Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 26-H7.39B

Date: 2026-11-19

Supplementary Information

Written Submission from the Canadian Environmental Law Association

In the matter of

Ontario Power Generation

Application to refurbish Pickering Nuclear Generating Station and to renew licences for the Pickering Nuclear Generating Station and Waste Management Facility

Commission Public Hearing
Part 2

October 6-9, 2026

Renseignements supplémentaires

Mémoire de l'Association canadienne du droit de l'environnement

À l'égard de

Ontario Power Generation

Demande concernant la réfection de la centrale nucléaire de Pickering et le renouvellement de ses permis pour la centrale et l'installation de gestion des déchets

Audience publique de la Commission
Partie 2

6-9 octobre 2026

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Canada

DURHAM NUCLEAR AWARENESS, SLOVENIAN HOME ASSOCIATION & THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Comments on the Ontario Power Generation's Application to Refurbish Pickering Nuclear Generating Station Units 5–8 and to Renew the Pickering Nuclear Generating Station and Pickering Waste Management Facility Operating Licenses – Additional Disclosure Pertaining to Potassium Iodide Distribution and Requests for Ruling

(Ref. 2026 - H-7)

November 19, 2026

Prepared by:

Theresa McClenaghan, Executive Director and Legal Counsel

Jacqueline Wilson, Legal Counsel

November 19, 2026

Sent by email interventions@cnsc-ccsn.gc.ca

Senior Tribunal Officer, Secretariat
Canadian Nuclear Safety Commission
280 Slater Street, P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9

Dear Sir or Madam:

Re: Ref. 2026 - H-7 - Submission on Additional Disclosure Regarding Potassium Iodide Pre-Distribution and Requests for Ruling

I. OVERVIEW

The intervenors, Durham Nuclear Association, Slovenian Home Association and Canadian Environmental Law Association (CELA) make the following supplemental submissions on a memo that was provided to the Commission by CNSC staff, signed on October 16th, 2026, and published on the CNSC Hearing Documents webpage on October 19th, 2026, giving an update on the issue of KI pre-distribution in Durham region.[1]

The intervenors are also concerned that the Commission has not yet responded to several requests for ruling made pursuant to Rule 20 of the *Canadian Nuclear Safety Commission Rules of Procedure,* SOR/2000-211, most recently on October 21, 2026. The requests relate to disclosure of key safety analyses and the opportunity to comment on those analyses prior to a decision by the Commission.

Furthermore, the intervenors made a request for disclosure of the Pickering Nuclear 5-8 Safety Report: Part 2 – Accident Analysis, which was denied. We request that this decision be overturned and the document be disclosed.

II. CELA COMMENTS IN RESPONSE TO KI DISTRIBUTION

At a previous CNSC hearing on the Pickering Nuclear Generation Station site that occurred between June 25th - 29th, 2018, members of the public expressed concern over the adequacy of emergency planning. One of the repeated issues at the hearing was the question of how

[1] Canadian Nuclear Safety Commission, *CMD 26-H7. E – CNSC Staff Undertaking, Update on Potassium Iodide (KI) Distribution* (16 Oct 2026). Online: https://api.cnsc-ccsn.gc.ca/dms/digital-medias/CMD26-H7-E-CNSC-UND.pdf/object

Potassium Iodide (KI) would reach the population, particularly children, in a timely way in the event of a severe accident with offsite emissions.[2]

Health Canada advises that to be effective, KI must be ingested (with advice from public health or the nuclear emergency authorities) either immediately before the emission of radioactive iodine begins from the accident sequence, or within the first few hours, to still be approximately 80% effective at blocking the uptake of radioiodine by the thyroid.[3] This is a very narrow window. There are certain scenarios in which this time frame would not be available, such as in the case of a failure of containment due to some catastrophic event, which is foreseeable in various ways including severe external occurrences.

In particular, in 2018 and now, CELA, and members of the public are requesting broader pre-distribution of KI than the 10 km zone around the operating plants[4] (as Bruce Power does for example[5]) to schools, childcare settings, and recreational centres among others; namely, locations where children may be found in large numbers in the event of an accident.[6]

Then CNSC President Binder requested during the previous Pickering Nuclear Generating Station hearing that CNSC staff work with certain agencies on this issue. Mr. Jammel agreed. Based on subsequent conversations with CNSC staff, CELA understood that it would be included as one of these agencies.[7]

Subsequently a working group was established, but CELA was advised by Mr. Jammel in a verbal conversation that the members did not want CELA included; however, Mr. Jammel advised that the CNSC would set up its own "advisory group" on KI to advise it on the work of the KI Working Group. This was done[8] and CELA joined that advisory group, along with Prof.

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[2] **Tab 1 -** Canadian Nuclear Safety Commission, *Transcript of OPG Pickering Public Hearing* (26 June 2018) at 116, 175; **Tab 2 -** Canadian Nuclear Safety Commission, *Transcript of OPG Pickering Public Hearing* (28 June 2018) at 101, 249.

[3] **Tab 3 -** Health Canada, *Generic Criteria and Operation Intervention Levels for Nuclear Emergency Planning and Response*, May 2018, S 7.1.1 at 18. Online: https://publications.gc.ca/site/eng/9.855963/publication.html; **Tab 4 -** Canadian Nuclear Safety Commission – KI Pill Working Group, *Report – Emergency Distribution of Potassium Iodide Within the Ingestion Planning Zone of Pickering Nuclear Generating Station* (Dec 2020) at 7.

[4] **Tab 5 -** CELA, "CELA's Comments on the Canadian Nuclear Safety Commission's KI Working Group Draft Terms of Reference," (14 Feb 2019) via email [communicated to CNSC].

[5] **Tab 6** - Bruce Power, "Community Safety Guide, KI distribution enhancing emergency preparedness in Frey, Bruce and Huron," 20 Mar 2025. Online: https://www.brucepower.com/2025/03/20/community-safety-guide-ki-distribution-enhancing-emergency-preparedness-in-grey-bruce-and-huron/

[6] **Tab 1 -** Canadian Nuclear Safety Commission, *Transcript of OPG Pickering Public Hearing* (26 June 2018) at 175.

[7] **Tab 2 -** Canadian Nuclear Safety Commission, *Transcript of OPG Pickering Public Hearing* (28 June 2018) at 316–19.

[8] **Tab 7 -** Canadian Nuclear Safety Commission, *Canadian Nuclear Safety Commission (CNSC) Annual Report 2021-22* (10 Nov 2025) at Departmental result 3. Online: https://www.cnsc-ccsn.gc.ca/eng/corporate/plans-results/annual-reports/ar2021-2022/

Dave Novog of McMaster University, Mr. B. Lemaich, Fire Chief at Kincardine near the Bruce nuclear plant, and others. These meetings were held in 2019 and 2021, and minutes were posted.[9] However, this group inexplicably ceased to continue meeting. CELA eventually understood that a combination of CNSC staff turnover and the events of COVID 19 had disrupted the plan for meetings of the advisory group. CELA is not aware that it was ever formally concluded or disbanded.

In the meantime, as shown in the update memo to the CNSC, which is the subject of this submission, the other working group only ever completed phase 1 of its work. To CELA's knowledge, phase 1 consisted of nothing more than a summary of the status of KI distribution, and did not contain any recommendations as to future actions, despite receiving multiple comments from several reviewers.[10] In particular, it did not contain any recommendations as to how to ensure that KI would be readily and effectively distributed rapidly and on time to the public, especially children, in the event of early release of radioactive iodine. There were also no recommendations about how to ensure that in the case of a severe accident locations without pre-distributed KI would receive it. These topics were supposed to be part of the phase 2 work plan for that working group.[11]

As far as CELA knows, the situation has not changed since 2018. The public's questions then and now are still unanswered. In particular, the statements made by the staff of the provincial emergency management program remain applicable, in which they informed the Commission that specific provisions would be developed at the time of an accident, to respond to the accident as it is developing.[12] This was to be the case for detailed evacuation as well as KI distribution. CELA is not aware of any provisions adopted since then to ensure that the above-noted child-centred locations beyond 10 km have KI, nor that the employees, residents and parents in these areas have been advised as to when and why KI would be administered.

As the Commissioners are aware, and CNSC staff and industry are aware, KI is an important measure in response to a severe accident with emissions. As has been found in previous nuclear tragedies, radioactive iodine is an early release in an event sequence. Radioactive iodine can be a cause of large numbers of elevated thyroid cancer following such an event, particularly in

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[9] **Tab 8 -** Canadian Nuclear Safety Commission, *Meeting Minutes: CNSC Advisory Committee Workshop*, 19 Nov 2021. Online: https://www.cnsc-ccsn.gc.ca/eng/resources/emergency-management-and-safety/ki-pill-working-group-meeting-20211119/

[10] **Tab 9 -** KI Pill Working Group, *KI Pill Working Group: Draft Report – Comments received from public consultation*, (6 Apr 2021 to 5 Jul 2021); **Tab 10 -** Curve Lake First Nation, "Curve Lake First Nation Comments on 90-day public review period – Draft KI Working Group Phase 1 Report," (20 Jul 2021) via email [communicated to Lee Casterton].

[11] **Tab 8 -** Canadian Nuclear Safety Commission, *Meeting Minutes: CNSC Advisory Committee Workshop*, 19 Nov 2021 at 2 Discussion on Draft Phase 1 Report. Online: https://www.cnsc-ccsn.gc.ca/eng/resources/emergency-management-and-safety/ki-pill-working-group-meeting-20211119/

[12] **Tab 1 -** Canadian Nuclear Safety Commission, *Transcript of OPG Pickering Public Hearing* (26 June 2018) at 143-147.

children.[13] While KI does not deal with any other radionuclide emitted in an accident, it is an important focus because there is an available prophylactic that is safe and effective[14]; and because of the urgent timing for ingesting KI.

III. REQUESTS FOR RULING REMAIN OUTSTANDING

On October 21, 2026, the intervenors wrote to the Commission with four requests for ruling pursuant to Rule 20 of the *Canadian Nuclear Safety Commission Rules of Procedure,* SOR/2000-211 and the reasons for those requests.[15] We note that this letter to the Commission has not been posted on the Registry and ask that it is posted as part of the hearing record.

Several of the requests for ruling were also made at the public hearing. The following requests remain outstanding:

> **Request for Ruling 1**: The intervenors request disclosure of full copies, not only summaries, of all PSR 3 documents:
> o All safety factor reports
> o Global Assessment Report: Currently, only a summary has been disclosed. (CMD 26 – H7.1B)
> o Integrated Implementation Plan (not yet completed)
>
> **Request for Ruling 2:** The intervenors request an opportunity to provide comments on all of the documents in the PSR3 process, including all of the safety factor reports, the full global assessment report, and the integrated implementation plan, prior to a decision by the Tribunal.
>
> **Request for Ruling 3:** The Ontario Power Generation Gap Analysis, to address the strengthened requirements in version 3 of RegDoc-2.10.1, must be completed and disclosed to the public and the Tribunal prior to a decision.
>
> **Request for Ruling 4**: The public seeks an opportunity to comment on Ontario Power Generation's gap analysis and its compliance with RegDoc 2.10.1, Version 3, prior to a Tribunal decision.

The intervenors reiterate their requests for disclosure and the opportunity to comment on key safety analyses before a decision in this matter is made.

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[13] **Tab 3-** Health Canada, *Generic Criteria and Operation Intervention Levels for Nuclear Emergency Planning and Response*, May 2018, S 7.1.1 at 18. Online: https://publications.gc.ca/site/eng/9.855963/publication.html
[14] **Tab 3 -** Health Canada, *Generic Criteria and Operation Intervention Levels for Nuclear Emergency Planning and Response*, May 2018, S 7.1.1 at 18. Online: https://publications.gc.ca/site/eng/9.855963/publication.html
[15] **Tab 11 –** CELA, DNA and SHA, "Ref 2026 – H-7 - Request for Ruling" (21 Oct 2026) letter via email [communicated to CNSC].

IV. DECISION TO REFUSE DISCLOSURE OF PICKERING NUCLEAR 5-8 SAFETY REPORT: PART 3 – ACCIDENT ANALYSIS

On October 27, 2026, the intervenors noted that the Commission had ordered OPG on September 23, 2026 to disclose two documents for "inclusion in the hearing record", including the Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis.[16] The Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis has not been disclosed or posted to the Registry.

A Tribunal Officer responded on October 30, 2026 denying the request for disclosure of the Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis:

> The document "Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis" contains prescribed information and therefore cannot be shared or posted online.

We request that this decision be overturned by the Tribunal and the document be disclosed to the public immediately. There is no indication of what "prescribed conditions" have been met which would justify an accident safety analysis, central to the public's concerns about the proposal to refurbish the Pickering Nuclear Generating Station Units 5-8, remaining confidential.

V. REQUESTS AND CONCLUSION

CELA requests that the Commission issue strong direction in this decision to require that the issue of pre-distribution of KI, as well as planning for distribution during an accident scenario, be brought back to the Commission for review as part of its determination as to whether the public is adequately protected from future operations at the Pickering Nuclear Generating Station, in the event of a decision to permit refurbishment.

With respect to KI distribution, CELA requests that the Commission exercise its own jurisdiction on this matter as part of its core mandate under the *Nuclear Safety and Control Act* to determine whether the public is adequately protected from the use of nuclear energy at the Pickering site in the event of refurbishment[17].

While there are additional responsibilities of provincial authorities, the core question of protection of the public from the operation of nuclear power is a central question to be decided by the Commission in issuance of a license, both constitutionally, and under the *Nuclear Safety*

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[16] **Tab 12 -** Canadian Nuclear Safety Commission – Commission Registrar, "Canadian Nuclear Safety Commission Request for Additional Documents Pursuant to OPG's Application for Authorization to Refurbish the Pickering Nuclear Generating Station and Renew its Pickering Nuclear Generation Station and Waste Management Facility licenses (26-H-7)" (23 Sep 2026) via email [communicated to Sarah Irvine]. Online: https://api.cnsc-ccsn.gc.ca/dms/digital-medias/CMD26-H7-CR-Letter.pdf/object

[17] *Nuclear Safety and Control Act*, SC 1997, c 9, s 3(a).

and Control Act, section 24(4).[18] The need for this measure is directly related to the license issuance jurisdiction of the CNSC for nuclear power operations and is a unique risk arising therefrom.

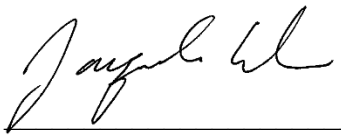
CELA further requests that the Commission respond to its requests for ruling, order the disclosure of key safety analysis documents, and allow for public comments on those analyses prior to any decision on whether refurbishment may proceed.

Sincerely,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION



Theresa McClenaghan, Executive Director and Legal Counsel



Jacqueline Wilson, Legal Counsel

[18] *Nuclear Safety and Control Act*, SC 1997, c 9, s 24(4).

Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Public hearing

Audience publique

June 26th, 2018

Le 26 juin 2018

Pickering Recreation Complex
1867 Valley Farm Road
Pickering, Ontario

Complexe récréatif de Pickering
1867, rue Valley Farm
Pickering (Ontario)

Commission Members present

Dr. Michael Binder
Ms Rumina Velshi
Dr. Sandor Demeter
Ms Kathy Penney
Mr. Timothy Berube
Dr. Marcel Lacroix

Commissaires présents

M. Michael Binder
Mme Rumina Velshi
Dr Sandor Demeter
Mme Kathy Penney
M. Timothy Berube
M. Marcel Lacroix

Secretary:

Mr. Marc Leblanc

Secrétaire:

M. Marc Leblanc

General Counsel:

Ms Lisa Thiele

Avocate générale :

Me Lisa Thiele

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Pickering, Ontario / Pickering (Ontario)

--- Upon commencing the public hearing on Tuesday, June 26, 2018 at 8:30 a.m. / L'audience publique débute le mardi 26 juin 2018 à 08 h 30

Opening Remarks

M. LEBLANC : Bonjour, good morning, Mesdames et Messieurs. Welcome to the continuation of the Part 2 public hearing on the application by Ontario Power Generation for the renewal of the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station.

Please note where the emergency exists are. They are at the back of the room, there are two doors there. Bathrooms are located near the main entrance in the lobby. There are also bathrooms here in the main room.

Des appareils d'interprétation sont disponibles à la réception for simultaneous interpretation. La version française est au poste 2 and the English version is on channel 1.

Please keep the pace of your speech relatively slow so that the interpreters have a chance to keep up.

I would also like to note that this

hearing is being video webcast live and that the hearing is also archived on our website for a three-month period after the close of the hearing.

Transcripts will be available on the Commission website in about two weeks.

To make the transcripts as meaningful as possible, we would ask everyone to identify themselves before speaking.

As a courtesy to others in the room, please silence your cell phones and other electronic devices.

Monsieur Binder, président et premier dirigeant de la CCSN, présidera l'audience publique d'aujourd'hui.

Mr. President...?

LE PRÉSIDENT : Merci, Marc.

Good morning and welcome to the continuation of the public hearing of the Canadian Nuclear Safety Commission. Welcome also to those joining us via the webcast and via teleconference.

Mon nom est Michael Binder, je suis le président de la Commission canadienne de sûreté nucléaire.

And for those who are not here with us today, I will begin by introducing the Members of the Commission.

To my right are Dr. Sandor Demeter and Ms Kathy Penney; to my left are Mr. Timothy Berube, Ms Rumina Velshi and Dr. Marcel Lacroix.

We have now heard from Marc Leblanc, our Secretary. We also have with us Ms Lisa Thiele, Senior General Counsel to the Commission.

Marc...?

MR. LEBLANC: So yesterday we heard the presentations by OPG, CNSC staff, five intervenors made oral presentations and several written submissions were addressed.

Thirteen intervenors are scheduled to present orally today. Ten minutes are allocated for each presentation, with the Commission Members having the opportunity to ask questions after each presentation.

To assist intervenors in managing their time, a timer system is being used today. The light will turn yellow when there is one minute left and turn red at the 10-minute mark.

Time allowing at the end of the day, we will be addressing several of the written submissions.

We have in attendance, available for questions from the Commission, representatives from Environment and Climate Change Canada; Fisheries and Oceans Canada; the Office of the Fire Marshal and Emergency

Management; and the Ministry of Transport.

Representatives from the Ontario Ministry of Natural Resources and Forestry will be joining us later this morning.

Available by teleconference is a representative from Health Canada.

Mr. Buchanan, can you hear us?

MR. BUCHANAN: I can hear you.

MR. LEBLANC: Thank you, Mr. Buchanan.

Your key contact persons will be Ms Louise Levert and Ms Johanne Villeneuve from the Secretariat staff. They are at the back of the room if you have any questions pertaining to logistics, the timing of presentations, et cetera.

We expect to break for lunch from 12:30 to 1:30 and for dinner from 5:30 to 6:30 this evening. There will be short health breaks in mid-morning and in the afternoon.

Mr. President...?

THE PRESIDENT: Thank you, Marc.

So yesterday I opened the proceeding with some remarks which I would like to summarize today.

The Commission is a quasi-judicial administrative tribunal and consequently it is independent from any political, government or private sector influence.

In fact, each Commission Member is independent of one another and also independent of the CNSC staff. It is the Commission Members who will render a decision based on all the evidence presented in the context of this hearing process.

The Commission, as an administrative tribunal, does not have the statutory authority and will not consider questions that are of a political nature and it is the Ontario provincial government that must address concerns that relate to fundamental energy policy questions. If Ontario decides that nuclear remains part of the energy mix, the role of the CNSC is to ensure it is safe.

The CNSC has no economic mandate and will not base its decision on the economic impact of a facility. It is the health, safety and security of the public and the protection of the environment that guides our decisions.

As was stated earlier, the Commission is an administrative tribunal. It is willing to conduct this hearing in the affected community and to provide a forum where members of the public can express their views on the matter at hand.

As the Commission wishes to hear the more than 80 oral presentations and ask as many questions as it deems necessary on these, we ask that everyone respect the

10-minute time allocation and the decorum of a Tribunal setting and assist with the orderly, civil and respectful conduct of this hearing. The Commission will not tolerate inappropriate behaviour and will take measures necessary to ensure the orderly conduct of this proceeding in the same way it does for all other proceedings it conducts in Ottawa and in the communities.

So with this introduction I would like to start with the first presentation, which is by the Canadian Association of Physicians for the Environment, as outlined in CMDs 18-H6.76 and 18-H6.76A.

I understand that Dr. Vakil will make the presentation. Please proceed.

CMD 18-H6.76/18-H6.76A
Oral presentation by the
Canadian Association of Physicians for the Environment

DR. VAKIL: Can you hear?

THE PRESIDENT: Go ahead.

DR. VAKIL: Can you hear me?

THE PRESIDENT: Yes, we can.

DR. VAKIL: Yes, okay.

Well, thank you very much for the opportunity to make this presentation. My name is Cathy

Vakil, I am a family doctor in Kingston and I am an Assistant Professor in the Department of Family Medicine at Queen's University. I am representing the Canadian Association of Physicians for the Environment, which is a group of health professionals, including physicians and citizens who are concerned about the health effects of environmental degradation and environmental toxins. Next slide, please.

So our recommendation is that the CNSC not grant OPG a licence to continue operation of Pickering nuclear power plant for 10 years and that the Provincial Nuclear Emergency Response Plan should be updated to address a Fukushima-level accident in keeping with international best practices.

Before I continue on my presentation I would just like to add that CAPE supports several requests for ruling that were submitted recently. The first one is from Durham Nuclear Awareness, Greenpeace, and Canadian Environmental Law Association that OPG be mandated to establish a nuclear emergency preparedness awareness campaign in the GTA; the second is from Northwatch, Canadian Environmental Law Association, and Greenpeace that OPG's closure plans for Pickering nuclear station are subject to environmental assessment; and the third one is from Canadian Environmental Law Association and Greenpeace

to remove the wording from OPG's licence giving CNSC staff the power to allow Pickering to operate past 2024 without a public hearing.

So I would like to continue with my presentation. Next slide, please.

Generally there are a lot of health problems with the nuclear energy industry. I am not going to go through these in detail, I just want to concentrate on the last two, which is a significant and real risk of accident and address some problems with a Provincial Nuclear Emergency Response Plan. Next slide, please.

So I just have a list of the issues that I'm going to talk about.

The first one, and probably the most important, is that the emergency response plan that we have in Ontario does not address a Fukushima-level accident, which should be an INES Level 7, it addresses about an INES Level 5, which is several fold, manyfold less severe. And until it does address -- it has an appropriate planning basis, our emergency response plan will be inadequate.

The second issue is the intentional lack of detail in the planning because a serious accident is considered unlikely. I think preparedness should also depend on the severity of the consequences of an accident. Because of the high population around our reactors here,

and we are the only country that has put our reactors in the most densely populated area of the country, there will be severe consequences in the event of a severe nuclear accident. There are 4 1/2 million people who live within 50 kilometres of Pickering and Darlington stations, half a million within 20 kilometres of Darlington, 1.3 million within 20 kilometres of Pickering. Half of Ontarians and one in six Canadians live within 60 kilometres of Pickering and Darlington. So in the event of a severe nuclear accident, the health consequences could be catastrophic and I think the public expectation is that our emergency response plan will address this, which it does not.

The next thing is the estimates of the probability of a severe accident do not align with actual frequency seen worldwide. Throughout the emergency response plan they continued to say how unlikely a serious accident is. However, we have had a significant nuclear accident every 10 years worldwide. Our reactors are old, they are multi-unit and they have shared containment, and all these things make the risk of accident higher.

The last thing on this slide is the issue of population effect. Through the emergency response plan it continues to say that the doses in the event of an accident would be extremely small. However, when you have a large population, which we do around our reactors, even a

small increase in risk will translate to a significant number of illnesses and deaths. Next slide, please.

There is also an innate conflict of interest. The technical information used to derive the emergency response plan comes from OPG and CNSC, both who are strong supporters of the nuclear industry, and I think that our emergency response plan should be free from industry influence.

The next one, and this is important because I think that Ontarians deserve to have an emergency response plan that meets international best practices, and I will use Switzerland as an example, which uses an INES Level 7 accident as its planning basis, uses different accident scenarios and weather patterns and has established detailed protective measures for each scenario and its evacuation zone is 50 kilometres, compared to our 10 kilometres. And in Ontario the health risk of an accident is far, far, far greater than it would ever be in Switzerland because of our high population. And again, I think Ontarians expect and deserve to have an emergency response plan that meets international best practices.

In terms of potassium iodide distribution, we would agree with the Durham and City of Toronto to request the pre-distribution beyond 10 kilometres. It is now available up to 50 kilometres. However, most people

who live in that area do not even know that they have access to KI. There has been basically no advertising for this or public education. At the end of 2015 the Toronto Star ran an article about this and within five days there were 11,000 orders. This shows that the public is concerned about an accident, but they are largely unaware of anything available to them due to lack of public education. We believe that KI should be pre-distributed and stockpiled in schools, daycare centres, hospitals, all workplaces to ensure a high percentage consumption as soon as possible after any exposure from a release as the KI lasts 24 hours but it loses efficacy within the first few hours of use, so it needs to be ingested as soon as possible when the person is exposed. And Bruce Power actually pre-distributes KI to schools, all schools within 50 kilometres, as do other jurisdictions in the world. CAPE also supports the Toronto District School Board's request that KI be stockpiled in schools within 50 kilometres and there are Canadian studies that have shown that children beyond 10 kilometres may need protection. Next slide.

Or actually, one more thing on that slide. Also, when you look at the emergency response plan there is some really unrealistic assumptions made about how an evacuation, et cetera, would unfold. It assumes there will

be no release before 24 hours, that there would be 100 percent evacuation from the primary zone, 10 kilometres, 100 percent ingestion of KI in the primary zone and 100 percent sheltering outside of that. All these things may well not occur and there is no scenario that would account for this. They also assume there is a complete communication to the public as to what to do, there won't be any traffic jams, there will be predictable weather patterns, and all these things are really unrealistic, especially considering the huge population that may need to be evacuated and the congestion that there already is along the 401 there. And keep in mind that Fukushima only had 150,000 people evacuated compared to the possibly millions that would need to be evacuated here in Ontario. Next slide.

Importantly, there is no addressing the possibility of drinking water contamination. Lake Ontario is drinking water for 9 million Canadians and Americans, including 50 percent of all Ontarians. In Fukushima, 80 percent of the radionuclides went out into the Pacific Ocean. Here they would go out into Lake Ontario and would possibly contaminate the entire lake and everything downstream. This is not discussed in the emergency response plan and this is a significant omission when you are talking about people's health.

Just a word about the healthcare preparedness and public education. Within 30 kilometres of Pickering there are 22 hospitals and 7400 beds, there are 82 retirement homes with 9400 beds. Possibly all these people will need to be evacuated into hospitals in the GTA and elsewhere and it needs to be absolutely sure that these hospitals have the room and the staff to accommodate these extra patients and there would be ambulances, et cetera, ready for transfer. Emergency room staff, paramedics and first responders all need to be practised in decontamination methods, they need to know how to treat acute radiation exposure, they need to be doing regular exercises and drills, and there should be audits on this to make sure they are all well prepared. There should be public education in the entire GTA for everybody and this should be taught in schools.

And lastly, just the zoning should be based on rigorous science and with best practices and acceptable safety margins to address uncertainty. Right now the 20-kilometre radius for the secondary zone is completely arbitrary, they just doubled the 10-kilometre, and this just isn't acceptable for our emergency response plan. Next slide.

So in conclusion, the request for OPG to extend the operating licence of Pickering Nuclear Power

Plant for 10 years should be denied until an adequate Provincial Nuclear Emergency Response Plan is in place that addresses the unique situation in Pickering and that is in keeping with international best practices. Thank you.

THE PRESIDENT: Thank you.

I think it's a good time to call the Office of the Fire Marshal to come forward and maybe address some of the issues being raised.

--- Pause

MR. MORTON: Good morning. My name is Michael Morton, for the record. I am the Director of Emergency Management with the Office of the Fire Marshal and Emergency Management.

I am joined to my right by Mr. Jonathan Stone, who is our Manager of Planning and Exercises within our organization; on my left I have Kathy Bleyer, who is our Senior Nuclear Emergency Planner; and behind me to the left is Lorie Whitcombe, who is our Senior Scientific Officer.

We are also joined today by representatives from the Ministry of Transportation and the Ministry of Environment and Climate Change, who can speak to issues specific to their portfolio, and we have access by phone throughout these hearings to a number of experts across the Ontario government.

What I would suggest, if it suits the Commission, is I could give just a very brief context to the Provincial Nuclear Emergency Response Plan. This will follow up on our very detailed presentation to the regular meeting of the CNSC which occurred on April 4th and that presentation is available on the CNSC website. It provides a lot of very specific context as to the changes made for the 2017 Provincial Nuclear Emergency Response Plan.

But just for those that did not hear that report and as a little general context I will start with just a few minutes of background on emergency management in Ontario and our PNERP and then we will get to some of the specific items that have been raised by the intervenors.

So first of all, within Ontario we have a very robust emergency management system. This is developed in accordance with international and national best practices such as the Canadian Standards Association Z1600, which outlines best practice for emergency management in general.

Our programs are carried out under the authority of Ontario's *Emergency Management and Civil Protection Act*. This Act requires all municipalities in Ontario as well as all ministries of the provincial government to have in-depth emergency management programs. These are further enhanced by Regulation 380/04, which

outlines specifics not just for emergency management but for continuity of government operations. Our organization works with all 444 municipalities in Ontario and all of our provincial ministries to provide oversight and to ensure that their programs are indeed consistent with the Act and its supporting regulation.

With reference to nuclear emergency management, the Act requires under section 8 that we develop a plan for emergencies at nuclear facilities within Ontario as well as those that could have effects on Ontario in general. This is a Cabinet-level plan. So the Government of Ontario, through the Cabinet, reviews and approves this plan.

And in addition to that, under Order in Council, our organization, our Ministry is provided the lead for all other nuclear and radiological emergencies. So we have, under Ontario law, the lead for offsite emergency management and offsite emergency response for any sort of nuclear or radiological emergency.

So consistent with the Act and our Order in Council duties, we have developed the Provincial Nuclear Emergency Response Plan. The PNERP is supported by over 20 other provincial, federal and municipal plans, and these are listed in the PNERP itself and all of these plans are publicly available.

We developed the PNERP in a very consultative manner. We first do that through what we call our Nuclear Emergency Management Coordinating Committee. This is an organization of over 30 stakeholder organizations at all levels of government as well as representatives of the nuclear operators within Ontario, and they are supported through an extensive staff structure within the Ontario government, the federal government and municipal governments. Within our organization we have numerous full-time staff that do this all day every day, and there are similar emergency management structures within designated ministries across the government who focus on specific procedures and processes related to nuclear emergency management. We work very closely as well with our partners at the CNSC, within Health Canada, who is the federal planning lead for the federal nuclear response plan, and we also work with Environment Canada and other federal departments that would have areas of jurisdiction related to nuclear emergency management.

The Provincial Nuclear Emergency Response Plan was last updated and approved by Cabinet in November of 2017. So we are operating under a very recent plan and there was a very robust process to develop that plan. It started in 2014 and the first steps to that were to look at what we call the planning basis. This is essentially the

scenarios that the plan addresses. Of note is what we would consider the worst-case scenario, if you will. We did a lot of study in order to define this. We worked very closely with CNSC and Health Canada to define what would be a credible large-scale event and that worst-case scenario looks at a total station blackout that would have no operator intervention for 12 hours. That's an extremely unlikely scenario, but it would indeed be consistent with the International Nuclear Event Scale, or the INES, Level 7 event.

This is detailed in the planning basis paper that we published in advance of updating the PNERP. That was posted for a 75-day period and we received a number of public comments on that to which we have responded. So that consultation, which was both the planning basis, including this worst-case accident scenario, as well as our proposed changes to the plan, that process received about 1600 public comments.

Our Minister appointed an international external advisory group independent of government to review all of those 1600 comments and the advisory group came back with a very detailed report. It included 15 recommendations and those recommendations fell into essentially two categories. Things that could be addressed in the 2017 PNERP, things that were primarily textual or

structural changes to the plan focused around ensuring that we have a regular review cycle mandated in the plan, which we now do, that we provide more clarity and more easily accessible language within the plan, samples and scenarios of how an accident would be responded to. All of those enhancements have been made and are reflected in the 2017 plan. So that addressed a number of the recommendations of the advisory group.

Other recommendations are dependent on a technical study that the advisory group recommended. And while the group supported the accident scenario and supported the intervention levels and the measures within the PNERP as well as our planning zones, they asked that we carry out a very detailed technical study that would look at particular weather and geographical effects on dosage rates that would occur around any of our nuclear facilities within Ontario as well as around the Fermi 2 plant in Michigan which could potentially have impacts on the Amherstburg, Essex County area of Southwestern Ontario. So that study is underway.

We have committed to act on all 15 of the recommendations, including that study. We expect the study to be complete by the end of the year and at that time we will look at those results, we will compare them to the work that has been done modelling to date, look at the

measures that are within the 2017 PNERP and, if indicated by the study, recommend options for any potential further enhancements to the PNERP.

But we do want to stress, and particularly given the concerns raised by the intervenor, similar concerns to what were raised during our public advisory period, that we do look at INES Level 7 emergency, we do look at multi-reactor scenarios, and there has been considerable review of those scenarios not just by the provincial government but by the independent advisory and by the CNSC staff, who have reinforced in CNSC documents their acceptance and agreement of those scenarios, as has Health Canada, and the applicability of the measures within the PNERP.

So there are many other aspects of this that we could speak to, but I will take a pause there and perhaps Members of the Commission would like to focus on certain aspects of this.

THE PRESIDENT: Yes. I think we should now focus on some specific questions associated with what the intervenor has raised. Who wants to go first? Ms Velshi...?

MEMBER VELSHI: Thank you. So I will start with the INES 7 rating and, as you have seen, it is one that not everyone agrees with how you have concluded

that the PNERP is based on an INES Level 7. So maybe I will start with staff. Is there a lot of subjectivity involved with what an INES rating is and, secondly, you know, how does one actually get kind of to check that this actually is an INES 7 rating of planning basis?

MR. FRAPPIER: Gerry Frappier, for the record.

So I think it's very important to start off with that the INES levels are not a planning tool, they are not designed to be a planning tool. They are not a decision-making tool, they were never intended to be a decision-making tool. It's a communication tool. The intent of the INES levels is that after an accident people could do a relatively objective assessment of the accident so that then you could have some understanding of how big an event it was, in particular when talking to the public and when talking to international colleagues. So the concept of making an accident scenario based on INES, that doesn't make any sense if you understand what INES is.

I think what most people are making reference to when they talk about that is the amount of radioactive material that is released. And so if what the intervenor means by an INES level 7 is to have a certain amount of a release, it's not so clear to me that that's the best way to determine what an appropriate emergency

plan is.

We would much rather be looking at it from what are the accident scenarios; what are the potentials; are we ready for what is likely to happen or what could happen -- I shouldn't say "likely," because -- but by what you could imagine would happen, and base your planning around that. And that's what the province has done. We've worked with them to try to create some scenarios that will result in as big a release as we could possibly see.

So certainly, all the planning that's been done would include as much response, if you like, as one could envision for any of these beyond-design-based accidents.

The actual exercise that just went through, just to give a bit of a feel for it, so the actual exercise that was just done at Pickering, the Unified Response, we have the responsibility in the CNSC to undertake the INES determination.

And again, because the INES process is all geared for after the accident, then it's a bit problematic in exercises, because of course the accident ended when day 2 ended, because that was when the scenario and the whole planning of the emergency exercise was over. In reality, that accident would have continued. So depending on how you want to play out that, what would have happened over

the next few days after the scenario's end, you can have that Exercise Unified Control -- I think I got that wrong, but the exercise that was just done at Pickering, you could have it as an INES level 5, 6, or 7. And that's what our analysis said. You basically would have to have seen how the mitigation things go.

What I think is important, though, is as far as decision-making on the part of the Province in particular, but also ourselves and OPG, the decisions were all made as if it was going to be INES level 7 or anything else. Because again, the Province doesn't wait for an INES determination, and it wouldn't be appropriate for them to do that. They're looking at what is the situation, what is the prognosis looking forward.

And so I think the INES level is a bit of a red herring in this, if that's a term that's allowed to be used. But it's because it's not really intended for planning.

So if what is being meant is we want a release that's bigger than we think out of any potential scenario is credible, we've already pushed the limits on that, and we've had in particular the SARP study that was done that really looked at a much, much larger release than any credible accident scenario.

MEMBER VELSHI: Thank you. So maybe the

Office of the Fire Marshal and Emergency Management should stop using that our planning basis is based on an INES 7, because if it's not a planning tool, let's not perpetuate this misrepresentation.

But did your independent international technical advisory committee say that the planning basis is indeed the worst possible scenario for planning? And should that not give enough reassurance to the members of the public?

MR. MORTON: What I'm going to do at this point -- it's Mike Morton, for the record.

I'm going to turn over to Kathy Bleyer in just a moment. Kathy authored the discussion paper, including a very extensive review of literature, as well as carrying out consultations with a number of different stakeholders initially in the development of that paper, working with the CNSC and Health Canada, but then through the process of the independent external advisory, and now within our external technical review that is being carried out in detail throughout this year. A number of variables were considered in the development of that. And again, we want to stress that this is based on the CANDU technology and the reactors that are operated here in Ontario.

So I'll turn it over to Kathy just to talk a little bit about her process in developing that and some

of the things that influence that consideration.

MS BLEYER: So it's Kathy Bleyer, for the record. I'm a senior planning officer with the Office of the Fire Marshal and Emergency Management.

When we went about the planning basis review, we brought together a group of stakeholders. So we worked very closely with CNSC staff and with Health Canada first, in the first order, to determine what would be the accident scenario that we would look at. Mr. Frappier, I believe, mentioned the SARP scenario, and we did undertake a detailed assessment of that SARP scenario. We looked at it based on the CNSC health consequence study that was undertaken and basically looked at the doses that would result from that scenario. So we included that in our discussion paper.

But we then decided with our stakeholders to look at an accident that was even more severe than that. It took us a while to land on that accident scenario, but basically it was taken from the Darlington probabilistic risk assessment, which was done in 2011, I believe. So it pre-dated the EMEs, the mitigating equipment that was installed based on the Fukushima recommendations made by CNSC.

So the scenario that we looked at basically involved extended station blackout with no

operator intervention for 12 hours. The accident, I believe, was called the RC1 accident. It did involve three emissions, but all of us agreed that to expect that there would be no operator intervention throughout the whole scenario was really, really unlikely. So the consideration was just based on the first emission, the first radioactive emission, which occurred 11 or 12 hours after the accident occurred.

So that accident scenario was taken, and it was modelled by Health Canada. And they did Gaussian modelling, Lagrangian modelling. They could speak much better to how they undertook the modelling. And so based on the dose assessments from that, we considered what the geographical extent of the planning zones should be.

So it was an extremely unlikely accident, and the dose assessments from the modelling informed our decisions for the planning zones.

THE PRESIDENT: I understand, Dr. Vakil, that you have to leave in about five minutes. So I want you to have the last word.

But before we do this, I really would like a yes or no answer from CNSC, Health Canada on PNERP. Are you satisfied that your planning basis is good for your current PNERP plan?

DR. VAKIL: Are you asking me?

THE PRESIDENT: I'm asking -- I would like Health Canada. Health Canada is online. Why don't we start with Health Canada, staff, and then Office of the Fire --

MR. BUCHANAN: Yeah, so President Binder, this is Kevin Buchanan from Health Canada, for the record.

My answer to your question is yes.

THE PRESIDENT: Okay. Staff?

MR. FRAPPIER: Sorry about that. Gerry Frappier, for the record.

Certainly staff believes that it's adequate. And I would also point out that the dose calculations, as was just mentioned, is equivalent to what there was at the Fukushima accident. And so that's why we see the equivalency there.

THE PRESIDENT: Office of the Fire Marshal?

MR. MORTON: Mike Morton, for the record, Office of the Fire Marshal and Emergency Management.

We are very satisfied with the planning basis. As my colleague Kathy Bleyer has indicated, this was a lengthy and detailed process, involving federal and provincial officials. It has been advised by an international advisory group that is external to government. And to go even beyond that, we're currently

conducting even further detailed local technical studies. So we are very satisfied that our scenario, although very, very unlikely, is indeed a worst-case scenario.

MEMBER VELSHI: I just want to confirm, so your international technical advisory committee also said that the planning basis is appropriate?

MR. MORTON: That's correct. They reviewed all 1,600 of the public comments. They affirmed our scenario as well as our planning zones, but have recommended a detailed localized study to ensure that all of our actions and intervention levels are indeed appropriate.

THE PRESIDENT: Dr. Vakil, I know you raised a few other issues which will be discussed today and throughout the next three days, so if you can join us later on or tune in. But you have the last word, if you really have to leave now.

DR. VAKIL: Yeah. I would just like to say that as a member of the public, and I know I speak for many, many, many members of the public, it really doesn't make sense to me that other jurisdictions -- and I would give the example of Switzerland -- but many other jurisdictions have done -- have created emergency response plans that are far more stringent and far more detailed with much larger radiuses for things like evacuation,

sheltering, and KI predistribution based on a severe accident.

And it doesn't make sense to me that they will come up with these much more stringent guidelines than we do, especially considering the severity of the consequences in terms of health here with a severe accident. And I think a lot of the members of the public would be in a bit of a quandary as to why our guidelines are so much less -- so much more lax considering the risks here are far, far greater.

And that's all I have to say. Thank you.

THE PRESIDENT: Okay, thank you.

We will continue now without this intervenor, I guess, if there is some outstanding questions. Because later on, we will revisit this again.

So Dr. Demeter, you want to ask this question?

MEMBER DEMETER: No, the intervenor on slide 3, first bullet, talked about "ongoing chronic releases causing illness in people living close by." Since you'll be talking to the local medical officer of health about health status surveys and epidemiology and databases, I just didn't know the reference for this bullet with this intervenor that would help inform my question.

DR. VAKIL: There have been many studies

worldwide showing increases in particularly childhood leukemia in people living close by to reactors.

MEMBER DEMETER: Do you have any Canadian references that we could subject to scrutiny?

DR. VAKIL: No, because the Canadian studies are not adequate enough, they're not powered enough to show an increase within five kilometres, which is what other studies have showed elsewhere.

MEMBER DEMETER: Okay. I'll follow up with the public health officer.

THE PRESIDENT: Were you tuning in when this was discussed yesterday?

DR. VAKIL: Are you asking me? No, I wasn't tuning in, and I actually have to go right now, but thank you for your time.

THE PRESIDENT: Okay. You may want to read the proceeding of what happened yesterday on this.

Thank you.

I'd like to move on.

To the Office of the Fire Marshal, I hope you stick around here. I'm sure they're going to have many other questions here.

The next presentation is by the Canadian Association of Nuclear Host Communities, and the Municipality of Clarington, as outlined in CMD 18-H6.23.

I understand, Mayor Foster, that you'll lead the presentation. Over to you.

CMD 18-H6.23

Oral presentation by the

Canadian Association of Nuclear Host Communities

and the Municipality of Clarington

MAYOR FOSTER: Thank you.

For the record, I am Adrian Foster, Chair of CANHC, the Canadian Association of Nuclear Host Communities, and the Mayor of the Municipality of Clarington, the host community of the Darlington Nuclear Generating Station.

I am joined on my left with Mayor Dave Ryan, the Mayor of Pickering, the host community for the Pickering Nuclear Generating Station, and to my right Chief Gord Weir, who is our fire chief.

The Canadian Association of Nuclear Host Communities welcomes the opportunity to comment on the various matters relating to OPG's application to renew its nuclear operating licence, and we thank you for this opportunity.

CANHC is an association comprised of the heads of council of municipalities that host major nuclear

facilities in Canada. Our association provides a forum for our members to share knowledge and best practices in our respective experiences in working with the nuclear industry. Most importantly, our association provides support for our members through public hearing participation and liaison with the various government agencies to further our objectives.

CANHC has established an excellent working relationship with OPG, and is familiar with the many facets of its operation at the Pickering Nuclear Generating Station. Our submission is therefore premised on our lengthy observation and familiarity with both OPG as the operator and with the plant itself. We urge the Commission to give our comments its utmost consideration.

First and foremost, our interest in this matter is public safety, including safety of the workers, many of whom are residents of Durham Region, and of course the safety of residents, particularly those living nearby the station. We believe public safety should never be compromised.

OPG, through its many years of operating the Pickering nuclear station since the late 1970s, has demonstrated and continues to exercise its due diligence when it comes to public safety. Its excellent safety record is a matter of public knowledge and is on record

with the Commission. OPG can elaborate on its safety record and the high standards maintained for its operations.

Another aspect of public safety is emergency preparedness, where emergency fire and police services regularly participate with OPG across Durham Region in various exercise drills, evacuation planning, and off-site training at the Wesleyville facility.

Since the start of construction of the Pickering nuclear station in the early 1970s to its ongoing operation, we've been pleased with OPG's exceptional track record for the safe operation of the Pickering station. There is every reason to believe that OPG will continue to uphold its excellent safety record. The Pickering station has been safely operated for more than 40 years.

Following the events in Fukushima, OPG made substantial investments in safety equipment and procedures. In the CNSC's annual nuclear station performance report, we note that the Pickering station continues to meet or better performance expectations in all 14 safety-related areas. This leads us to believe OPG is not only committed to public safety, it has proven to our satisfaction that it has given public safety the utmost attention and top priority in the continuation of the operation of the Pickering station.

Our CANHC communities enjoy the economic benefits of the stable, highly-skilled and safety-conscientious workforce. The continued operation of the Pickering station is essential to sustain employment opportunities, commercial and industrial development, and generate tax revenue to the local governments.

Last but not least, OPG has been an excellent corporate citizen in the local communities, and we welcome the opportunity to foster that relationship in the coming years through the many sponsorships and employee engagement in various community activities.

In conclusion, CANHC fully supports the OPG application to renew the operating licence for the Pickering station.

Again, I thank you for the opportunity to comment on the application renewal.

THE PRESIDENT: Thank you. Questions?

Ms Penny.

MEMBER PENNEY: Thank you for that.

Continuing on the same theme of emergency response, perhaps you could, in either one of your roles, elaborate on how you've been involved in the provincial planning process for emergency response.

MAYOR FOSTER: I asked the chief to join us for precisely a question such as that.

Chief Weir.

FIRE CHIEF WEIR: For the record, Gord Weir. I'm the Fire Chief for the Municipality of Clarington.

We've been involved regularly with OPG and with the OFMEM in the planning. Myself and my counter in Pickering, we're involved with the *CSA N1600 Standard* and its update, so, yeah, we're heavily involved.

As Mayor Foster had indicated, we regularly plan an exercise with Darlington. At least we do it with Darlington, and I'm confident that Pickering does it also with the Pickering site as well.

MEMBER PENNEY: With respect to traffic management with respect to evacuation, is that provincial or does that fall under you, say, for your area?

FIRE CHIEF WEIR: Predominantly, I believe it's through DMO, the region, and the OFMEM who look after that aspect.

THE PRESIDENT: Can we get the transportation experts here? We hear so much about the lack of evacuation planning, the inability to evacuate. Can somebody shed some light as to what kind of studies were done, are they up to date, are they consistent with PNERP? What's the plan?

MR. MORTON: For the record, Mike Morton,

with the Office of the Fire Marshal and Emergency Management.

I'll do a brief introduction, and then I'll turn to my colleague, Nathalie Boyd, from the Ministry of Transportation.

The PNERP certainly includes considerable content around evacuation. It is one of our primary and preferred protective actions. Under our Order in Council 1157/2009, which I referenced earlier, the Ministry of Transportation does have the provincial lead for preparing for transportation emergencies. Within the PNERP, the master plan, it's section 7.5.2 that requires the Ministry of Transportation to be the lead for the development of measures for evacuation, and specifically transportation management around each of the nuclear facilities in Ontario, as well as for the Amherstburg area in southwestern Ontario.

What I'm going to do at this point is turn it over to Nathalie Boyd. She will provide you some specifics related to their efforts to develop evacuation plans, and the measures that are in place around the Pickering Nuclear Generating Station.

MS BOYD: Thank you. Nathalie Boyd with the Emergency Management Planning Office of the Ministry of Transportation for the province.

Currently, what we have in place is if there was an emergency that were to occur we would work closely with the joint traffic control centre, where OPP, Durham police and Toronto police, as well as ourselves, work together to evacuate the municipalities and communities around the Pickering Nuclear Generating Station.

There is a nuclear emergency evacuation and transportation management plan that was done by our central region office, who did detailed modelling and exercises to look at evacuations in that area. That is in place now. We can enact it. When traffic does get to our highways, that's when we would enact it.

I understand that the Durham Region also has an emergency response plan, and the City of Toronto, as well as the Pickering Nuclear Generating Station.

As Michael Morton mentioned, we are currently working on the provincial nuclear emergency response plan requirements to implement a provincial all hazards evacuation and transportation methodology. That's the overarching framework.

In addition, we'll be developing unified transportation management plans for all four nuclear generating sites, including Pickering.

We have engaged with our central region

office, traffic operations office, to work on developing a request for bid to hire a consultant to develop the methodology and to develop unified transportation management plans.

We will also be looking to utilize a similar approach used for the Pan Am and Parapan Am Games in 2015, the unified transportation coordination centre, to operationalize the unified transportation management plan for Pickering.

THE PRESIDENT: Just so I can understand, if something happened today, is there a plan today for an orderly evacuation? When will the study, the further study you're doing, be available?

MS BOYD: Currently, right now, like I said, we would work closely with the OPP, Durham police and Toronto police to evaluate the areas within Pickering.

With respect to the RFB, the request for bid to hire a consult, we are working closely to bring that consultant on board for the fall and have the work done, completed, within two years.

MEMBER VELSHI: While you're here, I had a question for Mayor Ryan.

Pickering, with its current licence, the units are expected to shut down in 2020. I wondered what involvement you've had in their transition planning if the

plant were to shut down given what a major player it is within your community?

MAYOR RYAN: For the record, Mayor Dave Ryan.

We've been involved with the plant executive and with OPG executives for the past decade, frankly, in conversations regarding the eventual closure of the plant, which we understand is an inevitability at a point in time. Our concerns were threefold.

First, for the employee base, we're satisfied with that, with the refurbishment of Darlington and the opportunities that that provides.

Second, for the supply chain, we have worked with the Organization of the Canadian Nuclear Industry, OCNI, and we are satisfied along with the work with OPG that the supply chain also remains intact, again, given the continuation of the operation of the Darlington plant and, indeed, through Bruce as well, there is a connection.

Our final consideration was for the assessment base because Mayor Foster has indicated the plants are a significant contributor to the overall economy of the municipalities and, particularly, to the tax base. And although we haven't had a final word on that, we have had assurances both from OPG and from successive provincial

governments that we will find ways to assure that the assessment base has not been negatively impacted.

And I think there are other opportunities as well as we look at the work with the NWMO, which I know is not part of this, but they have, indeed, identified the existing spent fuel currently being stored at the sites as a commodity as it moves into the deep geologic solution that they have with their adaptive phase management.

So, I think that, you know, if the plants are going to close, it is another opportunity to balance the assessment impact as we look at that commodity base.

MEMBER VELSHI: Thank you. And just what about all the community support that you're getting from Pickering, and is that transition going to be managed well?

MAYOR RYAN: You're talking about the general population. I feel very confident that the general population is confident with the plant.

We have grown up around the plant. I've often used the analogy that when the plant was commissioned over 40 years ago that we were a population of less than 20,000. Today we're a population of a hundred thousand, so obviously we moved here in the full knowledge and expectation of the plant operation. It has met our expectations.

We continue to grow and to thrive. We are

the fastest growing community east of Toronto and expect to double our population here in Pickering over the next 20 years and, indeed, Durham Region as a whole is expecting to nearly double its population over the same timeframe.

So, obviously our residents, and I personally am very comfortable with the NGS operating in our community.

MEMBER VELSHI: Sorry, I didn't ask my question correctly. I meant, the community support, you know, that OPG provides. With the plant shutdown, does that leave a big hole for the community?

MAYOR RYAN: OPG has been, again as Mayor Foster referenced, a very strong community partner. I would anticipate that OPG would continue to be that strong community partner whether or not the plant is fully operating.

THE PRESIDENT: So, again, I'm going to ask every municipality who appear in front of us; are you happy with the PNERP as the new PNERP and the implementation plan for Durham and Pickering, because we hear noises about lack of funding to actually implement them.

I sure don't want to get into the politics of this, but I am concerned if you haven't got enough resources to implement the plan, then it's a concern of

ours.

MAYOR FOSTER: Adrian Foster, for the record. The brief answer is, yes; the extended answer is depending on any conditions that are imposed on the re-licensing, the communities would be concerned with resources that might come from the community, as opposed to the operator, you know, and resources do have a direct relationship to, you know, our ability to respond and react.

So, we're happy with it, but we certainly have a view to the future that if we have additional responsibilities we will need help.

And I'll ask Mayor Ryan if he has anything to add to that.

THE PRESIDENT: Well, the Office of the Fire Marshal. I know in your deck you were pointing out there were lack of resources earmarked for the enhancement of PNERP. Is there an issue? I'm trying to understand, was there no discussion about whether additional increment or resources would be to implement those plans?

MR. MORTON: Mike Morton, for the record, Office of the Fire Marshal and Emergency Management.

There are a very large number of organizations that have a role within the Provincial Nuclear Emergency Response Plan. They are, of course, at

all levels of government, including municipal.

From our perspective the nuclear industry has a long history of supporting governments, and particularly local governments in providing them with financial and in kind resources to supplement their existing and required emergency management programs.

And certainly there is review and discussion at the Nuclear Emergency Management Coordinating Committee around enhancements within the 2017 plan. At this time we have no indication of specific concerns, understanding municipalities are still working to bring their plans fully in line with the PNERP passed in November.

And historically, any time that a resource gap or a concern has been raised, that's been discussed at the Coordinating Committee, industry has been engaged in those discussions and industry and the municipalities have come to agreement to ensure that resources are in place.

So, at this time I'm not aware of any specific resources that would be required in addition to what's been provided, but that said, I can't speak for individual municipalities.

THE PRESIDENT: OPG?

MR. LOCKWOOD: Randy Lockwood, for the record. First of all, I want to thank both Mayor Foster

and Mayor Ryan for coming here today and making an intervention.

And my first comment would be reference to, we should never compromise public safety and I'm here to assure both intervenors, Members of the Commission and the members of the public that we will never compromise nuclear safety; that's our top priority, to ensure that our operations protect the worker, the public and the environment.

That said, the discussion right now about the implementation plan associated with the Provincial Nuclear Emergency Plan, we're currently in discussions with the various members in the community to do just that with priority. Our first priority is to address proper implementation of the new PNERP.

THE PRESIDENT: Thank you.

Question? Dr. Demeter?

MEMBER DEMETER: Hi. Thank you for the intervention.

More for the PNERP discussion. I just wanted to reflect what I heard and see if I'm interpreting this properly from a transportation and an evacuation point of view.

For the detailed planning zone, what I heard is that there's a pre hoc formalized plan for

evacuation. For zones beyond that, including the contingency planning zone, there's a discussion that will be had with other agencies at the time, in fact, that there's a distinction between a pre hoc formalized evacuation plan and a, we don't have that yet, but we'll talk to the other agencies.

Is that what -- is that correct?

MR. MORTON: Mike Morton, for the record, with OFMEM. I'll provide a little bit more context on what we have today opposed to what's in progress, as well as some of the enhancements within the 2017 PNERP, and then turn to Natalie Boyd from Ministry of Transportation to provide any further specifics that she'd like to provide.

I want to assure the Commission and the public that we have historically, and continue to have strong evacuation plans for all of the detailed planning zones previously known as the primary zones, the 10-kilometre areas around each plant.

These were previously referred to as joint traffic control plans and they are partnerships of a wide variety of particularly provincial and municipal stakeholders originally historically focused on traffic management, so, our police forces of jurisdiction and the Ministry of Transportation.

One of the major enhancements that came

from the experience leading up to and during the Pan Am and Parapan Am games was the evolution of that concept to what we're calling the unified transportation management concept.

This is essentially an expansion of methodology where an increased number of stakeholders is formally engaged in the planning process.

So, for example, Transport Canada has been engaged in that because of their areas of federal transportation, other modes other than road transportation.

And a particular enhancement is the formal engagement of transit agencies, not just here in Durham as has been done for a long time, but the engagement of the broader provincial public transportation networks including transit agencies in other municipalities and with Metrolinx as a provincial agency.

Those entities now would meet in what we're calling the Unified Transportation Coordination Centre.

Basically they all join together, similar to how they would under the joint traffic concept historically, and they have a very high level of coordination within a set methodology that the Ontario government heavily invested in in the lead up to the Pan Am games in cooperation with partners like Durham and City of

Toronto.

And that methodology was developed based on the lessons of other major events, such as the London Olympics and some of the other Olympic events that have been held internationally.

The advantage of the Pan Am/Parapan Am games is that we were able to implement that centre and that concept for a real event and to have that centre operational for about a three-week period and to deal with various incidents and complications that arose as we look to manage a special event on top of the existing transportation grid.

To ensure further due diligence with respect to the viability of these evacuation plans, a couple of really key enhancements that we've put into the 2017 PNERP include a requirement for evacuation time estimate studies to be done.

So, first of all, in the plan -- and this is section 2.6.3 of the Pickering implementing plan, for those that want to cross-reference it, there is a new requirement for the development of these evacuation time estimates that is a very similar requirement to what exists in the new CSA N1600 standard for nuclear emergency management and these time estimate studies are required to be done by the municipal and industry stakeholders on a

regular basis and are required to take into account changing population numbers and census data.

So, a few years ago OPG contracted reputable consultants to carry out time estimate studies looking at a variety of scenarios for the detailed planning zone. It was found under what we would consider relatively worst case scenario, very snowy conditions in the Pickering planning zone, that that evacuation in its entirety could still be carried out in eight hours and 40 minutes. Under our worst case scenarios that Kathy was outlining, the first possibility of release would be about 11 hours and Fukushima was something like 28 hours.

So you know, having those studies and making sure this can be done effectively is important to us, and we feel the studies have shown that this methodology can do that.

MEMBER DEMETER: Eight hours to what boundary?

MR. MORTON: The eight-hour figure, eight hours and 40 minutes is for the detailed planning zone, the 10-kilometre zone. The Ministry of Transportation has its own advanced modelling. It's looked at traffic models, of course, across the GTA which is their job and, you know, we have the confidence that that could be done on a broader scale and that the mechanisms that have been established

historically and through Pan Am, there is coordination efforts. Of course, they are not specific just at that 10 kilometres, so they can be applied anywhere in Ontario where an evacuation is required.

THE PRESIDENT: But again, so somebody maybe -- is it true that the evacuation zone equivalent to the 10 kilometres here, in Switzerland it's 50; is that correct? Anybody know?

MR. FRAPPIER: Gerry Frappier, for the record. I'd ask Richard Tennant to comment on that, please.

MR. TENNANT: Richard Tennant, for the record.

My understanding is that's not true, but we'll look that up to confirm.

THE PRESIDENT: Thank you.

MR. BURNS: Dr. Binder, Scott Burns for the record, OPG.

I would just like to make a couple of comments on evacuation. So my former profession was with the police service and I was on the other side of the planning with the region of Durham. So I am aware that both on this side and that side of the equation, we all share the same priority with community safety and I know these plans have been in place for a number of years. So

we have evacuation plans in place.

Our emergency preparedness plans are scalable. So in this conversation, we get really tied into the zones, detailed planning zones as if it's some hard barrier, but the plans are scalable.

And as Mr. Morton expressed, we are talking about partnerships here that involve the Ontario Provincial Police force, Toronto police force; Durham regional police force. They have had partnerships and worked closely together on a number of operations, both in road safety and others. The close relationships know how to coordinate plans.

So they would look at evacuation of what needs to happen and they would not be restricted by a detailed planning boundary that would be in place and an appropriate level of evacuation would occur.

I do want to comment on the evacuation time estimate studies. We did one in 2015. It gave us a level of confidence about our ability to evacuate around the Pickering area and the Darlington area. The company that we've used also does the evacuation plans for over 60 of the nuclear facilities in the U.S., and I believe there's 65 of them, and I believe they do the plans for approximately 62 of the facilities in the U.S.

So we have high confidence in this company

that they are going to take care of our community's safety needs.

I just wanted to make a couple of those comments.

THE PRESIDENT: Thank you.

Questions?

MEMBER DEMETER: I think I understand now. I mean part of disaster or emergency planning is to plan for more than one type of disaster. So my assumption was that evacuation plans would be put in place for other municipalities, other jurisdictions based on other risks and other scenarios so that you could, in fact, piggyback on some of that work that had been done -- evacuation plans generically beyond your detailed planning zone.

But I appreciate the answer and the effort that's going into the work in progress, and I think I'm satisfied with the questions.

MEMBER BERUBE: So thanks a lot. I have been listening with great curiousity and trying to figure out what's going on.

The question I have is this. Basically I'm listening to a lot of planning which is basically strategic in nature. What I'm really curious about, do you have the tactical assets on the ground to implement these things at this point in time? Is there a gap in tactical

assets to be deployed? How do we get to people that basically can't move on their own?

All of these kind of things, the minutia of actually doing this. It's one thing to talk about it on a theoretical basis. It's quite another thing to do it on a real basis.

So the issue is have we actually got to that level of detail where we have actually looked at even a small community and said we've got 10,000 people here. We're going to have to physically go and move 1,000 of them, or something like that. Do we have the assets to actually get that done?

MR. MORTON: For the record, Mike Morton with the Office of Fire Marshal and Emergency Management.

There are a number of other people in the room and on the line with me who wish to comment.

But just to set a little bit of general context first, the PNERP master plan is, as you say, the overall policy framework and standard for nuclear emergency management in Ontario. It is supported by seven other plans that we consider as implementing plans under the PNERP, including the plan for the Pickering nuclear station which was just updated in March of 2018. It is the most recent iteration, so it gets into more specific local details.

But then where you get very particular implementing detail is in the local municipal plans, as well as in the ministry-specific plans that cover everything from radiation monitoring right up to, as Natalie Boyd said, the details of how evacuation would be carried out.

So I would suggest that perhaps Natalie would like to talk just a little bit more about the local planning committees and how those plans are made. Chief Weir may want to talk a little bit about local implementation.

There is also substantial resources at the provincial level and federal levels, including chemical, biological, radiological nuclear response teams, both within our Ontario system and maintained by our office, in partnership with fire departments such as Toronto and Ottawa and, of course, Health Canada, and other departments of the federal government maintain very robust specialized radiological response both for interventions but also for monitoring.

Again, I think there are certainly people in the room that would like to speak a little bit to their local capabilities implementation.

I'll pass over to Natalie from a provincial perspective to evacuation and then others may

want to jump in after that.

MS BOYD: Natalie Boyd, Ministry of Transportation.

I just want to clarify that we do, as mentioned earlier is that the ministry does have a nuclear emergency evacuation traffic management plan that was created in 2016. A situation office did do the initial modelling and looking at different scenarios, weather events, and so forth. That plan can be implemented on our highways. Once that traffic gets vetted to our highways we can implement that plan today.

As we move forward to implement and develop the unified transportation management plan for the Pickering area, we will be working with a nuclear emergency management coordination committee, the subcommittee for transportation management, to work with the local municipalities and other stakeholders to develop -- to ensure that the municipal plans for evacuation for traffic flow coordinates with our plan as well, as we move forward to ensure that we meet the requirements under the PNERP.

MR. LEBLANC: Ms Boyd, just for the interpreters if you can just slow down a little bit? I think they are having difficulty following.

MS BOYD: My apologies, sorry.

MR. LEBLANC: Thank you.

MS BOYD: Should I repeat that? Okay, we're good. Okay.

MR. JAMMAL: Mr. President, it's Ramzi Jammal, for the record.

You asked with respect to the comparison to the Swiss. It's very important to note that at the Convention of Nuclear Safety there was a component that the contracting parties have to present on the emergency planning in the context of the IAEA requirement on zones, Zone 1 or Zone 2.

But I'll ask Ms Kathleen Heppell-Masys to give you the equivalency. She will read it on the record that Zone 1 in Switzerland and their legal treaty element is almost equivalent to the Canadian under the CNS, 3 to 5 kilometres, and then they go to Zone 2 which is up to 2 kilometres. But Ms Kathleen Heppell-Masys will provide you with the wording associated with the Swiss.

So international benchmarking, I think it was Dr. Demeter who asked or someone asked. We are all equivalent with respect to the zoning within the range of 3 to 5 kilometres.

MS HEPPELL-MASYS: Kathleen Heppell-Masys, Director General, Security and Safeguards at the CNSC.

So to elaborate a little bit on what Mr. Jammal has just mentioned, as was stated at the Convention

of Nuclear Safety, Zone 1 in a Switzerland context, is the area around an NPP in which there could be acute dangers in the public, in the event of an accident and for which immediately protective measures are required. Depending on the NPP power reading and the exhaust height and site, Zone 1 covers a radius of about 3 to 5 kilometres. That is Zone 1.

Zone 2 joins Zone 1 and encloses an area with an outer radius of about 20 kilometres. The public can be alerted, individual sectors as appropriate.

So that's the context for -- the basis for planning and preparation for a specific measure called planning areas as have been defined.

I would just -- perhaps I could elaborate that we have done benchmarking, elaborate benchmarking at CNSC, and we've taken at look at German, Sweden and also the IEA recommendations, and it is the range of the zoning that have been alluded to this morning is fitting within the IEA range.

As well, it should be noted that the IEA recommendations developed are based -- most of them are based on the light water reactors and are meant to be used as a first approximation of zone sizes. Just I brought that to the record.

Thank you.

MR. JAMMAL: If you allow me, Mr. President, I want to precisely focus on one phrase that was mentioned on the record by Kathleen.

The key point here is the Swiss takes into consideration the design and the technology of the reactor. That's the key point. That's why they have the range to fire. It says "depending on the technology" because they have multiple technologies.

In Canada, as was mentioned by the Office of the Fire Marshal, it's a CANDU-specific design. We do not have a hybrid technology. So we really know the source term and we know the offsite consequences with respect to radiological consequences.

So that's the key point here is the Swiss have multiple types of technologies; in Canada we have a single technology. It’s called the CANDU.

THE PRESIDENT: Thank you.

Go ahead.

MEMBER PENNEY: I have another question for the MOT. And my apologies for interrupting you.

The Unified Transportation Plan, can you talk a little bit about that? I understand there are plans that exist since 2016 and then there’s more plans being developed.

If you could talk a little bit about that,

I would appreciate it.

MR. MORTON: Mike Morton, for the record, Office of the Fire Marshal and Emergency Management.

Just to reiterate some of what I said earlier, we want to assure that we have longstanding plans in place that are specific to each nuclear facility to be able to carry out an evacuation of the ten-kilometre detailed planning zone.

And as we've noted, the methodologies that we use are able to be applied to any sort of evacuation. So they could easily be expanded beyond that ten-kilometre zone if necessary.

In fact, if we take the Parapan Am Games as an example, when we operated a Centre over multiple weeks, that was an event that spanned the entire Golden Horseshoe. And the Centre was co-ordinating with police services of jurisdiction, local transportation departments and public transportation across the entire Golden Horseshoe area of more than 8 million people over a sustained period.

Each of the areas around the nuclear facilities, though, have over really the last couple of decades had committees, the Joint Traffic Co-Ordinating Committees, that have worked on those detailed plans.

And as the representative from OPG

indicated who had been previously with the Durham Regional Police Service, they have that history of meeting regularly to develop these detailed plans, working with the applicable Ministry of Transportation, regions as they call them, and with the Emergency Management authorities to make sure that those plans are in place.

And they are very specific and detailed plans. They are publicly available.

And I think perhaps most importantly the time estimate studies take those plans into consideration. They take the existing transportation networks into consideration. They use advance computer models to actually simulate what would happen under those plans if an evacuation order was given and they are able to time under different conditions based on real life data, not just what MTO collects. But as was indicated, across North America the company that did these, KLD, has done over 60 different zones around nuclear plants and modelled those.

And the numbers that we gave from the 2015 study -- and again OPG has a wide range of these numbers that they could update on in more specificity -- we look more at the worst case. We look under bad conditions, under snowy conditions, under day-time traffic conditions, how long would it take people to get out.

And we are comfortable that the numbers in

that are well below the earliest potentiality for a release, even under our planning basis scenario.

MEMBER PENNEY: Thanks for that. I had to ask my colleague here what the Golden Triangle is, but I've got it now. Or the Horseshoe. Thank you.

THE PRESIDENT: Okay. Nothing else?

MR. LOCKWOOD: Randy Lockwood, for the record, President Binder.

In support of our commitment five, transparency and engagement with the public, I would just like to make the Commission aware that the evacuation time estimate that we spoke about earlier is posted. That entire thing is on our website.

MEMBER VELSHI: How frequently are these evacuation time studies done or when are you planning on doing the next one?

MR. LOCKWOOD: Randy Lockwood, for the record.

I will ask Scott Burns to speak to your question.

MR. BURNS: Scott Burns, for the record.

We are currently updating the plan as we speak and we do it as we receive new census data.

I would like to just say that although we do it when we receive the new census data, also the plans

look out ten years from that point. So the 2015 plan was looking out to 2025 projected populations.

THE PRESIDENT: Okay, thank you.

Any final thoughts?

MR. FOSTER: Adrian Foster, for the record.

A couple of final thoughts.

One is, I think as we've heard through this dialogue, that there aren't static plans; you know, that these are evolving plans, which is important because we do not live in a static community.

And that is part of the confidence that the communities have in OPG and the operations on the plants, where we see things like post-Fukushima actions being taken, interoperable communications systems that didn't exist but do now and should exist, and again the ongoing studies that are going on as well with the evacuation planning.

Something that was put in place ten years ago needs to be updated on a regular basis and we're hearing that.

So I think the communities living and seeing these activities again generate that confidence.

To the earlier comments on resources to the municipalities, OPG has never shirked those

responsibilities and I can't imagine they would in the future.

I will leave slightly off topic, Mr. President.

This is probably the last time that I will be in front of you in a formal fashion. Both Mayor Ryan and myself, and as a matter of fact all of the communities that form part of CANHC, would like to thank you for your interest, would like to thank you for the time that you have given us and would like to thank you for the service to our communities and to the nation as a whole.

THE PRESIDENT: Thank you very much.

I think before the break we have one more intervention.

The next presentation is by the Mohawks of the Bay of Quinte, as outlined in CMD 18-H6.141.

I understand that Mr. Shipley is coming through a teleconference.

Mr. Shipley can you hear us?

MR. SHIPLEY: Yes, I can.

THE PRESIDENT: Please proceed.

CMD 18-H6.141

Oral Presentation by

Mohawks of the Bay of Quinte

MR. SHIPLEY: Okay. Can you hear me okay?

THE PRESIDENT: Yes, we can.

MR. SHIPLEY: I am with XCG Consulting Ltd. We were hired by the Mohawks of the Bay of Quinte so I'm making this presentation on behalf of the Mohawks of the Bay of Quinte.

First of all, I would like to thank the CNSC for the funding provided under the Participant Funding Program. It was helpful to my client to be able to hire us to look at the technical details of this licence renewal application.

The Mohawks of the Bay of Quinte is a community located -- it's a First Nations community -- on the north shore of the Bay of Quinte. It's about 160 kilometres east of the Pickering Nuclear Generating Station.

It was important to the Mohawks of the Bay of Quinte to participate in this process because protection of the natural environment is a very high priority for the Mohawks. In the letter that we provided there is an Environmental Mission Statement from MBQ that you can read

that outlines the importance of the natural environment.

We looked at the Pickering Nuclear Generating Station and the licence renewal application from the point of view of how it could potentially impact the environment and human health of the Mohawks of the Bay of Quinte and its traditional lands.

So in preparing this we reviewed a number of documents that are outlined in Section 2.1 of my letter. So I would like to go through and sort of talk about the main points.

We got some feedback from the community, and the feedback we received had to do with the fishing, traditional fishing, and traditional harvesting. The community harvest salmon from the Lake Ontario and Shelter Valley areas and they also harvest crappie and wild rice from Rice Lake.

Now there are a number of areas where some concerns came to light. One of them is the aging infrastructure of the Pickering Nuclear Generating Station. The facility dates from between 1971 and 1985 when the various units came into effect. One of the concerns is that there is a plan to increase the effective full power hours of some of the units to 295,000.

We couldn't find anywhere in the literature indicating where a CANDU reactor has previously

undergone this kind of an increase in its service requirements, and we are concerned with the aging infrastructure that there could be problems arising from the increase in the effective full power hours of these units.

Under the category of Nuclear Waste Management the Pickering waste management facility operates on the site. It stores low level radioactive waste. And there's a concern that the Mohawks have, primarily relating to when this waste is moved from one place to another. If it's moved in the future after the closure of the facility, how could that affect the Tyendinaga Mohawk Community where the Mohawks of the Bay of Quinte live?

The concern is that the transport either by Highway 401 or by the rail line or even along Lake Ontario through the waterways, any spill or incident that occurs could affect the Mohawks of the Bay of Quinte, and they would like to be notified in the event of any kind of transportation of that type. They'd also like to discourage any transportation of waste by rail or by waterways past the community.

Under the category of radiological and atmospheric releases, we reviewed the information provided to support the renewal application. We sat that in 2016 OPG had exceeded the effluent radiological liquid release

action level for gross beta.

There was supposed to be some follow-up on this, but it's now two years later and we weren't able to find any information on the follow-up to that incident. We think that, because of this renewal application it's important to have completed that follow-up and to provide information on that.

There was also a heavy water release at Unit 7, which was contained to within the reactor building in November 2014. This type of event is a concern. It appears, from what we reviewed, that this type of event occurs approximately one to two times a year, which means for the upcoming 10-year period of the renewed operation you could have 10 to 20 similar events.

All of these are concerns in that they could potentially impact the Mohawks of the Bay of Quinte and their livelihood.

Sorry, I heard a sound there. Can you still hear me?

THE PRESIDENT: Yes, we can. Have you finished?

MR. SHIPLEY: No. No, I'm sorry, I just heard a sound and I thought I got cut off.

THE PRESIDENT: Okay, go ahead.

MR. SHIPLEY: So under environmental

spills -- and I believe I have about three minutes left, is that right?

THE PRESIDENT: Yes.

MR. SHIPLEY: Okay. Under environmental spills, we looked at the period from 2013 to 2017. There were 12 spills that occurred during that time of materials ranging from oil, sewage, hydraulic fluid, ethylene glycol, sodium hypochlorite.

These were not major spills, but the fact that so many spills occurred over that period indicates the potential for spills and the potential for possibly a major event, a major spill that could affect the Tyendinaga Mohawk Territory. The Mohawks of the Bay of Quinte have a concern about the aging infrastructure and the spills that, you know, potentially worse spills could occur and affect the community.

Under water cooling and fish impingement, we're aware that there's a thermal plume that's permeated, occupying an area of 1.5 to 8 square kilometres. We saw that there was an event that occurred at one station in 2011/2012 that was above the 10 per cent threshold for no effect on round whitefish embryo survival. We're concerned about this event.

We're also concerned about the chemical usage in the water intake infrastructure, sodium

hypochlorite, hydrazine, ammonia, morpholine, and the potential impacts of these chemicals if they're released on the fishery, because the Mohawks of the Bay of Quinte depend on that fishery for their livelihood.

Under the topic of seismic events, floods, high winds, the primary point to be made there is that this is an older facility. The information about its ability to withstand flooding, earthquakes, tornados and so on has not been released. At least we couldn't find detailed information on its ability to withstand these types of events.

So we're concerned that with an older aging infrastructure how can the Mohawks of the Bay of Quinte and the public be confident that such an older facility is capable of withstanding such events?

With that, I believe I've covered the main points. They're summarized again in Section 7 of our letter. With that, I'll end my presentation and turn it back to the Commission.

THE PRESIDENT: Okay, thank you. Questions? Go ahead.

MEMBER LACROIX: Thank you, Mr. President.

Mr. Shipley, first and foremost I'd like to thank you for submitting such a well-documented submission. It's well-laid out, the information is clear,

concise, precise, easy to read, easy to understand. So thank you very much for making my job much easier.

Second, you've raised this concern in your presentation and you also mention it in your submission. It's on page 5, Section 6.3, second paragraph. It says that one month in 2016 OPG exceeded the effluent radiological liquid release action level for gross beta.

You understand that environmental action levels are 10 per cent -- and so on.

CNSC have indicated that they will be following up with OPG.

Staff, could you tell me what this event is all about, and is there a follow-up?

MR. FRAPPIER: Gerry Frappier, for the record. Yes, I'd ask Kiza Sauvé to comment on that.

MS SAUVÉ: Kiza Sauvé, I'm the Director of the Health Science and Environmental Compliance Division.

So this event from 2016, CNSC Staff did follow-up with OPG and OPG did follow-up with CNSC Staff, and the results of the investigation was that cesium-137 was found within the effluent, and which is actually coming from the lake and not from the reactor itself.

So, as Mr. Rinker mentioned yesterday, there's still effects from nuclear fallout from the 1960s. So with this action level exceedance OPG took the correct

actions, they did an investigation, there were documents that went back and forth between the CNSC Staff, and the event is now closed.

MEMBER LACROIX: Thank you.

THE PRESIDENT: Ms Penney?

MEMBER PENNEY: Thank you, Mr. Shipley. I had a question, it's looking at your written document, Section 7, Summary of Key Findings, number 6. You talk about the unplanned releases, spills and action level exceedences that have occurred at the Pickering Nuclear Generating Station would not have been expected to impact the Bay of Quinte.

However, you go on to request that there's notification to the Mohawks of the Bay of Quinte if there is a potential for it to impact them in their territory.

So my question is to the CNSC around reporting and notification requirements. If you could clarify? Thanks.

MR. FRAPPIER: Gerry Frappier, for the record. So certainly, as mentioned, a lot of these spills are extremely small, because there's a very tight requirement with respect to reporting to the CNSC for any kind of spills of any kind of material.

There's also a requirement for any of these incidences to be posted. So there's a communications

dimension to this that requires that both CNSC and the licensee, OPG, post all of these on their associated website.

MEMBER PENNEY: So, just to clarify, if there is an exceedance, it's posted on the CNSC website and it's also posted on OPG's website?

MR. FRAPPIER: Gerry Frappier, for the record. So sometimes what we'll post is just a link to the OPG one but, yes, that's the case.

MEMBER PENNEY: Just to clarify, is there ever any direct notification of stakeholders?

MR. FRAPPIER: Gerry Frappier, for the record. So our communications team do have an ability to push out, as it's called, the information. It's not always done. That would be to all the people who subscribe to the CNSC information. I'm not sure these days whether it's a tweet or whether it's an email. I can ask our communications person to give you a bit more detail on that.

But as far as specific notifications, no, that wouldn't normally be done.

MEMBER PENNEY: So there is a mechanism to receive notification that's automated?

MR. FRAPPIER: Gerry Frappier, for the record. Maybe I'll ask Megan Gerrish to explain how that

works, how you become part of the group of people who would receive the push-out information from the CNSC.

MS SAUVÉ: Before Megan does, this is Kiza Sauvé, for the record. I just want to make a clarification. That within Ontario and in Canada there are different category levels of spills. So there's a Category A, Category B and Category C. So all the spills mentioned in this intervention are a Category C spill, and those wouldn't have been posted on our website as they're not -- there's no impact on the environment or people.

OPG does report to the Ministry of Environment and Climate Change, which there's a Spills Action Centre, so Environment and Climate Change Canada also gets notified. CNSC has a memorandum of understanding with Environment and Climate Change Canada, and we also share information anytime either one of us has a report of a spill at a nuclear facility. So there is that sharing of information.

Anything that is of a larger category that might have an impact on environment or people, those are the ones that would be posted.

I'll pass it to Megan to talk about how those notifications would occur.

MS GERRISH: Thank you, Kiza. Megan Gerrish, for the record. I'm a Senior Communications

advisor with the CNSC.

There are various notifications that go around, and OPG and the CNSC would communicate back and forth in terms of if something is relevant to the public or their stakeholders. This can go out through a variety of methods, including through social media, which is the fastest.

They are posted to the website and OPG does post quarterly event reports, and we will post the event on our website as well. We can, as was stated earlier by Mr. Frappier, push these out to subscribers through our latest news, and it can take prominence on our website if it does in fact impact public safety.

MR. LOCKWOOD: Randy Lockwood, for the record.

I would just like to point out that it speaks to again our commitment drive about transparency and engagement with the public. As already stated, Category C, very low significance. What I will share with the Commission, we wanted -- or I wanted all these included in our CMD. It speaks to our drive for continuous improvement and being open and transparent.

MS SAUVÉ: Kiza Sauvé, for the record.

Similarly, CNSC posts all the events, including Category C spills, in the Regulatory Oversight

Report that goes annually to the Commission in our effort to be transparent.

THE PRESIDENT: And is there any of your environmental monitoring that you post that would be of interest to the intervenor?

MS SAUVÉ: Kiza Sauvé, for the record.

So CNSC's Independent Environmental Monitoring Program does have a part of it where we communicate with indigenous communities. So in particular the Mohawks of the Bay of Quinte would have recently received a letter noting that we are planning to do independent environmental monitoring at Pickering in 2019. So we are reaching out early to indigenous groups to get them involved to see how we can make our sampling program meaningful. Through that communication we also offer opportunities to meet and discuss previous results and help explain what our results mean and can be more meaningful to them.

MR. LOCKWOOD: Randy Lockwood, for the record. Maybe it would be appropriate for us to call Kenn Ross and speak about our relationship and our discussion with the Mohawks of the Bay of Quinte.

MR. ROSS: Kenn Ross, for the record, Indigenous Relations with OPG.

We do engage regularly with the Mohawks of

the Bay of Quinte. This averages twice a year with in-person meetings either in their territory in Tyendinaga or at Pickering. Just as an example, last August we conducted a tour of our fish diversion system with representatives of the environmental office for the Mohawks of the Bay of Quinte. At these meetings we typically discuss plant operations, environmental reporting and discuss any concerns that they have.

MR. FRAPPIER: Gerry Frappier, for the record.

Perhaps I will take this opportunity to also mention that the CNSC has a deep relationship with the Mohawks as well, not just because of the Pickering facility but there are other facilities that are of interest to the Mohawks that we regulate.

I would ask Clare Cattrysse if she could provide a bit more information on our interaction with the Mohawks.

--- Pause

MR. FRAPPIER: We can't hear you, Clare, I think your microphone is not on.

MS CATTRYSSE: Can you hear now?

THE PRESIDENT: Yes, go ahead.

MS CATTRYSSE: Thank you.

Clare Cattrysse, Director of the Policy

Aboriginal International Relations Division.

Yes, at CNSC we have been reaching out over the years with all indigenous groups that we have nuclear facilities that we are regulating in the indigenous territories. We are hoping -- we are moving forward now to do something a little bit more formalized with communities and we will definitely be offering with the Mohawks as we are moving ahead to maybe do something similar to what OPG has been doing as much more sort of a formalized regularized engagement on a regular basis where we can talk for example about the Independent Environmental Monitoring Program, discuss a number of the issues that have come up in this intervention, and it would be a great opportunity to meet with representatives of the community about the life, the issues and traditional uses that are taking place around not just Pickering but also other nuclear facilities that are in their territory and in their proximity. So we will definitely be reaching out in the near future to see if there is an interest in that. Thank you.

MEMBER VELSHI: I will start with OPG and then maybe staff can comment as well. So the Mohawks of the Bay of Quinte is the only indigenous group that has made an intervention for this proceeding. So, as Commission Members, you know, one doesn't know what one concludes from that. Does that mean the others are

satisfied with the relationship and your submission? So maybe you can put some light on that and maybe staff can comment why we haven't heard from anyone else either in support or with concerns.

MR. ROSS: Kenn Ross, for the record.

We do also engage regularly with the Williams Treaties First Nations. Four of their communities are proximate to both Darlington and Pickering nuclear generating stations. Those meetings occur at least on a quarterly basis and again we cover the same territory of plant operations, environmental studies, offers to participate in our own programs for monitoring. And for instance, just the highlight of that was a tour of the Pickering Waste Facility in January of 2016. So again, meetings that are meant to illustrate our transparency and openness and to take in any information and respond to any concerns that they have.

At the same time there is also the Métis Nation of Ontario. They have a community organization known as Region 8 that stretches from Durham all the way over to Guelph and we also meet with representatives of that community council again to go over exactly the same issues and concerns.

In terms of choosing not to participate, I would like to believe that is because we are robust and

regular in our communications, but they certainly have been informed and I have not received any personal feedback indicating dissatisfaction with our level of engagement.

MEMBER VELSHI: I want to make sure it's not from lack of resources or, you know, capacities, travelling, that's preventing them from participating and have you confirmed that that is indeed not the case?

MR. ROSS: Resources, I'm aware, have been made. I know from discussing with contacts at both Williams Treaties First Nations of MNO8 that there are a number of different projects that they are engaged in. Williams Treaties in particular have a number of projects going through their territory that do put demands on the resources that are available, so the VIA Rail link for instance for high-speed trains, the 407, et cetera. So in terms of stretching of their resources, I think it's the multitude of projects that they have to consult on that they have to prioritize.

MR. FRAPPIER: Gerry Frappier, for the record.

I will pass it to Clare Cattrysse in a minute, but certainly from our perspective, as in the case of the Mohawks of the Bay of Quinte, we do offer participant funding, as you know, and that would have been available if they had applied earlier.

I would ask Clare Cattrysse if she could comment on some of the other aboriginal groups.

MS CATTRYSSE: Hello. Clare Cattrysse, Director of the Policy Aboriginal International Relations Division at CNSC. Maybe I will just give a little bit of background because it is a very good question.

So we did meet with the Mississaugas of the New Credit First Nation and they explained to us that they would actually like to just stand back and let the Williams Treaties First Nations be the people to talk about what is taking place in their territories. Then we did meet with the Williams Treaties First Nations with OPG in September and also in November we met with them and we also offered the Participant Funding Program. The CNSC did give funding to Scugog First Nation to participate. They were going to intervene. So there was capacity funding given. However, they phoned and regretted that they could not intervene as they were in the middle of negotiations regarding treaties with the Crown. So they are still definitely going to be engaging with us in the future. We have discussed meeting on a much more regularized basis and we will continue to do so. And again, most of the interests there have been just about learning more about the activities taking place and what's taking place at the site and to learn more about our Independent Environmental

Monitoring Program.

And the Métis Nation of Ontario, we also have met with them and offered them participant funding. At this point in time their interests tend to be more around other facilities and it was their choice not to intervene and participate for this particular facility.

And obviously the Mohawks of the Bay of Quinte who are on the phone right now, we did offer and they have utilized, as they mentioned, the participant funding for their intervention. Thank you.

THE PRESIDENT: Thank you.

MR. LOCKWOOD: Randy Lockwood, for the record.

I would like to say thank you very much for the Mohawks of the Bay of Quinte for making this intervention. That said, I see that as OPG we have to do additional follow-up based on my reading of their intervention to provide additional clarification as there are several items.

One item that really sticks out for me and has all along is their concern that we share around the environment, particularly the fish. And we did consult, as the Commission knows, in our search to receive a fish authorization from DFO and maybe I will ask Raphael to speak a little bit about that discussion. Raphael...?

MR. McCALLA: Raphael McCalla, for the record.

So, as Mr. Lockwood just mentioned, in the execution of our application for a *Fisheries Act* authorization for the Pickering facility, OPG actually went and engaged a number of the indigenous communities to make them aware of our application, the offsets that we were putting in place to address the impacts from the station. It also gave them an opportunity to provide feedback to us with whether or not they were supportive of the approach that we were taking. All of this information was submitted as part of the application to Fisheries and Oceans Canada in order to obtain the authorization.

We continue to use the regular meetings that are held with these indigenous groups to provide more and more information with respect to the operation of our facility. I will also comment that we did make an offer to hold stakeholder sessions with a number of these communities and where they were receptive to that we met with them as well.

THE PRESIDENT: Thank you.

Ms Penney...?

MEMBER PENNEY: Thank you for that. With respect to the DFO authorization, I think DFO is in the room and I had a question for them about the follow-up

monitoring program.

--- Pause

MEMBER PENNEY: Perfect. Thanks very much for being available. So I understand that the authorization has been issued and I would just like you to explain, because it is of interest to many of the intervenors' interventions that we have read, how the follow-up monitoring program works, the requirement for submissions to you. And then maybe OPG, you could add something to that.

MS THOMAS: Jennifer Thomas with Department of Fisheries and Oceans, Manager of Regulatory Review.

So with respect to the *Fisheries Act* authorization, one of the common requirements is to have annual monitoring. So OPG is required to report to us on an annual basis, both on the effectiveness of their mitigation measures, so the net that they put in place, as well as their offsetting plan. So they report to us and they provide reports and we would review those and provide comments back to them.

MEMBER PENNEY: In the course of the negotiation or the process that happened there was First Nations consultation, there was indigenous consultation by DFO?

MS THOMAS: Yes. Jennifer Thomas, for the record.

Yes, that is correct. We did meet with first Nations communities. We didn't have a lot of interest, I think simply because Ontario Power Generation and CNSC did quite a bit of consultation.

MEMBER PENNEY: OPG and then CNSC staff of course.

MR. McCALLA: Raphael McCalla, for the record.

So as was mentioned, OPG received a *Fisheries Act* authorization in January of this year. I will say that OPG actually has two authorizations. We have an authorization for our Darlington facility as well as the Pickering facility.

There are a number of conditions that are built into the authorization, as was just mentioned. We are required to report out annually with respect to the level of impacts that we are having and there are actually thresholds built into the authorization, which if they are exceeded would require us to sit with Fisheries and Oceans Canada as well as the CNSC to look at additional opportunities. There are requirements for us to do entrainment studies to support the data that was utilized in support of our application and there are conditions

around for instance the offset itself. And I will say that that was probably the most significant part of our application in that what was requested of OPG in terms of demonstrating that the offset was productive was leading edge technology in the sense that there wasn't any methodology in place to demonstrate that, so OPG actually met and worked with Fisheries and Oceans Canada as well as the academic community to develop appropriate methodology to demonstrate that we could show that the offset is being productive.

So we look forward to continue this work. As I said, I don't believe anyone else is doing this work at this particular time, but this is work that will benefit not only OPG but the industry as well with respect to understanding how to compare your actual impacts to the production that you are offering.

MEMBER PENNEY: And just remind me -- thanks for that -- what is the offset that you are doing?

MR. McCALLA: Raphael McCalla, for the record.

So the offset that we are doing, there are two components -- well, three components to the offset. So we have offered up hectares in the Bay of Quinte where we have restored a wetland at Big Island, as well as work nearer to the station in Duffin Creek. We are also

restoring that area to provide additional offset. And finally, we spoke yesterday about the Bring Back the Salmon partnership with the Ontario Federation of Anglers and Hunters, where that is also one of the components that we are actually offering up as well for the impacts from the station.

MEMBER PENNEY: Thank you.

CNSC staff...?

MR. FRAPPIER: Gerry Frappier, for the record.

So certainly as part of our compliance program we are also looking at environmental, as you know, including the different monitoring that we do.

I would ask Kiza Sauvé to give us a bit more information as to how it interacts with the fishing authorization.

MS SAUVÉ: Kiza Sauvé, for the record.

So since the fish diversion system, the barrier net has been in place since 2009, OPG has been reporting on the effectiveness of the barrier net and that has been a requirement of the Licence Condition Handbook. CNSC staff review that report and provide their review and recommendations to DFO as well.

Since the authorization is in place as of January under a Memorandum of Understanding with DFO, CNSC

staff will be performing compliance on the authorization and providing the results of the compliance to DFO and we will be doing that compliance both in the station as well as at the offsetting projects as best we can and we will work with DFO on that. One of the discussions we have had with DFO is access to the plant can be difficult I guess for DFO, so CNSC staff has that access and can do that compliance program.

THE PRESIDENT: Is the annual compliance report public or posted?

MS THOMAS: Jennifer Thomas, Fisheries and Oceans, for the record.

DFO's reports that they receive from OPG would not be posted on the Internet at this time.

THE PRESIDENT: Is there a particular reason? Is there any sensitive information in there? After all, we know what the authorization is. Presumably any exceedance would become public. So what's the problem with releasing the annual report?

MS THOMAS: Jennifer Thomas, Fisheries and Oceans, for the record.

There is no problem with making it public. DFO just doesn't have a vehicle to make that public at this time. With the *Fisheries Act* changing and a public registry likely coming into effect, that will likely

change.

MEMBER PENNEY: Does OPG make these annual reports public?

THE PRESIDENT: Well, CNSC, you were going to say something about this?

MS SAUVÉ: Kiza Sauvé, for the record.

So the results of these reports do go into our Regulatory Oversight Report, not the actual report, but we do report on the barrier net and going forward we will report on the *Fisheries Act* authorization.

THE PRESIDENT: I know, but some people ask for the actual report. I'm just curious to know what's so sensitive about it. Anyhow, you may want to think about it. You often claim willing to be proactive in disclosure, that could be something on your list.

MR. LOCKWOOD: All right. Randy Lockwood, for the record.

Not often claimed, actually true and definitely thinking about that, Mr. President Binder. We have just consulted with an Environmental Director. I see really no reason why that information is not posted. He has advised me that we do and I have read -- of course we send that information to the CNSC. The CNSC has asked if they could disperse that, we have said yes, I really see no reason why not.

THE PRESIDENT: Okay. Thank you. Anybody else? We are going to take a break. You are standing between us and the break.

MR. GREGORIS: President Binder...?

THE PRESIDENT: Go ahead.

MR. GREGORIS: Steve Gregoris, Deputy Site Vice President Pickering.

There is one item I would like to speak to and it's a correction in this intervention that's important for us to make. It is on page 5. It refers to a Unit 7 event in November of 2014 where a station emergency was declared and it also talks about that event being a regular type of event, that station emergencies are declared on a regular basis one to two times a year.

So first, I would like to correct the intervention by saying that that is not a likely or common occurrence, that kind of event on Unit 7, it is very unlikely. Station emergencies are not regularly declared at the station. So in the last licensing period, so over the last five years we have declared two station emergencies over those five years, not one to two per year as stated.

I would also like to point out that station emergencies are not declared only for radiological type of incidents. Most commonly they are proactively

declared to protect people from different kinds of hazards, to move people away from those hazards in a fashion because that method of communication is much quicker than normal communication methods within the station and that is typically the case for declaring station emergencies at the site.

THE PRESIDENT: So, Mr. Shipley, you have the final word.

MR. SHIPLEY: Yes. I just wanted to follow up on one point. It was mentioned that there was an investigation done into the 2016 radiological release and that the matter was now closed. I'm wondering if that information on how that was done and whether there was any corrective action put in place, whether there is any follow-up, whether there is any improvements made, is that information in the public realm at all?

THE PRESIDENT: Staff...? Does anybody recall?

DR. VIKTOROV: It's Alex Viktorov, for the record.

Yes, there was an action item initiated to follow up on this event and CNSC staff requested OPG investigate many possible ways that led to a particular exceedance of the releases. So the investigation was done to the satisfaction of CNSC staff and we do believe that

the origin of the release was not of the station but heat from the environment. The current status is that we request OPG to keep monitoring if any similar incident would occur.

THE PRESIDENT: But was this report available anywhere or is it in the public domain? I think that was the question.

DR. VIKTOROV: The report is available, but it's not within the public domain.

THE PRESIDENT: Okay.

MR. JAMMAL: It's Ramzi Jammal, for the record. There is a difference between posting and providing information. So anything that the intervenors requested were provided to them. So we will take into consideration what you just mentioned, but again, information is available upon request. As we just mentioned with respect to the report of the fish, we report it in the ROR. If the intervenor requests the information we will provide it to them. On action items, again, we report the issues in the ROR and information is available. But we will take into consideration if it needs to be posted or not. But again, we take risk-informed decision-making in consideration. Anything of significance is posted and pushed out, and anything of a low risk we report in the ROR and it is available upon request.

THE PRESIDENT: Okay. But Mr. Shipley asked for it and so just contact him and see if he can get a copy of the report.

MR. FRAPPIER: Gerry Frappier, for the record. We will do that.

THE PRESIDENT: Okay. We are going to take a break for -- we are going to be back at five to 10:00 -- five to 11:00, sorry. I just echo what I'm told.

--- Laughter / Rires

--- Upon recessing at 10:37 a.m. /

Suspension à 10 h 37

--- Upon resuming at 10:58 a.m. /

Reprise à 10 h 58

THE PRESIDENT: The next presentation is by Mr. O'Toole, MP for Durham, as outlined in CMD 18-H6.74.

Mr. O'Toole, the floor is yours.

CMD 18-H6.74

Oral presentation by the Honourable Erin O'Toole

HON. O'TOOLE: Thank you very much, Mr. President, and thank you very much to the Members of the Commission for allowing me the opportunity to speak today.

My name is Erin O'Toole. I am the Member

of Parliament for Durham, and I've grown up in the area and served as MP for almost six years.

And my brief remarks today will be related in large part to my letter of intervention from May 4th, 2018, I refer the Committee to, with respect to the 10-year renewal for the Pickering operating licence and the transition to safe storage by 2028.

I should mention at the outset I'm very pleased to have some colleagues from the provincial level of the provincial parliament with me who were recently elected. So they weren't able to intervene by letter and by appearance like I am, but I do want to recognize them: MPP-elect Peter Bethlenfalvy, the MPP for Pickering-Uxbridge, and MPP-elect Lindsey Park, the MPP for the riding of Durham. And both very strong supporters of the industry in our region and happy to have them here.

I would note, and I think it's in the public interest, that the Pickering renewal was an election issue. It was a live election issue where the NDP actually opposed the full life of the facility and the PC party supported it. And I would note that the Mr. Bethlenfalvy, the PC candidate in Pickering-Uxbridge, was elected. So you can't call that a referendum *per se*, but it was certainly a live issue in the election that got a lot of coverage. And I would note that Premier-elect Doug Ford

has already appeared to show provincial support for the subject matter we're dealing with today.

I would also note, as having grown up in the area, I recall fondly, as a grade 5 student in St. Joseph school in Bowmanville, interviewing the MPP at the time, Sam Cureatz, about the construction of Darlington before it was constructed. So you could say I've had an interest in nuclear energy since my childhood, in some ways. And now I'm honoured to be the Member of Parliament representing the community. And I'll speak about that shortly.

In my letter, I outlined that I believe, as a community representative at the federal level, that OPG has demonstrated to the community that their ongoing staff training and investments in Pickering and in the community, including the replacement and upgrading of equipment, have resulted in a top world-class safety record.

And this renewal is about safely and effectively maximizing the utility of our utility. And I think that can't be lost on us.

In 2014, the Pickering facility passed the 11 million hours mark without a single lost time incident. I think that shows its world-class effort. But the same year -- and I think this is very telling -- the same year

that milestone was passed, the Pickering facility committed to a risk improvement plan, both for facility, staff, and community engagement. So their ongoing efforts at being best in class when it comes to safety, when it comes to emergency planning, and when it comes to community engagement should be noted.

In 2016, they received the Canadian Electricity Association's gold award for safety.

And as a former military member, testing and evaluation through exercise, I think, is critical for evaluating the effectiveness of your safeguards. And I would note in December 2017 in Exercise Unified Control, which almost sounds like a military mission itself, strong results were demonstrated both for on-site and for off-site emergency preparedness.

The safety measures post-9/11 have also been remarkable and shows a committed investment by OPG, both at the Pickering and the Darlington sites. And as the former Minister of Veterans Affairs, I'm very proud that many of the investments on the safety arm have come as a result of hiring veterans. So OPG is one of the largest employers in Ontario of veterans of the Canadian Armed Forces and first responders. And I think that's why we're seeing such world-class results.

As MP, it's perhaps best for me to speak

for a few moments about their community engagement program as part of the public information plan, both in Pickering and in Darlington. These enhancements, in line with the risk improvement plan of 2014, have enhanced efforts at reporting, public education, and consultations. You've heard a bit about that today.

And I would suggest perhaps the most effective example of public engagement in emergency preparedness we saw just in the last few years in the Durham region, when 200,000 potassium iodide pills were distributed in communities like mine in the 10-kilometre primary zone as a result of the Commission's previous guidance for these facilities.

Not only was this done successfully -- I can tell you, my little package is in my kitchen cupboard in Bowmanville -- the engagement that continues through PrepareToBeSafe.ca and the ability for people in the secondary zone to access KI pills demonstrates that this engagement has gone far beyond just public affairs initiative to actually at-home, 200,000 households, who have received not just the KI pills but a brief when it comes to emergency preparedness.

In the House of Commons, I'm not allowed to have props, but I am allowed to have props here, I think. And this arrived in my own mailbox just last week

in Bowmanville, and this is part of the ongoing neighbour series for both Pickering and Darlington. It focuses on CNSC and meet a CNSC safety inspector on the back. I would note that this is part of the ongoing engagement and public education with respect to the facilities and emergency preparation. That's part of the overall social licence that's been talked about here.

Prior to my election as Member of Parliament, I did work on some of the early initiatives in the Bring Back the Salmon campaign we've heard reference to a few times. And OPG and its senior officials were some of the biggest supporters of that River Runs Through Us gala in Bowmanville, helping build a fish bypass channel for migrating species on the Bowmanville Creek. This is part of regular and ongoing engagement with the public.

And as Member of Parliament now -- the River Runs Through Us gala was before I was elected, but as Member of Parliament, I've only seen an enhanced approach to public engagement.

We've heard a little bit about the emergency response plans for both Pickering and Darlington and the areas in the Durham region that I'm proud to represent. My office will work closely with OPG, with Clarington, with the region of Durham, and with the Province on the provincial Nuclear Emergency Response Plan

on the notifications, on the traffic control plans, and on the public education.

In my constituency office in Bowmanville there is materials available to the public if they have any questions with respect to the Emergency Response Plan, with respect to KI pills. OPG has been very effective at providing all levels of government and all public officials in the Durham region with information to be a partner in preparation.

We saw with I would say mixed success the Alert Ready mobile testing system for emergency response on our cellphones. Most of -- mine went off; my wife's did not. So we see we still have work to do on the Alert Ready, but I think the province, the federal government, municipal governments, and corporate partners like OPG will continue to have more tools to provide both information but also direct emergency assistance for people in the event of an incident of any kind.

Finally, the last two points I want to raise is as Member of Parliament for Durham, I clearly recognize the provincial guardianship of the long-term facilities in Pickering and Darlington and the regulatory oversight at the federal level and partnerships at the municipal.

But often we forget that the nuclear

industry and the 70,000 people employed in it in Canada are part of our innovation economy and have been since the 1950s. We talk about innovation and hubs and investments today. Well, the nuclear industry has been doing that since the 1950s.

Canada, as the second country to have controlled nuclear fusion, has a proud track record of safe and effective and reliable nuclear power. With six other nations also having access to this same power through the CANDU technology, I've had the ability to meet with regulatory officials and public officials from many of those CANDU countries. And the track record of our technology is world-class.

It also contributes $7 billion in annual activity to our GDP.

And in 2014, I participated in the debate on the *Energy Safety and Security Act*, updating civil liability caps, limitation periods, and making us fully compliant with IAEA provisions at the federal level.

And after my election, I helped start a nuclear caucus in Ottawa, because I was quite startled by how little even public officials know about the regulatory and safety, the long-term storage, and waste plans through the Nuclear Waste office, and just how many jobs are directly attributable to this industry.

My final point is perhaps the best aspect of this industry, which is appreciated today much more than it was in the 1950s, and that's the fact that through our generating stations in Darlington, in Pickering, the Bruce, we have almost two-thirds of our electricity in Ontario generated virtually greenhouse-gas-emission-free. That wasn't an appreciation, really, in the 1950s, but I think it is today.

If Canada does not prudently and safely embrace our nuclear technologies and our industry, we will have no chance -- no chance -- of meeting our Paris Climate Change commitments, which I think we should be meeting. The International Energy Outlook 2016 suggested energy consumption in the world will go up by 50 per cent by 2040. If we deviate from having baseload electricity in Ontario and other places generated from nuclear energy, we will certainly have no chance at meeting our Paris targets.

And in fact, if you'll permit, I think the next frontier that you will be seized with helping regulate, the small modular reactor technology, will allow us to actually tackle some of the remaining large emitters within our economy. I often say in my opposition to the carbon tax that one-third of Canada's greenhouse gas emissions -- one-third -- are directly attributable to 596 facilities. Why we don't have a specific targeted plan for

the main emitters, many in the resource and energy-intensive industries where small modular reactors could actually help make those industries emission-free or carbon-reduced, that needs to be a serious part, I think, of our energy and our GHG emission plans for the future.

And in Ontario, we're very fortunate that for two generations we've been able to see 80 per cent of our electricity produced through clean sources in terms of emissions, either from hydro or from nuclear technology.

So it's my honour here today to supplement my written submission to you in these areas: climate change, safety, emergency preparedness, the public information programming conducted by OPG, and the excellent safety track record that I've been able to see first hand as an elected official. And I certainly hope these are helpful considerations in your deliberation with respect to the 10-year renewal.

Thank you very much.

THE PRESIDENT: Thank you.

Questions?

MEMBER LACROIX: Mr. O'Toole, thank you very much.

Why aren't you the MP in my riding? It's too bad.

HON. O'TOOLE: Where do you live?

--- Laughter / Rires

MEMBER LACROIX: Far away. In Sherbrooke.

HON. O'TOOLE: Move to Durham.

MEMBER LACROIX: My question is this. You had a great idea concerning this caucus. Does it still exist, and what is its scope, its activities?

HON. O'TOOLE: Thank you, Mr. Lacroix.

Yes, it still exists. It was primarily based as being an outreach tool for members of Parliament to learn more from the industry, to meet with stakeholders, and to raise essentially what I call the base level of knowledge of members of Parliament.

Outside of Ontario, in nuclear host communities, like we heard from Mayor Foster earlier this morning, there is little knowledge about the technology. That startled me, because Canada is one of the innovators, so our caucus not only toured Darlington, we met with several suppliers in the CANDU industry stakeholder group. We also toured Chalk River and talked about the medical isotope issue at the time. That's why I was very happy to see the announcement of the moly-99 isotopes announced just last week by OPG through the Darlington facility. Nuclear health and the isotope issue is something that we are going to lose from the experimental reactor at Chalk River, so we continue to try and engage, but as I said, I briefly ended

with the small modular reactor technology holds great promise, particularly for places like the oil sands or for smelting facilities, where there's a high energy need to refine our resources.

I often remind Canadians the resources in Alberta and Saskatchewan are not just theirs, they're all of Canada's, and we cannot only benefit from the responsible extraction and secondary processing of our resources, we can mitigate water-use energy through smart investments in technology. I think that has to be the cornerstone of a smart plan to meet our Paris targets. That's why I often say without embracing nuclear we have no hope of meeting our Paris targets.

So the public information and education campaign continues, and I try and work with my provincial partners and municipal partners too.

MEMBER LACROIX: That's good. Thank you very much, Mr. O'Toole.

MEMBER VELSHI: Thank you; and thank you for bringing your colleagues along with you.

What you have described with your caucus members we've heard from many interveners, especially those not living close to the facility, a lack of awareness of the facility, of the emergency plans, especially in the GTA area. I don't know whether through your recent campaigning

if that's what you've heard from your constituents about lack of awareness and the need for greater education. From where you are, what advice or recommendations would you give to the Commission, to the CNSC, on how that can be improved?

HON. O'TOOLE: I'll speak for a moment. Then, if you permit, I would invite my colleagues, who spoke to thousands of people on their doorsteps just recently, to give you their take.

One challenge that I think was alluded to by Mayor Ryan and Mayor Foster, and one challenge that our community faces, is the east side of the greater Toronto area is the fastest-growing part of the province, it's also a great place to live, Mr. Lacroix, as per our last comments, and it's the most affordable.

Clarington, for example, is the place where a lot of people are moving to from Brampton or from Markham to get that larger home, for great schools, great communities, that sort of thing, so we have a lot of turnover within Durham from people that came from, say, the west side of the GTA or even the north that don't have a history of living in communities with Pickering, with Darlington. I think that presents an added challenge, and I think OPG, in particular, is always looking at ways to tackle that. I've often suggested the GO train should be

plastered with information, because in most of these new suburban developments people are still working in Toronto, Mississauga or Markham, they just choose to live here, yet they don't have the history of living in the community, as I said, interviewing my MPP, before Darlington was constructed. In communities like Courtice and Bowmanville we have a number of people that are society members or PWU members, and they are part of the education, but this fast-growing pace I think is going to continue to be a challenge, that's why I think the outreach they do is very important.

Do you have anything to share?

MS PARK: Hi. I'm Lindsey Park, the MPP-elect for Durham.

I've noticed, sort of speaking with my colleagues, I think our experience, experience with my constituents in Durham, is much different than in maybe other parts of the GTA, such as Scarborough. I think there is still a need for greater awareness in some of the other areas. I find, in fact this may surprise many people, concern about nuclear safety did not come up once at the doors over the last year and a half or at community events. In fact, there's a great awareness of the safety measures in place, partly because many in our community work at the facility, but I think something that's noteworthy is how

close to the facility those people choose to live who work there. I think sharing that anecdotally I found with my colleagues outside of the area it's very hard for them to argue that there are real safety concerns, because they can't kind of put together in their mind why someone who worked at the facility and can see the daily safety measures would choose to live so close. I think that's something anecdotally that I like to share in conversation, and it speaks a lot to what we have going on here.

MR. BETHLENFALVY: Peter Bethlenfalvy, MPP-elect for Pickering-Uxbridge.

I'll address your question about awareness, but first just some background.

I did tour, as a nominated candidate, the Darlington and Pickering facilities to get more knowledgeable about the facilities. I did canvass. The riding goes all the way from basically the Pickering nuclear station almost up to Lake Simcoe. I did knock on virtually all the doors, particularly in Frenchman's Bay, Bay Ridges and the West Shore community. There's a very high degree of awareness through most of Pickering. The big issue really was more about jobs and affordability, and a good knowledge that it's low-cost and clean energy. Obviously, for the jobs, Pickering and our neighbouring ridings have a fair amount of employees at the facility, so

they're very knowledgeable and obviously very aware.

But I was struck by, knocking on so many doors in the community, the level of engagement, the level of knowledge. Obviously, as Mayor Ryan mentioned before, there were 20,000 people here, so at the time it was built, 80,000 people came here with the knowledge that they were coming to a community with a nuclear station, so there's a high degree of awareness, concern and understanding about safety, and the priority toward safety.

Then, quickly, how does it affect my pocketbook: low hydro costs, jobs, and a part of the community.

THE PRESIDENT: Questions?

I'm intrigued by the little brochure you showed us. I want to know who actually produced it, is it OPG, is it the Office of -- what I'm trying to understand is where was it distributed? I mean with things like this, we had a lot of discussion that you're focusing only on the primary zone, which is the 10 kilometres, but does anything like that go beyond that, so the 20 kilometres or 50 kilometres? That's where the awareness is much less than really near the facilities. I'm trying to understand to whom those kinds of things are sent, particularly if it mentions a CNSC inspection. Are you aware of that?

MR. MANLEY Robin Manley, for the record.

I'm the Vice-President of Nuclear Regulatory Affairs and Stakeholder Relations.

The Neighbours brochure, which has just been shown there, is distributed within about 10 kilometres of both of our Darlington and Pickering stations on a quarterly basis to approximately 120,000 households.

THE PRESIDENT: So nothing like that ever goes beyond the 10 kilometres?

MR. MANLEY: To the best of my knowledge, it's the region that I just described -- Robin Manley, for the record -- but we do post all sorts of other information on our public website, opg.com, and we can provide lots of details about that kind of information, as well as the other disclosures that we make.

THE PRESIDENT: The Office of the Fire Marshal, are you not concerned that there is no such periodic update or reminder to people living beyond the 10-kilometre zone?

MR. MORTON: Mike Morton, Office of the Fire Marshal and Emergency Management, for the record.

I just want to start with a little bit of more generalized context in that under the *Emergency Management and Civil Protection Act* all municipalities in Ontario are required to have a public education program that focuses on the risks that they have identified to

their community. They then allocate their resources in accordance with the severity of risk that they face.

With respect to nuclear emergency management and public awareness and education, these requirements are outlined in section 3 of the PNERP master plan. In 2009, we added a fairly extensive annex, Annex C, to the master plan that establishes detailed requirements for public education. It also has a requirement that each area, so each area around the facilities, would have a committee of stakeholders. This includes the industry, it includes responders, emergency management coordinators, and has the opportunity for public input as well. Each of those committees develops a strategy to help enhance the awareness of those living around the facility.

As you note, the emphasis of these programs is on the 10-kilometre zone. That's where we have public alerting measures in place. That's where we would anticipate that the risk could potentially involve evacuation, and those are the people that we want to have most aware of the measures that they may need to take.

That said, there is a wide amount of information that's provided. First of all, anyone who requests KI pills who lives between 10 kilometres and 50 kilometres would receive information with that package.

There is information on all of the

stakeholder websites, including the Ontario government websites.

So, Ontario.ca/Be Prepared has a section dedicated to nuclear. That site in general has about 100,000 visits per month and we've had significant interest in downloads on the nuclear information that's there. So, it covers really all of the various measures that the public may be requested to take.

OPG, Durham Region and others also have very similar information.

THE PRESIDENT: So, I don't want to belabour this because I think we will hear more about this in a couple of other interventions. But are you satisfied that all the information necessary is being conveyed to those beyond the 10 kilometres, or do you look for further enhancement?

MR. MORTON: Mike Morton, for the record. Public education programs really need to reflect the local needs, the local interests and the risk assessments of those areas and in Ontario those public education programs at the municipal level are all hazards.

We have in the last months, as was referenced earlier, been making a lot of effort to highlight the availability of the Alert Ready System and we'll probably get into a little bit more detail on public

alerting, but there has been significant investment in public awareness campaign for all Ontarians, all people in Canada as well, to raise their awareness of Alert Ready, the fact that they can now get alerts on their mobile devices as well as through broadcast-intrusive alerting through television and radio.

So, our perception and the results of those campaigns have been that people's awareness and public alerting in general has gone up significantly, but we do see public education as something that needs constant attention and constant local and municipal engagement as well to make sure that resources for education are allocated as reflective of the municipal risk assessment and the situations that the local populous may face.

MR. BURNS: Dr. Binder. Sorry, Scott Burns, for the record, OPG.

I could probably add a little bit of information to help you with the context outside of the 10 kilometres.

Durham Region will be here tomorrow I understand and can probably speak to this a little bit more, but in the spring of this year they continued their spring and fall EP and KI pill awareness campaign through a wide variety of platforms, and it's our understanding -- and confirm this with the Region -- they go -- their

campaign goes throughout the Region, so well beyond the 10 kilometres.

So, they include it in newspapers, transit ads, social media, childcare Newsletter articles, so a number of venues in the Durham Region.

I'd also like to clarify a couple of points that were made yesterday and really I think correct the notion that absolutely no information is available. That's just not true.

When you go to the City of Toronto's website they have a red page they call it and it's Your Action Plan to a Nuclear Emergency. You can find that in about two minutes, maybe less if you're more savvy than me, and they encourage people to print that off, put it on their fridge. It tells you everything you need to know about what to do in the case of a nuclear emergency, how to access KI.

So, in the information that we have from OPG perspective, people want information at their fingertips, they want it online. And we know that if you go to the Province's website, if you go to the CNSC's website, if you go to our website, the Region's website, all of our websites tell you lots of information and direct you to each other's website. You know that we're clearly working in partnership to keep our communities safe around

emergency preparedness.

So, I want to make that point that, you know, we've done -- we've invested millions of dollars in directing public education out to the 10-kilometre zone, to distribute pills, give people campaigns, that's in the City of Toronto and the Region of Durham, and there are mechanisms in place that go beyond that.

But we do know specifically, we've heard from our community, they want it at their fingertips and it is available online.

THE PRESIDENT: Okay. Thank you. Thank you for that.

Any final thought to share with us?

HON. O'TOOLE: Thank you very much for the opportunity, and I can leave this for you, Mr. President --

THE PRESIDENT: Sure.

HON. O'TOOLE: -- if you'd like to see it. There is quite a bit of information and...

THE PRESIDENT: The moment you do it, I's on the record.

HON. O'TOOLE: There you go, it's on the record. Thank you very much.

MR. LEBLANC: Please leave it with Ms Levert at the back, that would be appreciated.

HON. O'TOOLE: Okay.

MR. LEBLANC: Thank you.

THE PRESIDENT: Thank you very much.

I'd like to move on now to, the next presentation is by the Canadian Environmental Law Association as outlined in CMD 18-H6.57, 6.57A and B.

I understand that Ms McClenaghan will make the presentation.

CMD 18-H6.57/18-H6.57A/18-H6.57B
Oral presentation by the
Canadian Environmental Law Association

MS McCLENAGHAN: It will be Ms Blaise, Mr. President.

MS BLAISE: Good morning, President Binder and Members of the Commission.

I am Kerrie Blaise and I am legal counsel with the Canadian Environmental Law Association. Joining me today is co-counsel, Monica Poremba, and our Executive Director, Theresa McClenaghan.

While our sustainability expert couldn't join us in person, she is available on the phone to answer any questions you may have and her name is Dr. Tanya Markvart.

So, CELA is a non-profit public interest

law organization. We are funded by Legal Aid Ontario as a specialty legal aid clinic. For nearly 50 years we have advocated for strengthening of Canada's environmental laws and have sought to advance the public interest in order to increase environmental protection and safeguard the health of our communities.

The issue before the Commission today is whether to allow the operation of the Pickering Station. We have extensively reviewed the OPG and CNSC staff reports and supplementary materials and we do not find that the millions of people who live within 50 kilometres of the Pickering Station or the millions of people who rely on Lake Ontario for fresh drinking water have been sufficiently considered and protected from the effects of Pickering's continued operation.

CELA has received participant funding to be here today and to participate in this hearing.

Our review had three goals. First, to review the adequacy of emergency planning at the Pickering Station; secondly, to review how considerations of sustainability were factored into the CNSC's environmental review conducted under the *Nuclear Safety and Control Act*; and lastly, we reviewed the adequacy of the regulatory framework currently in place for the decommissioning of the nuclear power plant.

Section 9 of the *Nuclear Safety and Control Act* requires that the Commission, in fulfilling its duty, ensures the prevention of unreasonable risk to the environment and the health and safety of persons. For the following reasons, we submit there is not the evidence or of detailed and robust planning before the Commission necessary to make this finding.

CELA reviewed the current emergency plans for the Pickering Station and we found that the level of emergency preparedness is insufficient, specifically for residents in the 20 to 50-kilometre zones around the plant where detailed emergency planning is not required.

We also noted that the Ontario Provincial Nuclear Emergency Response Plan, the PNERP, which was released in December of 2017 is currently undergoing a technical study by the Office of the Fire Marshal. This study, once completed, will look at meteorological effects around the nuclear plants, it will assess planning zones and the distance for KI pill distribution and it will also study the water quality and drinking water impacts of Pickering.

These findings, however, will not be available until the end of 2018.

Secondly, while we heard from OPG yesterday that its emergency response plans are robust and

well integrated with off-site authorities, the implementing plan for Pickering which was released under two months ago requires changes to on-site and municipal level emergency response plans. These plans have not been updated and neither have they been aligned, nor have they been tested to make sure they're actually operable and functional.

As we further detail in our submission to the Commission, despite updates to the PNERP, detailed emergency planning for evacuation, for KI distribution or for public awareness is not required beyond the 10-kilometre detailed planning zone.

It is critical that detailed planning for emergency measures be extended beyond the immediate 10-kilometre zone, not only are residents beyond this mark deserving of equal levels of protection, it's required under Section 3 of the *Nuclear Safety and Control Act* that the Commission ensure that its decisions align with Canada's international obligations.

As a member of the IAEA, it is the Commission's responsibility to, at a minimum, ensure we align with international standards.

In this slide we've excerpted the recommended zones and accompanying measures provided by the IAEA. Our submission details this chart further.

So, reviewing the sufficiency of emergency

response plans also requires the Commission to consider the effects of venting radiation over Lake Ontario. The PNERP explicitly states that in the event of a radioactive containment venting will occur over the lake. However, there is no accompanying contingency plans which detail how an alternate drinking water supply will be provided to millions of people. Neither is there modelling of Lake Ontario's currents or studies demonstrating the effects of venting on the unique characteristics of Lake Ontario's near and offshore areas.

We submit these studies should be complete before proposing to vent over Lake Ontario.

CELA has provided a total of 31 recommendations to the Commission, unfortunately, because of time we can't review each and every one. So in order to remedy what we see as the most fundamental deficiencies before the Commission, here's our key recommendations.

First, the current 10-kilometre detailed emergency planning zone should be extended to 20 and the contingency planning zone which is currently 20 should be extended to 50.

So this does mean expanding emergency response measures like evacuation and ensuring that it functions for the millions of people who live in a region already plagued by traffic congestion. This also requires

alerting residents that they can order KI pills online at PrepareToBeSafe.ca and providing KI to vulnerable groups.

Secondly, given the Ingestion Planning Zone is currently at 50 kilometres, we recommend it be extended to 100 kilometres so that the protection of our food from farm to fork is ensured.

I will now pass the presentation over to my colleague, Monica Poremba, who will discuss our findings and recommendations related to sustainability and environmental assessment.

MS POREMBA: Thank you, Kerrie.

CELA reviewed all CNSC and OPG materials for this hearing and find that the key tenets of sustainability have not been considered. The following slides highlight our findings related to five critical sustainability issues that remain unaddressed by OPG and CNSC.

To begin, sustainability requires that the costs to future generations be studied and analyzed: What does the continued operation of Pickering mean for Ontario when cheaper and safer options exist? Where is the accounting of the financial cost of a nuclear reactor across its life cycle?

Sustainability also requires accounting for greenhouse gas emissions by conducting a climate test.

The total GHG emissions associated with nuclear power in Canada are estimated to be in the range of at least 840,000 tonnes per year.

Another requirement for progress toward sustainability is providing meaningful public participation opportunities. Compared to public participation opportunities under CEAA, CNSC's review did not provide as many opportunities, nor the opportunity for iterative review among experts, stakeholders and decision makers. We also found that neither OPG nor CNSC staff account for transition planning among the stages of operations and stabilization.

Demonstrating that sustainability has been considered should be a prerequisite to licencing. This would require that OPG's licence application be evaluated against the purpose and need for the undertaking with direct reference to the public interest and compare other reasonable alternatives. It is also necessary that a sustainability assessment be conducted for all stages of the Pickering plant's life.

CELA's key finding on environment assessment is that the NSCA's process, which CNSC staff have titled an environmental assessment is at best an environmental review of a proposed environmental monitoring program.

Section 24(4) of the NSCA, which states that in providing a licence the Commission must ensure that the licensee will, in carrying on the activities make adequate provision for the protection of the environment, is too narrow a statement to be equivalent in scope, review and outcome to Canada's existing environmental assessment legislation. In contrast, Canada's *Environmental Assessment Act* sets out, in law, the grounds for a review of the project which are not required under an NSCA environmental review. This includes environmental effects, cumulative environmental effects, their significance, feasibility of mitigation measures and the purpose, need for, and alternatives to the project. These parameters, which are required under a federal EA, have likewise not been applied by the CNSC in its review of OPG's proposed decommissioning activities.

In the context of decommissioning, an analysis of all options needs to be explored and justification provided for the preferred strategy. This review should actively engage experts, public and stakeholders and allow all interested parties to comment.

CELA specifically reviewed the record before the Commission, to review the accuracy of protections in place for human health and the environment, these objectives which, according to the NSCA, must guide

the CNSC. We ask that OPG's request for a 10-year licence be denied, for the reason that the record before the Commission is inadequate in fulfilling the Commission's public interest, health, safety and environmental protection mandate.

Thank you.

THE PRESIDENT: Thank you. Questions? Who wants to start? Ms Penney...?

MEMBER PENNEY: Thank you for that.

I am looking at your recommendations or comments on sustainability. So I think it's slide 8 and then 9, and then the recommendation being that there be a demonstration of sustainability. Just I'd like you to give me a tiny bit more detail about how the NSCA environmental assessment could have been expanded to include what you would describe as appropriate sustainability

MS BLAISE: Thank you for the question. It's Kerrie Blaise, for the record.

I believe our expert, Dr. Markvart, is on the line. If she is, can we see if she is able to answer this question? Thanks.

DR. MARKVART: Yes, Tanya Markvart here. Can everybody hear me okay?

THE PRESIDENT: Yes, we can. Please proceed.

DR. MARKVART: Yes. So to answer the question when it comes to proper consideration of sustainability in environmental assessment, we first need a proper working definition of sustainability, and one of our findings of our analysis included that REGDOC 2.9.1 includes just a very simple definition of sustainability. It just simply gives one sentence.

A proper working definition of sustainability would provide enough substantive information about what the concept of sustainability entails for the CNSC to then analyze whether or not the proponent has met those requirements, as well as to provide guidance for the proponent on how to properly consider sustainability and assessment.

So to get a little bit more detailed, a proper working definition includes things like not just providing a simple definition, but also laying out for authorities and proponents, what the generic requirements or progress towards sustainability are. That would then lay out certain tests that CNSC and proponents could then follow and incorporate into their environment assessments to ensure that those requirements for sustainability have been met. It also includes specifying the generic requirements for the particulars of case and context, and we did this in our report.

We laid out in a table all of the different contexts, specific requirements for nuclear energy generation and waste management specifically, not Pickering specifically, that should be covered for an appropriately stringent application of sustainability in this kind of EA.

And then we also need to know how the concept of sustainability was applied in analysis through the process of decision making.

Those are the three key points that I made in the report regarding how we can elaborate on the concept of sustainability, what it means, and how it should be applied in analysis.

THE PRESIDENT: Staff, do you want to tackle this?

MR. FRAPPIER: Gerry Frappier, for the record.

A couple of things and I'll pass it to Mr. Mike Rinker to speak specifically around the EA and the comparisons.

But I would note that part of their sustainability considerations that they are concerned about is cost to future generations. Certainly, the nuclear industry and the nuclear regulator require very extensive plans with respect to decommissioning, where the waste is

going to go. We can argue about whether it takes too long or too short, but at least the plan is there, the funding is there.

We check on an annual basis, as we talked about a little bit earlier, that there is sufficient funding for managing the entire cost of a life cycle. So that's certainly one that I would suggest maybe the nuclear industry should indicate that they do that very well compared to other energy sources.

With respect to the environmental assessment aspects, I'd ask Mr. Mike Rinker to comment.

MR. RINKER: Mike Rinker, for the record. I'm the Director General responsibility for environmental and radiation protection.

So under the context of sustainability, the intervenor references some of the work done by Professor Bob Gibson, who has published works on next generation environmental assessment and is one of the Canadian leaders on where sustainability may fit in Canadian environmental assessments.

Professor Gibson is part of a committee called "The Multi-Interest Advisory Committee" for which I am also a member of, and this committee is providing expert advice to the federal Minister of Environment and Climate Change Canada on where the next generation of environmental

assessment or impact assessment would go in Canada.

However, this advice is for a replacement for the *Canadian Environmental Assessment Act.* It is not something that is being incorporated into other federal areas of permitting or life cycle regulators or other aspects. It's for that larger planning basis type of legislation such as environmental assessment and impact assessment.

I think that advice is being brought forward into the federal oversight through what is being proposed as the impact assessment legislation that is before Cabinet now.

As towards how our environmental assessment is used for this regulatory purpose, I'll ask Dr. Ducros to answer.

DR. DUCROS: Dr. Caroline Ducros. I am speaking on behalf of my former position as the Director of the Environmental Assessment Division.

So I would like to put a little bit of context. As a nuclear regulator we don't look at the socioeconomic aspects, so in terms of sustainability and the NSCA we wouldn't be examining those aspects. However, it is our mandate to protect the environment, health and safety of people and we do this in several ways that are elaborated in REGDOC 2.9.1 that was referenced by the

intervenor. That is the REGDOC on environmental protection, environmental principles, assessments and protection measures.

So how we do that as one of the underpinnings of the EA under the NSCA is the environment risk assessment. The risk assessment is based on very conservative assumptions. We also have licensing and in the licence limits, those are also established several magnitudes below expected levels when we do establish them.

We have a five-year cycle for the environmental risk assessments, so that's at a minimum a five-year cycle, unless there is new activities or new science. So we have that adaptive management potential in case any of the predictions that we have made are not as anticipated.

We also in the EA in the *NSCA* have gone beyond that to look at the regional aspects. So we look at data from other government departments at different levels. We look at the Ontario Ministry of the Environment climate change data, Ontario Ministry of Labour, Health Canada data, and we look at CNSC's Independent Environmental Monitoring Program too, to get the full picture to see whether there are any effects off-site that are being caused by the facility or anything is different.

So as a lifecycle regulator we have that

longitudinal, that temporal and the spatial view of what's going on for a facility that we've been regulating for several decades.

In my estimation there is a sustainability element imbedded in how we regulate.

THE PRESIDENT: We are talking about Pickering here, not about general. So I'm trying to understand what the intervention would have liked to hear about the alternatives here as part of -- it says here accounting for alternatives to this.

I thought we talked about alternatives and all those things, a Government of Ontario decision, not ours. So what does it have to do with sustainability?

Something doesn't connect here. Maybe the intervenor can enlighten me here.

MS McCLENAGHAN: It's Theresa McClenaghan, for the record.

I will begin and then I'll ask Dr. Markvart to add to what I have to say.

The question for the Commission is whether to grant the licence under your authority and in doing so the Commission documents make statements that it includes an environmental assessment process under the statute, the *Nuclear Safety Control Act*.

And our question for Dr. Markvart was:

Does that actually have the hallmarks of sustainability?

So vis-à-vis Pickering then, if you did apply an environmental assessment process and not just next generation environmental assessment but today's environmental assessment as recognized internationally and in practice, you would normally include questions of alternatives.

And that's an extremely important question in today's context where we do have surplus of power in Ontario, where we do have alternatives.

I know you are going to say this is Ontario policy choice --

THE PRESIDENT: It is and it is totally out of scope.

MS McCLENAGHAN: But the question is --

THE PRESIDENT: We are dealing with existing pieces of legislation, not hypothetical.

MS McCLENAGHAN: Right. But the question for the Commission is whether, on all of the evidence, to grant the licence. And sustainability is a very important consideration in terms of necessity, especially when you are considering questions of risk and safety to the surrounding population. That means you look at the alternatives.

And if you are considering a situation

where in our contention too much hazard and too much concern around safety is being imposed on the population in a context where there are alternatives, this is directly core to your sustainability question under the Act you have to administer.

I will ask Dr. Markvart to add to that.

DR. MARKVART: Yes. Tanya Markvart here, for the record.

Theresa, you covered most of the points I would have made. I would only add that best practices in a sustainability based environmental assessment -- and I would argue that REGDOC is heading in that direction -- requires not just looking at alternative means but also a discussion about need for the project. And that discussion about need for the project then sets the basis for a statement of purpose and then an analysis of alternatives to the project, as well as alternative means of undertaking the project.

Those four things together should be laid out really clearly so the public can see very clearly that there is a demonstrated need and that that need is really closely connected appropriately with the purpose, and then an analysis of alternatives to an alternative mean, which is done in a comparative way that incorporates sustainability considerations throughout.

THE PRESIDENT: Ms Velshi, questions?

MR. MANLEY: President Binder, if I may? Robin Manley, for the record.

Perhaps OPG could have a chance to speak to this issue of sustainability.

The intervenor may not be aware of the fact that Ontario Power Generation has a sustainability policy. It's available on our website. I'm looking at it right now on opg.com. And it speaks to many of the kinds of things that have been discussed here, such as the mission of this company, which I maybe could briefly speak to.

> "Power with Purpose – Providing low-cost power in a safe, clean, reliable and sustainable manner for the benefit of our customers and shareholder."

Our policy speaks to the values of the company, our behaviours, our strategic comparators, including our social licence, and the outputs that we think are important: safe, clean, reliable energy; reasonable electricity rates; displacement of fossil fuels; safe, healthy and engaged employees.

And I can go on.

When it comes to the topic of a policy and

whether or not there are alternatives, other regulators in Ontario have already spoken to what is the right source of power for Ontario.

The Ministry of Energy in Ontario has that accountability and the Independent Electricity System Operator has evaluated various options that are in front of the Ontario government. It argued in front of the Ontario Electricity Board that the Pickering continued operation to 2024 has an economic benefit to the province as a whole.

The question in front of you is safety, not economics, so I won't go more into the question of cost. But I will mention the topic of greenhouse gases.

Ontario Power Generation is very proud of our contribution to the reduction of greenhouse gases that we have made through closure of coal and the fact that we produce a very sizable amount of the total electricity in this province 99 per cent greenhouse gas free.

It's not just us who says that nuclear contributes to low greenhouse gas emissions. You can refer to one of the other intervenors. The Toronto Region Board of Trade, in CMD 18-H6.27, notes the benefits and it quotes from the Intergovernmental Panel on Climate Change, which shows in its research that nuclear has less greenhouse gas emissions than a wide range of other alternatives, including less than solar.

So I submit to you that sustainability is a very large component of our overall accountability as a good corporate citizen, and people can read about it on our website.

THE PRESIDENT: Thank you.

Ms Velshi?

MEMBER VELSHI: Thank you.

I want to talk about Recommendation 16 around public awareness. I did check the City of Toronto website and yes, in 30 seconds I got to their page.

And I've actually ordered my Ki pills and they will be delivered to me in four weeks.

So it does work.

But I do want to let you know that the first site that you get when you do a search is City of Toronto's Nuclear Emergency Plan that is dated September 2012.

So if someone didn't go further down, then I don't even know why that's on the site.

But the question is for OFMEM.

When we talk about demonstrating public awareness outside the detailed planning zone, what does the PNERP require or what do the implementation plans require and what kind of confirmation exists now that that awareness exists?

MR. MORTON: Mike Morton, OFMEM, for the record.

The PNERP master plan in Section 3, in Annex C, outlines the public awareness and education requirements. These are focused on the detailed planning zone.

Obviously the committees that are established under Annex C take a broader perspective and can work within any scope that's decided by the local stakeholders in supplementing again the municipal level public education programs that are required for the entire municipality, for all municipalities in Ontario, under our legislation.

I'm not in a position to speak to those programs at the municipal level. There are other efforts that OPG may be engaged with, but they may wish to share on some of those efforts.

MEMBER VELSHI: I will ask OPG or Staff if they are aware of any requirements outside the detailed planning zone around awareness and how is that measured.

MR. BURNS: Scott Burns, for the record.

In terms of comments from the province, the requirement is clearly outlined in the Provincial Nuclear Emergency Response Plan from our perspective and then speaks specifically to the detailed planning zone.

So generally we design, in collaboration with the partners, our focused campaigns to that zone.

But as mentioned earlier, we put a focus on reaching all members of our community through websites.

The pamphlet or the kit that we sent out at the end of last year, Mr. Gregoris profiled it for the Commission at the Part 1 hearing. We have an online pamphlet that describes that plan in general, all the components of emergency planning from a nuclear perspective easily found online.

I've mentioned the Durham Region and their focus. We've heard from their Director who frequently tells us --

MEMBER VELSHI: I'm sorry to interrupt, but I really want to know outside the detailed planning zone what's being done.

I understand there are no specific requirements in the PNERP and it's left up to the local implementation teams to do so.

So any information on outside the detailed planning zone.

MR. BURNS: Scott Burns, for the record.

That was my point about the Region of Durham. Their campaigns don't just focus on the detailed planning zone. They target the entire region of Durham.

MEMBER VELSHI: So yesterday we heard from an intervenor about the Bruce and how they had their brochure go out, I think it was to 20 or it may even have been a 50 kilometre zone.

As we kind of sit here, we go well, who oversees that? Who co-ordinates? Who makes sure there is consistency?

And clearly the City of Toronto has got something on their website but how effective is it and who monitors this to make sure it's being done?

Maybe, Staff, you can have a stab at this?

MR. FRAPPIER: Gerry Frappier, for the record. So certainly talking, we're a big believer in Defence in Depth of course, and so most of our effort is spent on the plant itself and on the operations of the licensee. But Level 5 of Defence in Depth does talk about emergency planning, and we do have some requirements on that and we're mostly focused close in to the plant.

With respect to what we do in the broader sense, I'd ask Mr. Richard Tennant to provide some additional information.

MR. TENNANT: Richard Tennant, Emergency Management Program Division, for the record.

Yes, RD-2.10.1 spelt out guidance for the licensees on their communication plan, so it does, specific

to the designated preliminary exposure planning zone, which is now the detailed planning zone, so that is the 10 km.

But outside of that, in the PNERP Master Plan, Appendix C, Section 4, there is a reference to agriculture as well. So there is a mention how to communicate and explain things as well, and this is for the ingestion planning zone, which needs to be differentiated between emergency planning zone, which is outside the shelter and evacuation.

MEMBER VELSHI: So the City of Toronto has passed a motion that the CNSC and I think it's OPG and the Province should be doing more to raise awareness outside the detailed planning zone. What would your advice be to Commission on that?

MR. TENNANT: Richard Tennant, for the record. The regulation RD-2.10.1 spells a minimum requirement, but we would strongly support any efforts to extend communication and education past the requirement.

THE PRESIDENT: But I'm still back to the KI distribution. So I thought that in the REGDOC there is a reference to vulnerable population that should be treated differently. I assume it doesn't mean that somebody goes online and order it, it means that there'll be a proactive -- making it available.

So I'm trying to understand, to the

vulnerable population; schools, hospitals, retirement homes, what is being done over and above the normal make it available?

MR. TENNANT: Richard Tennant, Emergency Management Program Division, for the record. So the stockpiling, which is outside of the DPZ, it does reference vulnerable populations, and part of that would be the management of where the KI would be stored, so it can be expediently given to these identified populations.

THE PRESIDENT: So who does this? Whose responsibility is it to make sure that it's done? Is that the Office of the Fire Marshal or the local community, or the local municipality? Who actually makes sure that those vulnerable communities have access to the KI pills in the 50-km zone?

MS McCLENAGHAN: Mr. Chairman, if I may indicate what our position is on that question, which is that while the mechanics and cost of providing the KI and the information beyond the detailed planning zone should fall to the operator, and while the municipality should be cooperating with that as necessary. That it is integral to your role as regulator to ask, as you are doing right now, whether it is being done, and to require it to be done as a condition of licensing.

As you point out in the REGDOC that you

issued, you did require that particular consideration be given to sensitive populations such as children and pregnant women within the designated ingestion planning control zone.

So this is the kind of question that we are raising when we say we don't see evidence of this happening around the Pickering plant for those vulnerable populations.

MR. BURNS: Scott Burns, for the record. So I'll just make a couple of comments. We're talking about a few different things. We're talking about the deployment strategy of KI outside of the detailed planning zone.

So we have a clear strategy inside the detailed planning zone and we have a clear stockpiling strategy outside of the detailed planning zone.

In terms of the Bruce, they have modified their strategy, which we heard about yesterday. Some of the foundation of their decision we understand to be in relation to potential road closures, which occur more often in their community and don't generally occur as often in ours.

So if we were fundamentally talking about changing that strategy, it would have to be an evidence-based decision. Simply just stockpiling in the

school does not necessarily make it more effective. It depends on the time of day.

As we know, if you do have a controlled release, that progresses over some period of time. We know that generally families facing evacuation would want to reunite with their children. So there's a number of different factors that we would have to think about and consider in order to change that strategy.

So it's not as -- although it seems, on the face of it, it might be as simple as just changing the strategy and putting it in the schools, there would have to be a collaborative discussion with the partners. OPG, we support our municipal, regional, provincial partners in this. We've heard this morning we've never shirked our responsibility with that, nor would we ever.

But I'd like to come back to what we heard this morning about the planning basis. We heard from the CNSC and from the Province around that planning basis. We heard from Health Canada. Everybody that spoke about it said they were satisfied with that planning basis.

We, as a community, are following that planning basis in order to keep our community safe.

The provinces indicated they are in the process of doing a technical assessment. We are following that closely and looking forward to the results. So if

there are recommendations that come out of that, it would be our intention to follow and support those recommendations.

THE PRESIDENT: What I'm trying to find out is the meaning of the words "vulnerable population" in the REGDOC. What does it mean in terms of a requirement? I'm not getting a straight answer.

MR. JAMMAL: Ramzi Jammal, for the record. Since you're talking about REGDOC and the regulatory requirements, in the REGDOC we have two components. I would like to take 30 seconds to walk through and clarify the difference between a requirement and the guidance. So in our REGDOC we say that as a requirement, Section 2.3.4, that the licensee shall:

> "ensure that a sufficient quantity of ITB agent is pre-stocked and ready for prompt distribution within the designated ingestion control planning zone; this inventory of ITB agents shall be located so that it can be efficiently obtained by, or distributed to, members of the public when required"

Then we go on, as a requirement, number 4, that's your question, Mr. President:

> "ensure that particular consideration is given to sensitive populations such as children and pregnant women within the designated ingestion control planning zone"

Then we go to the guidance, which is under the same section. Then we provide the guidance for the responsible authority:

> "Pre-stocked ITB agents for the designated ingestion control planning zone should be located to facilitate prompt and efficient distribution during an emergency. Recognizable locations with credible persons within the community (such as fire stations, police stations and pharmacies) should be considered in the selection of pre-stocking locations."

So we have the guidance in place.

We previously spoke about international. If you look at the Swiss, we just finished under the Convention on Nuclear Safety the Swiss report. They said the Canton has the responsibility to make sure that the distribution is done. So the regulator provides guidance

and provides the requirement. The implementation, internationally, there is the local authority, there is the federal authority, and then equivalent to provincial authority.

So, as a regulator, we're providing requirements, we're providing guidance, and with respect to the implementation let's take the Swiss, they specifically state the Canton.

In Germany the federal regulator provides recommendations -- not even a "shall" shell statement, a recommendation -- in certain areas. Like, the state, Aachen, where it's a proximity to Belgium, the local authority decided to pre-distribute, at the 50 km, iodine.

So the consistency is applied from a regulatory perspective on what is the best way for protective measures and actions to be taken, the implementation is at the local authority.

So the question is, who is in charge? It's the provincial and the local authorities will make sure that there is coordination, but at the same time it will be useful to be use in the case of an emergency.

THE PRESIDENT: Well, I accept that the first requirement that was mentioned is being handled. I'm not sure about the second requirement. In terms of the "shall" here for sensitive populations, I don't -- what has

it got to do with fire places and...? So I'm not sure about that.

Dr. Demeter, you wanted to ask a relative question?

MEMBER DEMETER: Well, this is an issue that I've been struggling with as well, especially since the two teachers and their boards talked.

So from PNERP, can you tell me is there a detailed document that lays out where the KI pills are distributed beyond the 10 km, the volume, and the plans for getting that to vulnerable populations?

If there is such a plan, can it be tabled with the Commission so that I can have some confidence? Because right now, to be honest, all I've heard is a lot of arrows going in different directions without actual firm statement that, yes, we've stockpiled, here are the locations, here are plans for getting to vulnerable populations.

I need that degree of certitude, because it is our responsibility to make sure that those people are safe.

MR. MORTON: Mike Morton, with the Office of the Fire Marshal, for the record. So just to back-up one step, and we just want to make sure that this is on the record, is that the new PNERP is consistent with the REGDOC

reference 2.10.1 in that KI has been distributed. It is required within the detailed planning zone. As we heard earlier this morning, those zones have been established based on the planning basis, based on the credible scenarios and even were based on an INES 7 level emergency.

With respect to KI in the broader IPZ, we do have the requirement for stockpiling out to 50 kilometres and there is that requirement that those be made to any resident, not just vulnerable populations but to anyone that requests that. And when they do that, they would be provided with not just the pills but with information on those pills, which we heard about earlier they can read about on a variety of websites and through a variety of communication methodologies. So again, the PNERP requires pre-distribution in the 10-kilometre zone because that is what the risk scenario indicates and the analysis of our Ministry of Health and Long-Term Care indicates.

That said, we want to ensure that anyone that has an interest in this within the 50-kilometre zone has an easy way to obtain that and for that reason around 6 million doses of KI have been stockpiled and are available not just for pre-request if individuals choose to request that but could be distributed on an emergency basis outside of the 10K zone, which would be very much based on an

assessment of the situation, a technical assessment, and would be more into an incident, because this is to protect from a very specific risk, when a plume moves over and there is a potential for airborne exposure. Our preference is always going to be to evacuate if we have plume consequences that are moving in a certain direction or potentially outside of that 10K zone into any sort of hotspot.

MEMBER DEMETER: So I guess I have heard some more detail, so 6 million doses have been distributed, but do you have a planning document that outlines in lined form where things are stockpiled and how to distribute them to select vulnerable populations and can that be tabled?

MR. MORTON: Mike Morton, for the record. I'm going to turn to my colleague Jonathan Stone, who is our Manager of Planning. He will speak to that scenario and then we can see if that does address your question. If not, we can take an endeavour for the Ministry of Health to respond more fully. They are not able to be here today, but if necessary we can ask them to provide further detail.

MR. STONE: Jonathan Stone, for the record.

So I can confirm that the 6 million doses are in stocks held and maintained by the Ministry of Health and Long-Term Care in the Greater Toronto Area at the

government pharmacy. So they are in a centralized location. The location has easy and ready access to distribution points via 400 series highways.

And in terms of the specifics of a plan, we are currently working with the Ministry of Health and Long-Term Care and our colleagues at the OPP and MTO to develop that plan. That plan will be aligned with the 2017 PNERP Master Plan and will take into account ultimately the result of the PNERP technical study.

That said, in the event an emergency were to occur today, the distribution of those stocks would occur and be coordinated via the Provincial Emergency Operations Centre, which would handle delivery of potassium iodide pills in the IPZ as part of the overall provincial emergency response operations.

So at a high level the PEOC scientific section would assess -- would undertake an assessment to determine the need for thyroid blocking, specifically where that would be required in the IPZ. This would include a direct engagement with the Ministry of Health and Long-Term Care and the Chief Medical Officer of Health. We would then work with our ministry partners within the PEOC to undertake the emergency distribution. So that would include MTO, Health, OPP. It would also include our partners at the municipal level. And I think at a high

level we would already use the resources that are in place to access and distribute the doses to the distribution points and this would also include the provision of instructional material to people receiving those doses so they were clear on how to take it and in what timeframe.

MR. JAMMAL: Dr. Demeter, it's Ramzi Jammal, for the record.

I think we are going in circles here. What is of key importance here I want to reemphasize the fact that the PNERP has been updated and in the implementation of the PNERP there is a requirement on the power generation such as the licensee to fulfill the requirement, and then there is a requirement on the provincial authority and the local authority. So if you look at the implementation plan of the PNERP, the key point here has just been mentioned, there is a Chief Medical Officer, and I think if there is confusion what I'm recommending is for CNSC staff to work with the provincial authority, include the medical officers of the areas for them to understand what it is that should be done to address the sensitive population in the Greater Toronto Area. Because once there is an order to provide the potassium iodide pills it's going to be an order coming from the Ministry of Health and Long-Term Care, but the key point here is there's Medical Officers who are in charge of

the well-being of the community and they should be engaged in this discussion to determine what needs to be done.

MEMBER DEMETER: So I understand the decision to release and take the potassium iodide is usually through the Medical Officer of Health, the Chief Medical Officer of Health or their designate. What I was drilling down to is what I've heard is that this stockpile is in a central location within the Ministry of Health and not in a distributed model like some other regions like Bruce. The 6 million doses are in a central stockpile is what you said.

MR. STONE: Yes, sir.

MEMBER DEMETER: So I'm being very down to earth and mechanical here. What I want to get a sense of assurance is that it's centrally stockpiled and the logistics for distributing that, you know, because that's the important thing once it's decided that you need it.

THE PRESIDENT: But that wasn't my understanding. I thought you guys said it's in pharmacies all across GTA. Okay, so we are going to have the Medical Health Authority I believe on Thursday here and maybe we can raise it with them, because I think you are right and we are talking about two different types of population, we are talking about the general population that the plan now says, you know, go and get it. I'm talking about the

vulnerable population that needs it to be distributed before, they are not getting it distributed, and I was thinking about school boards, maybe hospitals, maybe retirement homes, this kind of a thing. So I want to hear from the medical authorities what their plan is. Now --

MS McCLENAGHAN: Mr. Chairman, when you have them here -- and I will try to be webcasting on Thursday but I won't be here -- one thing to keep in mind and for all of us to keep in mind is that the Health Canada guidance is that the KI needs to be distributed or to be consumed, pardon me, to be most effective, just prior to a release that might include radioiodines and its effectiveness tails off very quickly after it's ingested, in the order of a couple of hours, up to six maximum. So we are talking about logistics that would have to account for how to have those children and vulnerable populations in that 50K zone actually consuming the KI before, preferably before a plume to which they might be exposed, and if not then pretty much right at the same time. And absolutely I agree evacuation is the preferable strategy, but this is just about accounting for circumstances where something went wrong and there is a quicker timeframe.

So when you are asking those questions about logistics, which I am very happy to hear you doing because I have encouraged you to take on this

responsibility of checking that these things are actually in place on the ground, that kind of question that Dr. Demeter is asking about the logistics is very apropos. And to think that we actually could get it distributed to all of those facilities, you know, in something under four hours all across the 50K zone from a central facility is the kind of thing that I think if you drill down you are going to find -- it sounds like there is not a plan yet, but it belies logic that it could be effective. So that's why we are advocating for pre-distribute to those vulnerable facilities so that you leapfrog those logistics.

THE PRESIDENT: Okay. Thank you.

Other colleagues? Ms Penney...?

MEMBER PENNEY: Hi. Thank you. I wanted to talk about decommissioning. So I'm looking at your slides 13 and 14 and your submission, Section 5, 5.1 and 5.2. You have concerns about the regulatory framework around decommissioning and the timeliness of a decommissioning plan, and when I look at CSA N294-09 and the CNSC guidance G-219, you say in addition to that there should be additional guidance from IAEA and I would like you to just talk about that a little bit. I'm hoping that maybe there is something in that IAEA guidance other than a different option than the one that has been proposed by OPG and accepted by the CNSC with respect to in-place, not

immediate decommissioning. So perhaps you can give me a little bit more around the decommissioning issues, and then of course staff and OPG.

MS BLAISE: Kerrie Blaise, for the record. Thank you for the question.

So I think the decommissioning segment of our report also comes from our sustainability chapter, so I think what's important to recognize is by saying there is a preferred decommissioning strategy jumps over the fact that the alternatives haven't all been looked at, so what are the options for decommissioning, what would they look at, where are the technical studies, where is that review. So while the IAEA GSR Part 6 stipulates that the preferred decommissioning strategy such as immediate dismantling, if that is chosen, you have to consider all of the other relevant factors in other situations which could be applicable to the situation.

MR. MANLEY: Perhaps OPG could speak to the decommissioning as well. It's Robin Manley, for the record, and I have Art Rob here who is our Vice President of Decommissioning who is prepared to expand on this further. But just a couple of remarks.

First off, with respect, this is not a decommissioning licence hearing, we are not applying for a decommissioning licence. We do have a preliminary

decommissioning plan filed on our public website, and again, it has been discussed in front of the CNSC Commission in the past. We do update our preliminary decommissioning plan on a regular basis and we will in time prepare a detailed decommissioning plan as well.

We are familiar with the IAEA documentation and we perform extensive benchmarking around the world as to what decommissioning plans, strategies and actual things have actually happened. In fact, if you look around internationally, there is not a consensus on what is the right answer on decommissioning. In fact, it is done on a case-by-case basis and it does take account of local considerations, safety, the environment, cost and all sorts of other things, and OPG has looked at those factors and they have all informed our decommissioning strategy to date. In general terms, the international industry is split sort of 50:50 on whether to go to prompt decommissioning or delayed or deferred dismantlement. In addition, there is a third option about a sort of a local storage option as well.

Perhaps at that point I can pass it back to Art Rob to expand on this.

MR. ROB: Art Rob, for the record. I am the Vice President of Decommissioning with Ontario Power Generation.

So Mr. Manley has done a good job characterizing some of the work that OPG has done so far in preparing detailed decommissioning -- or, sorry, preliminary decommissioning plans.

I think just to clarify maybe a point about the IAEA, the IAEA recognizes of course the different strategies that can be used for decommissioning and it's sort of a case-based, risk-based kind of approach that they would endorse. One of the things that drives the IAEA position on prompt decommissioning would be of course the capability or the predictability of the constituent to be able to actually carry out the decommissioning in the future. Today we have heard actually about the financial guarantee process that actually is endorsed by the Commission and of course OPG has been through that process and demonstrated our capability to actually manage the decommissioning costs in the future. So I don't think that the IAEA case in this regard is appropriate for the Pickering decommissioning. So we have a demonstrated financial guarantee in place, we actually have plans in place, and we have worked carefully to make sure we have appropriate planning.

THE PRESIDENT: This intervenor and many other intervenors are going and repeating, saying Canada lacks an adequate framework for decommissioning. Staff...?

MR. FRAPPIER: Gerry Frappier, for the record and I will move it to Ms Karine Glenn in a minute.

We would disagree with that. We do have a framework in place. We have just been to the IAEA in Vienna on the convention on how nuclear waste is managed and that was part of the discussions.

But in general with respect to our overall framework, I would ask Karine Glenn to provide some info. She is back in Ottawa.

MS GLENN: Karine Glenn, for the record. I am the Director of the Waste and Decommissioning Division at the CNSC.

As Mr. Frappier pointed out, we disagree with the intervenor's statement that Canada has an inadequate regulatory framework for the management of waste and of decommissioning. As Mr. Frappier stated in May, the Canadian delegation just attended the Sixth Review Meeting of the Joint Convention for the Safety of Used Fuel Management and the Safety of Radioactive Waste Management. Part of that is a review of the Canadian report which clearly elaborates what framework we operate under.

In addition to the *Nuclear Safety and Control Act*, there is also the *Nuclear Fuel Waste Act*, the Government of Canada National Policy on Radioactive Waste Management and a number of other guidance documents that

the CNSC has, as well as a whole suite of CSA Standards that deal with waste management and CSA Standards that deal with decommissioning planning. All of that put together creates a comprehensive and adequate framework for the regulation of waste management and decommissioning as well. Recently, in April of 2018, the CNSC issued a fact sheet that outlines the framework and that is available on the CNSC website as well.

The other thing I would like to point out is that the CNSC has undergone two IRRS reviews, one in 2009, a follow-up in 2011, and while there were opportunities for improvements identified in the area of guidance for waste management and decommissioning, and we are currently addressing those improvements through our modernization of our decommissioning and waste management guidance document, there were no gaps identified. More recently, staff here at the CNSC have undertaken an extensive side-by-side comparison of the IAEA documents that are available against the CNSC and the CSA documents and they have confirmed that there are no gaps.

THE PRESIDENT: Thank you.

MR. LOCKWOOD: Randy Lockwood, for the record.

If I may, personally I find the comments from the intervenor around decommissioning to be extremely

vague. Currently we meet all the requirements that are in place. We have laid out our strategy to all stakeholders, including the public in various community information sessions, council updates, tours, et cetera. It is posted. Our preliminary decommissioning plan is posted on our website for all to see.

As well, that plan takes into consideration what we hold dear, protection of the worker, the public and minimizing the impact on the environment. We have talked about what our long term is in line with and we have talked about our long-term plans for low and intermediate waste as well as spent fuel. Finally, it looks at minimizing the cost based on what we presently know now.

And lastly, I would like to say that we have ensured that there is adequate funding through the financial guarantee, which is reviewed on an ongoing basis to ensure that there is adequate funding to carry out that proposed decommissioning plan.

MS BLAISE: President Binder, if I may respond to that briefly?

THE PRESIDENT: Go ahead.

MS BLAISE: Thank you. Kerrie Blaise, for the record.

I would just like to reiterate that in

addition to decommissioning triggering regulations and rules under the NSCA and the *Nuclear Fuel Act* and many CSA Standards, I would just like to point out that currently decommissioning is not under the project list for the proposed *Impact Assessment Act*. So decommissioning as an activity doesn't trigger an environmental assessment. So in a request for a ruling that CELA, along with Greenpeace and Northwatch, put to the Commission is that decommissioning become a project under the proposed *Impact Assessment Act*. The proposed *Impact Assessment Act* is still a Bill right now, it passed third reading and it's proceeding to the Senate, and so I think if we could see decommissioning under a project list, that would trigger a federal environmental assessment under Canada's new *Impact Assessment Act*, that would remedy -- it would be a first step. It would address many of these issues.

THE PRESIDENT: But it is not really going to be this Commission's decision about whether it is part of the designated project or not, so why are you suggesting that we do anything about that?

MS BLAISE: We would recommend that the Commission makes a recommendation to the Ministry of Environment and Climate Change that it would --

THE PRESIDENT: It is a piece of legislation now going through Parliament. All the

consultation has been done, so I don't understand how we can help on that concept.

MS BLAISE: So the consultation on the project list is still ongoing. There was a June 1st deadline for one phase of the consultation.

THE PRESIDENT: For which you made a submission. We all read your submission, everybody read your submission, so the process will follow right now the process. Nothing to do with us.

MS BLAISE: But the consultation remains open. Everything is still proposed, so there is still the opportunity for decommissioning to be a designated project under the IAA.

THE PRESIDENT: Go ahead. Go ahead.

MEMBER LACROIX: Thank you, Mr. President.

This question is for CELA. It's on recommendation number 11. It's about the maintenance of Pickering NGS in a safe configuration. You mentioned that CNSC should exercise its authority to compel OPG to undertake an alternative means of analysis that utilizes the best available up-to-date science and methods. I want to know, what is wrong with the actual science and methods used by OPG and what is right about the alternative means?

MS McCLENAGHAN: The recommendation is aimed at the situation where the plant closes and there is

quite a bit of debate, as you are hearing here, about what should happen after that in terms of what's a safe state for the plant. It has to do with the decommissioning discussion we just had. That has to do with the pace of decommissioning, where should material be stored on the site, what if there aren't other facilities elsewhere, and fundamentally the question about whether we have a satisfactory state at the moment is still I think very open to debate. Do we think that the current location and security around fuel waste onsite is sufficient, do we think that the intermediate waste is well stored at present, and this needs to be considered for the kind of near to medium term. So we are not suggesting that we have the answers today, but we are suggesting that this is a very live debate both in the community and for Canada in general as we move into this phase of nuclear power and we need to explore whether we have sufficient research and science around those options so that we have the maximum security, not just environmental health and safety but also security for all of those kinds of waste and facilities as we move from one dismantling/decommissioning long-term state to another.

MEMBER LACROIX: I'm a bit confused here. You're talking about science or practices?

MS McCLENAGHAN: Well, we --

MEMBER LACROIX: It's totally different.

MS McCLENAGHAN: We also think that ongoing research about alternatives, for example, to deal with intermediate waste as well as fuel waste, is highly necessary. So for example, we've been involved in the deep geological repository. And there's absolutely all kinds of ongoing science still needed for that facility for intermediate waste and low waste as well as for the NWMO process. And science is going on all over the world in that we haven't arrived at the right answer for all of these facilities yet.

MEMBER LACROIX: I would like to have a reply from OPG, please.

MR. GREGORIS: Steve Gregoris, for the record.

So we have a very clear plan that was discussed during our presentation with regards to waste once the units are shut down. Specific to the fuel, we have shown that we will defuel the units in the first one to three years of shutdown. That fuel will be stored in the irradiated fuel bays for up to 10 years. At that point, that fuel is transferred to the dry storage facilities.

Through the periodic safety review, we did a full review of the irradiated fuel bays, including the

health of those bays and the supporting equipment. And the bays and supporting equipment were found to be in good health and the programs will ensure they remain in good health so that we can execute the strategy as shown.

As far as the dry fuel storage and our waste management facility, that facility meets regulatory requirements. The storage of the fuel there can be for an extended time. It's designed that way. Ms Morton spoke to that. If there's any delays, it's designed to cater to that. And it meets all security regulations.

THE PRESIDENT: Okay. Staff?

MR. FRAPPIER: Gerry Frappier, for the record, and I'll pass it to Ottawa in a minute, there.

I think that certainly science is always something we should be keeping track of and moving forward with, and there are certainly more and more science research going on associated with optimization of decommissioning and waste storage.

With respect to some of the areas that we're talking about, you know, fortunately, you do have a regulator and we are considering all those matters. And so with respect to putting the unit into a safe state at the Pickering site, there's already a couple of units that are in safe state. We are going through -- or pardon me, Hydro-Québec has also done that with the G2.

We have a very good compliance program associated with how to take that nuclear power plant, move it in a safe way towards complete shutdown and safe storage. And as was mentioned by OPG, moving the fuel -- defuelling it, putting it into the wet storage, and then eventually moving all that to dry storage.

THE PRESIDENT: Okay, we're going to have in 2028 there will be application for decommissioning.

MR. FRAPPIER: Uh-huh.

THE PRESIDENT: Where most of those things -- this is not a decommissioning kind of a hearing here now.

MR. FRAPPIER: Okay.

THE PRESIDENT: So I really would like to move on.

And do you have any particular question?

MEMBER PENNEY: I was just going to say to CELA we had fulsome description last night of waste management from both CNSC staff and OPG, so you might want to -- if you haven't.

MS McCLENAGHAN: Yes, and we know there are other intervenors here focused on waste management.

THE PRESIDENT: So the one last -- the one question I have, and I want to put this away once and for all. Somebody talk to me about contaminated water. Lake

Ontario will not provide drinking water. Where does that come from, and it is likely, and what's the plan?

MS McCLENAGHAN: Mr. Chairman, do you want --

THE PRESIDENT: I'm looking for the Office --

MS McCLENAGHAN: Yes, do you want me to start with what the concern is and then you could ask them --

THE PRESIDENT: No, I heard your concern. We've read your concern. I would like to hear it from the Office of the Fire Marshal.

MR. MORTON: Mike Morton with the office of the Fire Marshal, for the record.

So we want to begin again just by assuring that there are plans and procedure in place to protect drinking water supplies and also to assess the effects of an accident on drinking water.

Within the context of our plans, there's really two scenarios that we're looking at. We would be looking at the impacts following an accident at the plant that releases to the air. But we also, under the liquid emission plan, look at an incident that would involve a release of tritium. So these are two separate and distinct scenarios for which we have separate plants that have been

well detailed.

In terms of the specifics of those plans, it essentially involves a combination of real-time monitoring at the water intakes as well as for airborne contaminants that's done by our Ministry of the Environment and Climate Change. And there are very specific levels that are set that would indicate when a drinking water supply would have to be closed as a result of contamination.

We do have a representative of the Ministry of Environment and Climate Change who is attending on Friday. He's highly specialist in these areas and could speak to Ontario's regulations related to drinking water and the very particular details of this. And --

THE PRESIDENT: That's the Ontario Ministry of Environment?

MR. MORTON: That's correct, the Ontario Ministry of Environment that has the direct oversight of drinking water in Ontario --

THE PRESIDENT: They will be here on Friday?

MR. MORTON: Here on Friday with their specialist who works directly with these plans and the regulations for water safety.

THE PRESIDENT: Okay, go ahead now.

MS McCLENAGHAN: Mr. Chairman, I am not aware of any specific plans. And I do a lot of work on Ontario drinking water. In fact, I wrote a book for Carswell on Ontario drinking water law. I pay a lot of attention to this issue.

I would like the Commission to find out what the plan is and to table it publicly.

There was some assessment of routine operation radiological hazard for the source water protection plans with some consideration that intakes might have to be closed if there were an accident. But I am not aware of any plans for contingency supplies for the kinds of populations we're talking about, nor am I aware of any assessment having been done and made public about what the hazard would be in the wake of various accident scenarios.

And I might add that the Minister -- OFMEM's Minister asked them to provide that in 2013 after she met with CELA, Greenpeace, and Durham Nuclear Awareness. And as far as I know, that has never been done, a contingency plan for drinking water around the nuclear plants.

THE PRESIDENT: So staff, when the calculations for release were made, were there no calculations about those release impacts on the water and what kind of contamination will result from that plume

hitting the water? Was any of this stuff done?

MR. McALLISTER: Andrew McAllister, director of the Environmental Risk Assessment division.

I'm not too sure if this will fully address your question, but to get around the idea of, you know, has there been an examination of accidents near us that may impact the Lake Ontario specifically from the nuclear generating station, the answer is yes. This was done under the Pickering B refurbishment environmental assessment that was conducted in around 2007. And it looked at a direct discharge to Lake Ontario as a result of a release of moderator grade heavy water to Lake Ontario, resulting in a maximum tritium concentration in drinking water of around 17,000 becquerels per litre, which translated to a dose to a member of the public of less than 1 microsievert per day, which is a fraction of both background radiation dose and the annual public dose limit in Canada.

So it has been examined in the Bruce refurbish -- sorry, the Bruce? -- the Pickering refurbishment environmental assessment, and that has helped -- that helped or was concluded by the Commission of no significant environmental effects in that case.

THE PRESIDENT: So did any of this get translated into action in the PNERP? Go ahead.

MR. MORTON: Mike Morton, with the Office of the Fire Marshal and Emergency Management.

We'll reference a couple sections of the PNERP, and then I'm going to turn over to Lorie Whitcombe is our senior scientist. She can speak to our procedures that would be put into place if there were an accident affecting potentially water quality. And she'll also speak to our liquid emission response plan.

But for reference, our water standards are in section 1.9.4 of the Master Plan, and then Annex E, Appendix 2, is where we have our specific intervention levels in terms of contamination in water that would be put these procedures into place.

But at this time I'll turn it over to Lorie, and she can give us an overview and then we'll see how far that takes us.

We do, again, have the Ministry of the Environment coming on Friday.

MS WHITCOMBE: Lorie Whitcombe, OFMEM, for the record.

The Province does have the Provincial Liquid Emissions Response procedures. These procedures are subordinate within the PNERP and they are intended to address an emission directly from the station into a lake. We follow these procedures, which outline how all of our

stakeholders come together; how we are going to take samples and from where; who will do the analysis, whether it is the Ministry of Labour or, for example, Health Canada; and what our next steps collectively as a group are.

As a part of that group, we have stakeholders that are embedded in the Environmental Radiation And Assurance Monitoring Group. These are both provincial ministries, such as the Ministry of Environment and Climate Change, and also a federal contingent, including Health Canada and the Canadian Food Inspection Agency. In addition, under the PLERP, we also include the region and the local medical officer of health, who comes into this group to provide guidance and advice.

Outside of a direct release from a station into a lake or other body of water, under the Environmental Radiation and Assurance Monitoring Group, we can take samples of water from any source that needs to be assayed, so from well water, from lakes, from rivers, wherever we need to take that sample we can do that, and we can then analyze and formulate actions as they are needed.

THE PRESIDENT: Questions? Ms Velshi.

MEMBER VELSHI: I have two very quick ones. The first one is for OFMEM.

The technical study that's being done right now, and this may be premature, but is it likely to change the emergency planning zones' dimensions?

MR. MORTON: Mike Morton with OFMEM, for the record.

It really would be premature for us to suppose what the technical study would say. Once we have those results, our approach within the public service is to make recommendations and options to government. Then, based on that information, those decisions would be made, and if any changes were indicated, then that would be taken through the same process that has led us to our current plan, which is cabinet review and approval of the plan.

MEMBER VELSHI: Thank you.

The next question is to staff. This is around Recommendation No. 12. There was some indication that the Licence Conditions Handbook does not make reference to the latest version of REGDOC-2.10.1. Comment on that, please.

MR. FRAPPIER: Gerry Frappier, for the record.

As we've discussed before, REGDOC CSA standards have a certain process by which they get into a licence space. For this particular one, I'd ask Heather Overton to give us some details.

MS OVERTON: Heather Overton, for the record.

REGDOC-2.10.1, version one, which was published in 2014, is in the Licence Conditions Handbook. The simple reason is that when OPG first notified us that they were going to renew the licence, we put together a list of new and updated REGDOCs and CSA standards that were considering for inclusion in the Licence Conditions Handbook and asked OPG to provide us with their implementation plans for those new standards.

Just to have some certainty for their licence renewal period, we established a cut-off date, and we informed OPG that any new or revised standards published after that cut-off date would be introduced into the Licence Conditions Handbook after renewal, following our regular implementation process.

Version two of REGDOC-2.10.1 was published after the cut-off date, so it will be introduced into the LCH following our regular process. Once new REGDOCs and standards are eventually introduced into the licensing basis, the Commission is informed of that on an annual basis through the regulatory oversight report.

MEMBER VELSHI: As I'm not really clear, the proposed licence conditions handbook that's attached to

the staff CMD, does that have version two in it as the licensing basis?

MS OVERTON: It has version one in it.

MR. JAMMAL: Ramzi Jammal, for the record.

You've been described aloud here the process with respect to establishing a licence and the Licence Conditions Handbook. What is important to understand is the content between the versions is identical. It's very, very similar. There's only one reference in version two that will be updated, so the key point here is the content between the previous version that we issued, as the CNSC, and the new version that's upcoming, they are very, very identical, similar.

I will pass it on to Richard in order to tell you what is the -- it's so minimal. It's administrative in nature. We established the take-off point as being, I hate these numbers but anyway, 2.10.1, the version, the previous version, and now we're updating it with the second version.

The LCH will be updated as soon as the implementation plan is in place, or at the frequency that first comes. If there are any major gaps that really impact safety, we'll make the change immediately, but Richard will provide more detail.

MR. TENNANT: Richard Tennant, for the record.

Version one, when it was released, shortly thereafter there was an update to REGDOC-2.3.2 on accident management, so REGDOC-2.10.1 was updated, because they speak to the same topic. The updates for version two updated the changes in REGDOC-2.3.2, accident management, so a long story short, there's no changes in the regulatory criteria specific to REGDOC-2.10.1 that applies to emergency management between version one and version two.

Version two has been released, but as Ms Overton said, there was a cut-off date.

THE PRESIDENT: Okay. Anything?

Go ahead.

MR. MORTON: Mike Morton with the Office of the Fire Marshal and Emergency Management.

I'd just like to do a very brief supplement to Commissioner Velshi's question around the technical study, and also a brief supplement to Lorie's presentation, just because of the concern expressed that there wasn't a plan. I just want to reference the PNERP section 7.15, which is about liquid emission response, and 7.15.2 requires the development of the provincial liquid emission response plan that Lorie referenced. That is, though, a separate plan, which we're happy to provide, it's

just not in the master plan which establishes the requirement for it, so we can certainly provide that.

Then, 7.6 is the Environmental Radiation Assurance Monitoring Group Plan that's actually just been fully refreshed, and it is a separate plan in support of the PNERP. We wanted to offer that clarification, and also --

THE PRESIDENT: Those plans are available?

MR. MORTON: Those plans are openly available. All of our plans are public, they're just a supplement to the PNERP, so that's why you don't see them in the main text.

I also want to just give Lorie the opportunity to speak very briefly about the technical studies' scope with respect to drinking water, because we are working to fully assess what we have in place now to make sure it's adequate. Again, that would inform any changes that might be needed.

I'll just turn back to Lorie for just a moment, if that's okay.

MS WHITCOMBE: Lorie Whitcombe, OFMEM, for the record.

Just to clarify, as Mike alluded to, the technical study will include, as an integral part, a detailed analysis of the impact on drinking water, water in

general, under the three accident scenarios that have been chosen for the technical study, that is, a design-basis accident, a beyond-design-basis accident, and a severe beyond-design-basis accident. Each of those will have a water element included in the technical study.

THE PRESIDENT: What's the estimated release of that study? Will there be a consultation about that study? I'm trying to understand the process.

MR. MORTON: Mike Morton with the Office of the Fire Marshal and Emergency Management.

The study's target and date is by end of calendar year 2018, and it is building upon the work that's been done to date in terms of the public consultations, so they will have obviously full access to the public commentary, the advisory group report, as well as the facilities having granted them access to source term. Really any information that they determine they need will be made available.

THE PRESIDENT: Okay. Thank you.

CELA, you have the last word.

MS POREMBA: Thank you.

The Commission's role is to ensure that the plans are robust enough, and that includes practical questions like sufficiency of planning zones and sufficiency of the resourcing. As we recommended, active

public awareness and KI distribution should extend to 50 kilometres.

After considering the response to CELA's presentation, as well as interveners last night, we feel the need to make the following request for a ruling under section 27(3) of the CNSC's Rules of Procedure. We ask the Commission to direct OPG and OFMEM to release all plans regarding the stockpiling of and distribution of KI in the ingestion planning zone around the Pickering nuclear station to confirm compliance with section 2.3.4, clauses 2, 3 and 4 of REGDOC-2.10.1, by 5:00 p.m. on June 27, 2018.

We make this request for the following reasons:

One, we have heard from CNSC staff that the only requirement for KI stockpiling and distribution in the IPZ is that there be a plan, but we have reviewed all publicly-available information and there is nothing in the public domain to confirm the existence of such a plan.

Two, we have heard evidence and public concern during these hearings that Bruce Power has complied with this clause by stockpiling KI in all schools within 50 kilometres of the Bruce nuclear station, but OPG has made no equivalent effort.

Three, the large population around the Pickering nuclear station would make the prompt

distribution of KI to vulnerable communities, such as children, logistically challenging in the event of an emergency. There is no evidence on the record to show that the province or OPG could distribute KI promptly enough to protect a large number of vulnerable individuals in the ingestion control zone.

Four, as we heard last night, the Toronto District School Board has passed a motion requesting the CNSC facilitate the stockpiling of KI in Toronto area schools.

Five, without this information on the record, we don't believe the Commission has sufficient information to make a determination of whether OPG is in conformity with its licensing basis or has demonstrated sufficient effort to protect the health of Canadians.

Thank you.

THE PRESIDENT: Could you pass that in writing to the secretary, please?

Okay. Thank you.

We are going to break now for 45 minutes. Can everybody do lunch in 45 minutes? Is that okay for everybody, 45 minutes? Okay.

--- Upon recessing at 12:59 p.m. /

Suspension à 12 h 59

--- Upon resuming at 1:45 p.m. /
Reprise à 13 h 45

THE PRESIDENT: Okay. We are ready to proceed.

And the next presentation is by Ms Tilman as outlined in CMD 18-H6.24 and H6.24A.

Ms Tilman, the floor is yours.

CMD 18-H6.24/18-H6.24A

Oral presentation by Anna Tilman

MS TILMAN: Thank you very much and good afternoon.

I would like to go over the Power Point presentation now, as you will see in front of you, very quickly in order to work on some issues that are important.

You know what the OPG's licence request is, this is known, but the point I want to stress is this is in contrast to the shutdown as proposed in 2020 in its current licence.

One of the issues of Pickering, if we review its history, it's a legacy of safety issues. In particular, a particular point is the last two bullets: all reactors share the same safety and support systems. That's

unique I believe. And at least two units at Pickering B must operate to support the safe operation of Units 1 and 4 of Pickering A.

So, there's a safety issue concern just in terms of this alone and I'm not sure if OPG has planned to deal with this.

Going through the history again, originally the Units 5 to 8 would enter into operation -- continue operating until the end of 2020 or the limit of 247,000 equivalent full power hours would be reached. Units 1 and 4 had their pressure tubes replaced, so that's another issue.

And it was proposed that after the last shutdown, Pickering would apply for a deferred decommissioning strategy with a 30-year safe storage period.

But things have changed. This is a quick chart to show what was projected as end of life for the current licence period, and you can see that the years for Pickering B in particular vary from 2019 to 2021.

But now we see a change in plans as OPG is requesting to extend Units 5 to 8 up to 295,000 EFPH and operate until 2024.

However, as noted, there is a caveat in their materials in that, in quotes:

> "OPG must notify the CNSC no later than December 31st, 2022 in case it wishes to extend its operation beyond the 2024 date." (As read)

Now, that is a red -- that's a difficult point and it is a great concern because does that mean that there is no end in sight, no final end in sight to operations?

I have spent a fair amount of time looking at the issue of pressure tubes and the importance of their integrity in the safe operation of these. Right now the current licence -- or the current licence is for 247,000 EFPH, but OPG's requesting 295,000 which they'll need if they want to continue operating for that much longer.

Aging issues are a critical factor here and the pressure tubes, the components, calandria tubes, et cetera, become more fragile. The other point is there's no way to predict when a critical fuel channel component will fail.

So, a fair amount of this presentation was based on aging issues, fuel components, the deterioration and the degradation and leakages as outlined here.

There's an increase with age of cracks to develop and if not -- if they're not repaired or detected in time, if it's even possible, it could lead to a loss of

coolant accident.

One of the main factors involved is the increase in concentration of hydrogen or deuterium, if you like, ingress which, as it accumulates, creates the formation of blisters and cracks and it's been the dominant contributor to reduction in what's known as toughness of pressure tubes.

This, in turn, can lead to a development of cracks and growth in cracks as with migration and what is called delayed hydride cracking is most pronounced during the transition state between shutdown to full power and vice versa. And very little of that is actually mentioned.

There's a fair amount on this slide dealing with deuterium ingress and corrosion.

And what I want to highlight in all of this is the effect of temperatures -- increasing temperatures such as the third bullet, the pick-up of hydrogen at rolled joints, but what's really important, is this issue has been researched for decades, but it still remains a major source of uncertainty, and I think that all operators would agree and the CNSC would agree with that because, in fact, in reading through the materials of CNSC and Canadian Nuclear Labs, formerly AECL, that uncertainty does strike one that there's a lot that is not known.

Now, this is just a diagram from CNSC's document -- a document showing the sources of deuterium intake and this is a concentration profile. You can see what's happening after a number of years of service, what is happening with the ingress of deuterium at the rolled joint and at the two end joints, particularly the end joint. And, again, very little is known about this.

One of the issues, too, that comes up that I have some issue with is that a lot is based on effective full power hours which only includes the time which power is produced; whereas hot hours, which includes close, turn on and shutdown times is a longer period and this affects the condition of the pressure tubes as well.

So, I would like to see more on that. Most of the literature that I've researched shows hot hours versus EFPH is the metric to use.

There's been a great deal of discussion on emergency planning and I don't want to go over some of the issues that have already been addressed in previous presentation, but the main thing is, if a severe worst case scenario accident were to happen today any time, are the emergency planning and preparations, the essential components in place?

And we've seen talks about public alarm systems, provisions for food, medical assistance. We've

had discussions on for vulnerable populations. One of the issues, are the planning zones even appropriate? We hear talks about the five, the 10, the 50, but how they're determined, how they're delineated; are they circular or not, do they cut off people or not? And I think it's very unclear how they've been designated.

You've heard discussions about the distribution of KI pills. And again, I won't repeat what you've heard in the previous presentation, but there are concerns whether it will reach the people most needed and it has to reach it within a timely fashion.

Also, KI pills we must remember only deal with one radionuclide release; there are many others. So, it is not a panacea, it is not the only thing we need to worry about.

The thing is, safe sheltering, where is that? We need far more discussion on safe sheltering. It's not just sheltering, it's not just evacuation. And farmland, livestock, I haven't heard very much about that.

We did hear about considerations given to vulnerable populations and workers, concern about workers in carrying out evacuation.

So, coming to the end of this part. In the interest of public safety, we find the time has come to shut down Pickering Station rather than risk an accident

which would be so devastating for so many.

We have a number of recommendations for CNSC based on this: that you provide explicit directions to OPG to prepare for a shutdown and issue an operating licence specifically for the period between. A suggested date is going back to the current licence period of 2020 to 2021. And then, during this time the preparation for safe storage decommissioning is to be undertaken, the public are to be engaged with all these matters and CNSC is to ensure that, and OPG must have a complete decommissioning plan I think sooner, rather than later, which would be subject to due public process and consultation.

There is no justification at this stage to proceed with a 10-year licence period, it is far too long, it entails a number of operations and unnecessary risks and it doesn't allow for public scrutiny at the level that at least a five-year licence or shorter licences would be.

In considering the age of the station and its history, its proximity to a highly populated area and safety issues, to continue to operate it as proposed for at least six more years poses enormous risk to the safety that CNSC as regulator should not accept.

Continuing operating Pickering also blocks far more affordable, safer and cleaner alternatives for residents of Ontario.

So, in conclusion, the position that is being put forward I think is very clear, that I don't think there's a leg to stand on to keep supporting the continuing operation with aging components, things that can go wrong, nobody wants anything to go wrong; not the operator, not the CNSC, not the public.

It is a public safety issue for which you are responsible, and I urge you to exercise that responsibility which I know that you can and have the power to do so.

Thank you very much.

THE PRESIDENT: Thank you.

Questions? Dr. Lacroix?

MEMBER LACROIX: Thank you, Mrs. Tilman, for this presentation.

Right off the bat, you start off in your submission with a sentence that you repeat twice. It says:

> "It is unconscionable that the Provincial Government, the CNSC, and OPG give their unqualified support for continuing operations at Pickering..."

I hope that in this group of unqualified supporters I'm disqualified.

MS TILMAN: I think to start it off, with

the way I was intending to conclude was part of it, was to state there are serious concerns.

You have the power to look at these concerns. I mean, when I see issues such as possibly even extending the life of Pickering beyond even the request to 2024, that's a huge concern.

So, yes, you do have the authority to deal with it. You are the grantors of the licence and this is what concerns me as I -- not that you are the holders of that licence, but should that licence be granted, is it safe? Is it safe, is it secure? Do you -- I don't have that comfort level when I look at particularly the components involved, and that's my main area for this particular submission.

And things can happen. Nobody wants them to happen, but not every pressure tube out of the 380 per unit are tested to know. You have models, leak before break, which are used to back up if there is, but a model is not the same as the reality and one doesn't know. These tubes are very old in Pickering B.

So, that's why I don't want unqualified support, I want some serious thought as to whether this particular request should be granted, particularly as -- I think what bothered me most is going over the previous, the current licence in the previous hearing in 2013 where there

was a surety that these plants would be closed by 2020 approximately. They would be reaching their extended equivalent full power hours by then, but now there seems to be no termination that's definite. And I think that should be a concern of the Commissioners.

Have I answered you?

MEMBER LACROIX: Yes, yes, yes, indeed you have answered my question.

OPG and CNSC staff, is there an issue, among all the issues that Mrs. Tilman raised, is there an issue that has not been addressed yet?

MR. FRAPPIER: Gerry Frappier, for the record.

We've talked. I guess I'm melding a little bit between what we've talked about yesterday and today, versus what we have talked about over time. Certainly, the pressure tube concerns that she has, we have certainly talked about them. I'm not sure how much we have talked about them in this forum.

But other than that, I would say there is no information in there that we would say is surprising and, as she mentioned, a lot of the information she has is from our own sort of presentations, or own submissions. From that perspective, if you go back to Part 1, we did have quite an extensive discussion around pressure tubes

and that.

THE PRESIDENT: SO why don't you -- the intervenor actually mentioned the hot hours versus the EFPH. Why don't we get an answer to the intervenor about the difference between the two, and which one is reliable, and which one is not?

MR. FRAPPIER: Gerry Frappier, for the record.

So I'll ask Glen McDougall to come and explain both differences and how we use them, because we do in fact, use both.

THE PRESIDENT: Okay.

MR. McDOUGALL: Glen McDougall, for the record.

Yes, in a presentation that we gave to the Commission in January of 2018 that's available on CNSC's website, we went into the differences between hot hours and the EFPH, but just to reiterate that I think it's important to distinguish between the two purposes of having these metrics for measuring operating time, and the metrics that staff use for judging the fitness for service of pressure tubes so we can make recommendations to the Commission about future safe operation.

Hot hours and effective full power hours are two ways that the industry and, primarily researchers,

use to compare apples with apples. You need to be able to compare pressure tubes in the same reactor, pressure tubes across a given station, and pressure tubes between stations across Canada to get an idea of what the trends are in different kinds of aging such as the ones that Ms Tilman mentioned in her presentation.

The reason that there are two different metrics are because they are used to gauge the amount of aging that happens for different types of aging mechanisms and fuel channels. For aging mechanisms that are primarily driven by temperature differences, the preference is to use hot hours because they record the total amount of time that the pressure tubes are exposed to temperatures where corrosion can take place.

So typically, if you're looking at data that is measured in terms of hot hours, you're looking at something that is linked to corrosion, so for instance hydrogen pickup would be the most common one.

However, many types of pressure tube degradation involve the damage to the material that occurs from the neutrons that fire on inside the core. For that purpose, a better metric is effective full power hours because it takes into account only the fraction of the operating time when the material is being irradiated by neutrons. So this is the reason you have two different

metrics.

But to get back to my first point, the most important thing that we worry about as staff is the degradation of the pressure tubes themselves. For that purpose we don't use operating time as a metric. If you look in the CSA standards, which are the basis for the assessment of pressure tubes and also the basis for all the acceptance criteria for fitness for service of pressure tubes, you'll find that time does not enter into the question.

The acceptance criteria in the CSA standards, which are the basis for staff recommending to the Commission that a pressure tube can continue to be operating, they are not based on hot hours or effective full power hours. They are based on the actual structural integrity of the pressure tube and its likelihood to remain integral.

So for this reason, a pressure tube could have two hot years of operation or it could have 40 hot years of operation. Provided it can continue to meet the same acceptance criteria in the CSA standard, it would be judged to be fit for continued service.

THE PRESIDENT: Let's get some questions and then I'll give you the floor.

Ms Velshi...?

MEMBER VELSHI: So a question for OPG. I share the intervenor's concern to an extent about a possible request to operate beyond 2024. I too remember the 2013 hearing when OPG wanted to operate to 2020 and the Commission had asked specifically -- Mr. Manley was there -- so are you likely to come in front of us and ask for a further extension, and I recall the answer was a vehement "no".

So here we are today, and if you flash forward to 2024 -- and we've just heard from staff it's not based on EFPH, the staff will make sure that it meets acceptance criteria that there is a safety basis and meets all their requirements -- and if the situation were to change and now there is an economic case to continue operating the units beyond that because you've met the safety requirements, would you operate the plant any differently over the next few years if you thought you had to -- and I know you have said it's going to be in better shape the day it closes than it has ever been, but would your investment decisions, would your operations, maintenance plans or processes be any different if you thought you were going to run for 10 years as opposed to six years more?

MR. LOCKWOOD: Randy Lockwood, for the record.

So you have several points in there that I would like to respond to. Starting with the last one, would we run the plant any different? Absolutely not. I committed yesterday six commitments. The last one was we will continue investing in Pickering. There is no reason why we would not. It makes logical sense from a business perspective to keep investing in Pickering.

As well as our commitment number one, is that we will continue with nuclear safety as a priority. So to answer that question, that would not bear into this at all.

The next piece is -- with all due respect, what I am about to say is that I did read the transcript from 2013 after our Part I hearing. I thought it best that I do that before responding. Again, with all due respect, there was a volley of discussion and the discussion was around ensuring it was safe based on -- and I summarize -- based on a current business plan. Again, with all due respect, there wasn't a definitive "no". By the same token, there wasn't a definitive "yes" if you can accept that, please.

The current application before the Commission and I think what you're alluding to here, is I can really only tell you what we put in the application, right. We were asked by the shareholder to look at and

continue operations of Pickering beyond 2020 to 2024, and their rationale, as I have explained, and we have included in our various submissions and on the record, was to provide base load generation during refurbishments at Bruce or major component replacement at Bruce and refurbishment at Darlington. That's the rationale and that's why we are continuing.

There is a number of refurbishments that are in overlap during that period, I believe. I can be corrected, but up to five. So a significant drain on base load supply in Ontario.

Also, we have mapped out that what our intention here was, was to seek a 10-year licence with the end of commercial operations being the end of 2024 and place -- shut the units and place them in safe storage for that period and be in safe storage by 2028, and then proceed with safe storage and the rationale, as I just outlined why for those particular timelines. So that was included in our application.

I will point out to the Commission and members of the public here, that one of our current licence conditions is to make known to staff what we intend to do -- what the intended shutdown dates are. We supplied that letter June 28th.

I can tell you I thought a lot about that

letter, and that letter says that we intend to operate Pickering to the end of 2024. It's posted on our website for all to see, including the entire application for this licence application, is on our website.

I have communicated this to staff; I have communicated this to the public through our community information sessions; I have communicated this to counsel updates that those are our intentions. As well, that I will point out to the Commission is that is my mandate, safely run and operate Pickering beyond 2020 to the end of 2024, properly implement and execute Project 2024. That's my mandate.

So with my honest hand on my heart, I can say that's what our intentions are.

THE PRESIDENT: Okay. So can I jump on that?

So then I don't understand this December 31, 2024 hold point. I'm trying to understand what does it mean? I didn't understand the language: OPG must notify the CNSC no later than December 2022 in case it intends to operate. That doesn't sound like it must have the approval and a process to go beyond that. I didn't -- I don't understand the language here.

MR. FRAPPIER: Gerry Frappier, for the record.

So as you noted, the licence does put a requirement on OPG to come back to the Commission if they do intend to operate beyond 2024. So by December 31, 2022, they would have had to come and express their desire to operate longer than that. We didn't want to presume what the Commission would want to do about that. So the Commission, of course, would be able to say "no". They would be able to say "yes" as long as -- put new conditions on whatever the case would be.

THE PRESIDENT: Well, that's a very good clarification but I don't read it in this sentence that moving beyond 2024 is subject to the Commission's decision. I don't think that is the intention here.

MR. MANLEY: President Binder, if I may? This is Robin Manley, for the record.

I'm looking at our Draft Licence Condition Handbook, Section 15.4, and there's a statement there that says:

> "This licence condition also ensures that operation beyond December 31st, 2024 would constitute a change in the licensing basis, requiring approval by the Commission." (As read)

THE PRESIDENT: If that's there, I'm happy.

MR. FRAPPIER: Yes, that's what I was trying to say.

The licence does require the licensee to come back in front of the Commission if they intend to go beyond 2024.

The language here, as I think was just read out there, that essentially how we capture that into something that requires approval is the fact that we would say that's a change to the licensing basis and it requires approval from the Commission.

THE PRESIDENT: But I've got to tell you, it's not only this intervenor. A couple of other intervenors picked it up as language that all you have to do is notify and you're ongoing.

So I think there could have been better communication on that particular one.

MR. FRAPPIER: I think Mr. Jammal would like to add to that.

MR. JAMMAL: It's Ramzi Jammal, for the record.

It's just been stated what I wanted to say. You establish the safety case and no one can get out of the safety case.

So with respect to clarity, we hear you.

As a matter of fact, the licence is the

Commission licence so you can request an amendment. That's why we are giving a draft licence. But we will provide clarity in the LCH because the LCH is unequivocally clear that the licensee shall apply for CNSC approval.

THE PRESIDENT: Okay, thank you.

Questions?

MR. LOCKWOOD: Randy Lockwood, for the record.

I would just like to add a point, President Binder, if I could.

There is absolutely no doubt in our mind if we were for some reason to extend beyond 2024, that we would be appearing in front of the Commission again.

As well, I would like to give members of the public and yourself confidence and a little bit of context.

We sought a ten-year licence for the reasons that I said, to carry on commercial operations to a certain point and then under that licence place the unit in safe storage, defuel and dewater.

With some context here for two things. I wanted to make sure and provide comfort and confidence to everyone that the plant was safe to do those activities and our programs were in place to get to that point in 2028.

As well, I wanted to provide comfort that

there is margin here; that even if we did this PSR based on a ten-year licence, to provide the Commission and the public with that confidence that there is margin.

We have the intention to end Pickering operation at 2024, as I just stated. That is the plan. But to give everyone confidence that that plant is safe to do so, but also acknowledging when we completed that PSR on certain aspects that the intention was to end commercial operation in 2024.

THE PRESIDENT: Thank you.

Questions? Ms Penney?

MEMBER PENNEY: Just going back to fuel channels, pressure tubes, I had a question for CNSC and maybe for OPG around how often they are inspected versus how often you use your models to look at them.

And if the intervenor has anything else to say after the fact, that would be good too.

So CNSC?

MR. FRAPPIER: Gerry Frappier, for the record.

Again, I would ask Glen McDougall to talk about the inspection plan versus what we do with pressure tubes that are not inspected.

MR. McDOUGALL: Glen McDougall, for the record.

Currently as part of their licence OPG commits to apply CSA standards. There is one CSA standard that we use that prescribes the schedule for fuel channels to be inspected. It also prescribes how many channels have to be inspected and it explains exactly what properties of the pressure tube have to be monitored.

A second standard explains what happens if OPG finds something in any of the inspected pressure tubes that does not meet acceptance criteria. It basically specifies engineering assessments that have to be done and the acceptance criteria for those assessments.

I would like to point out, because there's been a concern in a number of hearings about the implications for safety of extended operation, it is very important to remember that acceptance criteria that are in the CSA Standards for fitness for service of pressure tubes. They were established in the late 1990s by industry. They have been introduced in licences granted by the CNSC since 2002, and the criteria have not changed. And there is no intent by Staff to go along with or to recommend that any of those acceptance criteria change.

What has changed is that some of the assessment methodologies that are used to determine whether a certain kind of degradation in a pressure tube, of what implications it can have for safe operation. But at the

end of each of those assessments you get a result and the result must be compared against acceptance criteria.

It is those acceptance criteria that are a line in the sand that has not changed.

For uninspected pressure tubes the CSA Standards prescribe a series of risk assessments. The two most important ones that you hear of, that you've heard a lot about in recent hearings and Staff described in a January presentation, have to do with the property of pressure tubes called fracture toughness.

Fracture toughness is the resistance that a pressure tube will offer if a crack should occur in the tube and attempts to move down the length of the tube to the point where the tube might rupture.

The two types of risk assessments are called Leak Before Break and Fracture Protection.

The CSA Standards explain how these types of assessments are to be done. And once again there are fixed acceptance criteria in the standards which the licensees either meet or don't meet.

Our requirement as the regulator is for these risk assessments for fuel channels that are not inspected, the entire reactor core must meet the acceptance criteria in the CSA Standard.

MR. JAMMAL: Ramzi Jammal, for the record,

to complement what Mr. McDougall has mentioned.

We go back to the LCH itself and it clearly describes the compliance verification criteria associated with the safety control area, fitness for service. And the same thing applies for the effective for power hours and what is required with respect to the end of commercial.

So page 140 of the LCH clearly states what are the requirements for OPG to come to us for approval on the basis of the end of commercial operations and clearly states what Dr. McDougall has mentioned with respect to the compliance verification criteria for fitness for service.

We go on through the details of what is applicable and how we review it from our expectations from our perspective.

MR. GREGORIS: Sorry, it's Steve Gregoris here, for the record, just to add on to what Mr. McDougall said.

So OPG has a Lifecycle Management Plan that is well aligned with CSA Standards and what was described by Mr. McDougall.

What I would like to stress is, first off, that if fitness for service is not shown for a fuel channel, that fuel channel will not go into service. We will do additional inspections. We will do assessments.

We will replace that fuel channel and we have removed and replaced fuel channels in the past. We have procedures and people that are proficient to do that.

And again in line with our commitment around fitness for service, we will ensure fitness for service, including our fuel channels, from now until end of operation.

THE PRESIDENT: Thank you.

MEMBER PENNEY: One last clarification.

So what's different here from Bruce is OPG is not asking to exceed the hydrogen equivalent. That's correct?

And therefore the models that haven't been developed don't apply in this case.

Am I understanding this correctly?

MR. FRAPPIER: Gerry Frappier, for the record.

You are correct. So in this case the CSA Standard already talks about up to 120 parts per million. And as noted for the Pickering case, they don't expect to be reaching those levels of hydrogen uptake.

MEMBER PENNEY: So all they are requesting is to exceed the full power hours.

THE PRESIDENT: Dr. Demeter?

MEMBER DEMETER: Just a very broad stroke

question.

So with the strong presumption that OPG will cease operation in 2024 and then go through a three-year stabilization period and then go through decommissioning, which I gather would have to come before the Commission, could the stabilization activities be considered a prelude to decommissioning?

This is an unusual circumstance. So what's the downside of having a six-year licence with decommissioning starting at the stabilization activities period versus a ten-year licence?

This is an unusual circumstance where we have a strong presumption of operations. So why not lump it in with the other one?

You have to come before the Commission anyways for either decommissioning or an alternate request.

MR. FRAPPIER: Gerry Frappier, for the record.

Again the period of the licence is a convenience with respect to administrative burden that there may be. The ten-year requested licence would take us through a couple of phases, as you've mentioned. Those phases would be doable, and they have been shown to be able to be done, and would not require the Commission because they're not going to be actually decommissioning the

facility within that. They would be moving into safe storage.

So at some point presumably -- and I think that's what OPG has said -- for their next licence they would be moving everything into being more of a decommissioning and also putting their waste facility together as a licence.

I'm not sure if I'm answering your question.

The downside is just the administrative burden.

MEMBER DEMETER: I just looked at your horizontal bar graph on slide 5.

It just says the decommissioning licence would start August 2028. That's just a four-year difference -- three year difference.

So that's just that sliding that little bar, it's not a huge difference between a six-year licence and a 10-year licence. You still have to apply, based on your graph, for a decommissioning licence in 2028 versus 2025.

MR. FRAPPIER: Gerry Frappier, for the record. So I think the date there of the 2028 is because this licence will end at that period. So we're expecting at that point they're going to be looking for something a

bit different.

I think the key thing is that after shutdown there's a period of time that's a couple of years that is required to move into being a safe shutdown and stabilized shutdown.

So, again, if we look at G2, they shutdown in 2012, they're at 2020 before they have all the fuel removed from the pool. So somewhere in that period we believe is the right time to be switching over. The actual date could slide.

MR. JAMMAL: Ramzi Jammal, for the record. It's very important to note the fact that the safe shutdown, or what we call on a technical term a layup, this is not a unique situation. So it's part of the operation. So an existing operating licence allows any operator to go into layup mode or the safe shutdown. That is the practice that is being done when they have a planned outage, they go into a safe shutdown and then they restart.

Now, with respect to the decommissioning, so the 10-year licence is not really for convenience. We've done a PSR based on a 10-year. Within the PSR and the improvements, so they have to take place -- in this case, it takes into consideration the preparation for the shutdown and the eventual decommissioning as a decommissioning activity in accordance with the PDP.

So the phased approach in the operation takes them into a decommissioning state at that point as a decommissioning standalone licence, would be before the Commission for approval. So the dates are proposed planned dates, it's not a regulatory date. The licensing term really is not a regulatory function. The licensing term is to put really stakes in the ground with respect to what needs to be done at what point.

But the key point here, I want to go back to the safe shutdown or layup or GSS, that is a normal operation for every existing licence that currently exists. So when we go to the decommissioning phase, that's a whole different licensed activity that requires the Commission's approval.

But some of the decommissioning can be done in the existing operating licence. When I speak of decommissioning, is they do it anyway; when they remove a tube, currently operating reactors, for example Darlington, is taking out a tube, that is a decommissioning function. The only difference in decommissioning is you never put a tube back in, you just take it out and break it up.

So that's why you've got the 10-year licence, in order to allow that activity under operation to take place, and then the phased-in approach towards decommissioning will kick in.

MR. GREGORIS: Steve Gregoris, for the record. I'll just add from OPG's point of view and to add to Mr. Jammal there.

So as far as a 10-year licence, the PSR was done and it covered a 10-year period, so the safety case for the licence for 10 years has been assessed. The activities associated after shutdown, after 2024, which include defueling, dewatering and drying the systems, those are activities that we execute in outages under the operating licence.

Those are operating licence activities that we execute in our current outages, and which Darlington just executed under an operating licence for their refurbishment. So these activities, with procedures currently developed, are executed, obviously they're going to be done on a larger scale, but they fully fit within the operating licence and, again, as I said, with a 10-year safety assessment across that entire duration.

So really, there isn't a safety case to end it any sooner. It provides a lot of benefit for the licensee to be able to transition smoothly into the shutdown, defueling and dewatering, with the existing procedures.

THE PRESIDENT: We're going to move on. Go ahead. What is your reaction to all you've heard?

MS TILMAN: Before final words, I am reacting to some of the discussion here and I'm seeking some clarification here. I'll start off with a simple one.

How many tubes are tested versus subjected to the model? I didn't hear a breakdown of that number. I've heard, or I think from reading, I would suggest 30 per cent, but I could be wrong. How many tubes are actually physically inspected versus subject to modelling to see how long they are, their condition?

THE PRESIDENT: Well, why don't we start with OPG, and then Staff?

MR. GREGORIS: Steve Gregoris, for the record. I'm going to ask Kathy Charette to give the specifics for that answer.

MS CHARETTE: Okay thanks, Steve. So I understand you want to know how many tubes we're testing versus how many we're assessing in the specific assessments?

MS TILMAN: Versus the -- yeah.

MS CHARETTE: So we test our tubes every outage. So we go and do an inspection on a certain number of tubes every outage, as has been explained, as per the CSA Standard; there's a minimum requirement that we're required to satisfy, and we exceed those requirements.

Then every four years we actually pull a

tube from the reactor and send it over to a lab for some destructive testing so we can get some real good information on the condition of those tubes.

So according to our Lifecycle Management Plan, we'll be continuing these activities all the way through to 2024 to ensure that the tubes are fit for service all the way through to their end of life.

MS TILMAN: I guess my question is, how many of these tubes out of the 380 tubes in any one reactor are being sent for the first test, which I presume is the kind of test you're doing on...?

MS CHARETTE: Kathy Charette, for the record. As I said, we do one every four years. So we've done the total -- I think we've sent three or four now. Four for surveillance testing, just four --

MS TILMAN: Four tubes?

MS CHARETTE: Correct. But we also have -- since 2009 OPG, Bruce Power, and Canadian Nuclear Laboratories have undertaken an extensive life management project for the research and development activities on fuel channel specimens basically. So we've done all kinds of work. We're actually on our 35th first test now under that program.

So we are continuing to do a lot of work that doesn't necessarily involve taking tubes out of the

reactor at that time. We will take a tube out of the reactor, cut it into four sections or so, and then test each of those sections. So there's extensive work going on right now so we have a good understanding of our degradation mechanisms.

MS TILMAN: I'm still not --

MR. LEBLANC: Just before, I'd like to remind all participants, you're all talking to the Commission --

MS TILMAN: Oh, I'm sorry.

MR. LEBLANC: -- and not to each other.

MS TILMAN: I have this habit.

THE PRESIDENT: Okay. But, first, let's -- I don't think there's clarity with doing too many different tests. There's pulling out the tube and for actual crack testing there's some other testing. Why don't you clarify?

MR. McDOUGALL: Glenn McDougall, for the record. There are two types of testing that are done, as Ms Charette just mentioned. Maybe another way to look at it is if there's -- there are two different ways of assessing whether fuel channels are safe to continue operating.

We mentioned earlier that there's the fitness for service assessments that are done. Many of

those assessments rely on assumptions about the material properties of the pressure tube. To get those material properties industry doesn't rely exclusively on models.

Ms Charette pointed out they periodically remove actual irradiated pressure tubes from the reactor to make sure that the inputs that they're using for their fitness for service assessments are based on real pressure tube data, not just tests that might go on in a laboratory somewhere.

Unfortunately, there are some pressure tube properties that you can't measure in an in-service pressure tube. You actually have to remove a pressure tube in order to measure those properties. That's an additional reason why industry periodically removes pressure tubes.

That isn't just at Pickering, it also goes on at Darlington, it goes on at Bruce, it goes on at Point Lepreau. So industry takes all of these pressure tubes that are removed, they make a whole series of different measurements that are all prescribed by the CSA Standards, and they create a big database of property information on pressure tubes and the look at it from a number of different points of view.

They look at it from the point of view of temperature, how long pressure tubes have been in the reactor, how much hydrogen they have in them. That forms

the basis for most of the safety assessments that are done on CANDU pressure tubes.

All the licensees share that information, so it's not as though Pickering only looks at Pickering tubes. They share operating information from some of their competing utilities. So that information is used across the board by all the CANDU utilities.

MS TILMAN: Can I --

THE PRESIDENT: So that's the test, the actual test, of the material. What about the tests they do in each outage, the inspections? What are they inspecting?

MR. McDOUGALL: Glenn McDougall, for the record. As a requirement of the CSA Standard licensees conduct a periodic inspection program. I mentioned earlier that there's a standard that specifies the schedule and the number of fuel channels that have to be inspected. That standard also says what are the different types of degradation in pressure tubes that they have to look for?

So that includes most of the degradation that Ms Tilman talked about in her intervention. For example, the presence of surface flaws on the pressure tubes, hydrogen content in the pressure tubes, that can actually be measured in service --

THE PRESIDENT: So, roughly, how many do you do? We're looking for some numbers here.

MR. McDOUGALL: Oh okay, yes. Under the CSA Standard it requires 10 fuel channels every three years. But OPG, for a long time now, has gone well beyond that. By my calculation, their current numbers are about 30 per cent.

THE PRESIDENT: Okay.

MS IRVINE: So, it's Sara Irvine, Senior Manager of Fuel Channel, Life Confirmation Project, for the record. So I do have the numbers that Ms Tilman has asked for. As Mr. McDougall stated, the CSA Standard would have us do 10 full-length volume metric and dimensional inspections every three years; looking at the dimensions of the tube, how it's getting bigger with time, thinning with time.

Our Lifecycle Management Plan exceeds that, and we actually inspect anywhere from 12 to 15 every two to two and a half years, depending on our outage schedule.

As well, to sample for deuterium, we do 10 or more body-of-tube scrapes every outage. That's where we go in and take a thin sliver of metal from the inside diameter of the tube and send those samples to a lab to get the concentration of deuterium in the tubes. As well, the region of most concern is at the rolled joint, where deuterium concentration is the highest. That's the numbers

that we have provided on the end-of-life and it's about 120 ppm limit. That is where we are most likely to see it. So again, every outage we go in and sample 10 or more tubes.

In other areas, such as elongation, we inspect every single tube. We are able to do that from the outside of the reactor. So we have inspected every tube for elongation and as well to look for spacer movement and to confirm that the spacers that keep the gap between the pressure tube and calandria tube to avoid blistering are in position. We have inspected every channel and we know where those spacers are and we go back and subject them to reinspection to confirm the location of those spacers. And, as Mrs. Charette said, we do do surveillance every four years as required by the standard, where we remove a tube and ship it to Chalk River. And again, we rely on models that aren't just built on our tubes, they are built on the industry data sets. So that's a very robust program.

So just in conclusion, we do exceed what's required of us by the CSA Standard in terms of inspections.

THE PRESIDENT: Okay. Go ahead.

MS TILMAN: [Off microphone] not final, but just to say in response to that, I am still concerned about the number of tubes that are being inspected. Different tubes age differently. There seems to be some

uniqueness in these tubes. From what I read and discussions with Bruce, this is with Pickering as well, the conditions aren't the same. So I am concerned about the numbers still, the proportion that are being tested.

I am also concerned about the hydrogen concentration that is now at 120 ppm. I don't believe right now that your tubes are anywhere near that at the outlet in terms of hydrogen concentration. So we are entering into a new territory the longer these tubes are operating. And yes, there may be more testing that might go on, but I really question how safe and how robust this will be in the end. I'm speaking quite honestly of a concern about this. This is not something I'm dreaming up when I read this.

And also, I have to question again the metrics that were used. The explanation was given we use hot hours, but sometimes we use equivalent full power hours and other conditions. Well, why wouldn't one apply the most robust, the strongest level in doing this, and why apply one metric for certain conditions, another metric when they are really measuring time that the tube is operating? Why not use the most conservative measurement of all?

THE PRESIDENT: Okay, you expressed your opinion. Does anybody else have a question? You have a

question. Go ahead.

MEMBER BERUBE: Maybe we can get some clarity on that. This is interesting. We need to understand this, I need to understand this. When we are talking about HEQ and we are talking about equivalent full power hours, in terms of metrics on tube viability, for all intents and purposes, fitness for service, are these proxy variables? Are these in your model in order for us to understand the relative health of these tubes? Is that what we are actually talking about? So when you are modelling, you are using these as proxy variables, these are the worst-case scenario and that that's why we use these variables; is that correct?

MR. FRAPPIER: Gerry Frappier, for the record.

I will pass it back to Glen McDougall in a minute, because I believe there's two dimensions to the question you are asking there. One is with respect to making a determination on the pressure tubes and the material properties of it and all that stuff and I will let Glen explain that because he will be much better than I was.

There is also a licensing dimension to this as to having something that is measurable, that is understandable to everybody with respect to saying your

licence is good until, so a date is often obviously one that we use. And the effective full power hours is another one that's very effective to use and as long as it is bounding all the others with respect to the time and whatnot, it's a good licensing tool for saying let's be clear, we are not going to allow you to operate beyond 297,000 hours in this case.

But with respect to the physical properties, because I think that is what you are really going after, I will ask Mr. McDougall to explain that.

MR. McDOUGALL: Glen McDougall, for the record.

Yes, that's a very important question. I would like to break it into two pieces. I will talk about the fitness for service assessments that are done and those are done on actual inspected pressure tubes. In the second part of my question I will talk about the risk assessments that are done on the uninspected pressure tubes.

For the fitness for service assessments, these are done on actual inspected pressure tubes and the industry uses a portion of the CSA standard to guide which of those tubes they should be looking for. So in that case, yes, they do use proxy variables, but that's only for the selection purpose to decide which channels they should look at. For trending purposes in fact the standard

defines which pressure tubes they have to look at. So if they have looked at some pressure tubes in the past, the standard says a certain number of the pressure tubes you will look at next time will be the identical tubes so that you can look for possibly negative trends in some type of aging.

However, when it comes time to actually assess the pressure tubes themselves, there is no reliance on proxies of any kind. The pressure tube is inspected using non-destructive means. For example, there are ultrasonic testing methods that will determine if there's an imperfection in the service of the pressure tube. At that point the standard does not care where the imperfection came from, it just applies hard engineering methods to say what is the possible consequence of having that in imperfection in the pressure tube. But it is important to know that the standard does not allow a licensee to absolve all further inspection of that tube. What it says is here is the engineering method you will use to check the fitness for service of that tube for a defined period into the future. Typically the defined period is until the next inspection outage and then if the result of that assessment is that this imperfection can be found to have little or no impact on safe operation, the tube is deemed fit for service up to the next inspection.

When it comes to uninspected pressure tubes, risk assessments are done. There are several different types that are done. In this case again we have to have some way of determining which are the most important tubes to pay attention to. So the two types of risk assessments I mentioned earlier, the leak before break assessment and a fracture protection assessment, they rely on a parameter that can unfortunately only be measured in a removed pressure tube. That is fracture toughness. So we can't use any non-destructive method to be able to determine that when a pressure tube is in the reactor. But in this case we can use a proxy, we can use hydrogen equivalent concentration to determine which are the tubes where we really have to pay attention to what happens to that fracture toughness. So for that reason, industry has developed two models which tell them how fracture toughness will decline as hydrogen levels increase, and those models are then used as part of the risk assessments for the pressure tubes.

But I would like to clarify a misconception. When some people refer to models for risk assessments, it's almost as though we are just throwing in a whole bunch of benchtop experiments and waiting to see, you know, what will happen in reality. That is not actually what goes on. The models at their heart begin

with research and development, but as a regulator we require the models to be validated against actual irradiated pressure tubes, and industry has done that with the fracture toughness models in particular that have been developed in the last few years. Industry has done a very large number of very specific tests on removed pressure tube material to be able to show that if the model predicts that the fracture toughness at a certain hydrogen level will be X, the burst tests have to come in at a level above X just to show that the model is in fact being conservative. Industry is continuing those tests and I hope that answers the question.

THE PRESIDENT: Okay. I think we need to change topics here.

MEMBER VELSHI: One last question on this. So you have said you have had experience doing single pressure tube replacement. So other than for tubes that have been removed for destructive testing, how many other tubes would you have had to replace because they didn't meet the fitness for service requirement?

MR. GREGORIS: Steve Gregoris, for the record. There has been zero pressure tubes replaced due to fitness for service.

THE PRESIDENT: Okay. Any other questions? Okay. Final thoughts to you.

MS TILMAN: I just want to remind as we say so far none have been replaced or everything is okay, that is under present circumstances. You have to extrapolate to what is being asked in this licence to the 295, not the 247 or at present the 240, and that's the unknown. So the way I see it, as a licence request, it's an open door, it's allowing for extension of the lives of aging reactors well beyond what could be their end of life for safety. The mandate of your Commission -- of the Commission is to protect the health and safety of Canadians and the environment. So you need to weigh as the Commission whether granting OPG's licence would conflict with your mandate. So I am urging you, and I am urging you Dr. Binder as well, as regulator and protector, to use the utmost precaution in considering OPG's request. Then, Dr. Binder, you can maybe retire knowing you have made some pretty good decisions in this respect.

THE PRESIDENT: Thank you.

We are going to set up for the next presenter. So the next presentation is by the Canadian Nuclear Laboratories, as outlined in CMD 18-H6.41. I understand Mr. Cotnam will make the presentation.

--- Pause

THE PRESIDENT: Please proceed.

CMD 18-H6.41

Oral presentation by the

Canadian Nuclear Laboratories

MR. COTNAM: Thank you, Mr. President and Members of the Commission. For the record, my name is Shaun Cotnam, I am the Chief Regulatory Officer from Canadian Nuclear Laboratories, which is commonly known as CNL.

I am speaking before the Commission today on behalf of CNL to voice our strong support for OPG and their application to renew the operating licence for the Pickering nuclear station for the proposed 10-year period.

As Canada's national nuclear laboratory, CNL, formerly AECL, has served as a world leader in the development of nuclear science and technology. All the nuclear power stations across Canada and the work carried out at CNL is closely tied to this, including the Pickering Nuclear Generating Station. Given this long relationship, CNL is well positioned to act as a knowledgeable intervenor and advocate for the Pickering nuclear station at today's relicensing hearing.

As one of the largest generating stations in the world, Pickering station serves as a critical facility for the delivery of electricity to residents of

the Province of Ontario and the nuclear power generated in Pickering is approximately 14 percent of Ontario's produced electricity. This is created safely and virtually free of greenhouse gas emissions, as you know. This helps Canada reduce its carbon pollution and fulfil our international commitments by meeting climate change targets.

The safe continued operation of the Pickering Nuclear Generating Station has many important benefits for Ontario and its residents. This includes a reduction of those greenhouse gas emissions by an estimated 17 million tons and savings of approximately $600 million for avoiding more expensive forms of electricity. It would also produce much needed electricity to the Province of Ontario while the Darlington and Bruce nuclear stations undergo their plant refurbishment. As an environmentally responsible corporate citizen, CNL, we wish to place particular emphasis on that latter point, on the ability of Pickering to produce greenhouse-gas-free electricity during those key refurbishments.

CNL, as the Commission knows, has a long history with pioneering in the development of medical isotopes. I listened closely yesterday, as I'm sure everybody else here did, and Pickering is making those isotopes. It may often go unnoticed during the focus on safe electrical production, but irradiated cobalt from

Pickering is used for medical instrument sterilization as well as protecting our food supply.

OPG has demonstrated strong leadership on important challenges that benefit the nuclear organizations across Canada and they help ensure industry compliance with changing CNSC requirements. For example, OPG co-leads a multi-year and multiphase project to demonstrate the robust safety case for the life extension of these same fuel channels we have been talking about. This is a key CANDU Owners Group, COG, led project. It has been a major initiative for about a decade now, with the best fuel channel experts from across the industry involved. Extensive R&D testing and analysis, you heard about the destructive testing, that has all been performed at places like our Chalk River labs, Kinectrics and other facilities. This program is still ongoing and marks a very significant investment by the industry in fuel channel safety and performance. And personally, listening in the last hour, I'm not sure that was fully reflected in what I heard.

OPG also co-championed an industrywide culture of continuous improvement in nuclear safety. OPG and Bruce were very early adopters of international benchmarking, peer reviews and what I would call applied safety culture learning. I have personally observed OPG exhibit those behaviours, I have seen it in action, and

they do adopt what I call the four cornerstones of corrective action program, observation and coaching, benchmarking and self-assessment. In my own opinion, the nuclear industry in Canada owes a great debt of gratitude to OPG and Bruce Power for championing those.

I also would offer up that OPG has played a major role in industry in response to the new fitness for duty requirements in our industry. Our new industry pays close attention to this issue. We have programs in place to assess and accommodate. However, as the first fitness for duty REGDOC, which was about managing fatigue, was in the consultation process, OPG was instrumental in demonstrating strong leadership to help the industry with a very robust and extensive way of defining safety-sensitive positions. They also shared their OPEX willingly as well as their third-party information and so on.

Additionally, OPG led the ongoing COG program which ensures that all members have essentially access to a robust suite of industry codes and standards. This is particularly important to the power plants, but it also is very important to the supply chain and to those of us in the labs working with those same codes for the industry. Again, that demonstrates OPG's commitment to strong leadership beyond its own organization.

Most importantly, we are here for

Pickering and it operates with an unwavering commitment to safety. Through decades of collaboration, CNL knows OPG is a responsible member of the nuclear sector, an organization that places emphasis on safe operation and is dedicated to the health and well-being of its constituents and the public.

CNL notes that the Pickering Nuclear Generating Station received the highest achievable safety performance from the CNSC in 2015 and '16. This rating reflects improvements in a number of important areas like operational safety, reliability and human performance. And in 2017 Pickering's injury rate was something to be envied, it was in line with industry best around the world.

Overall, the Pickering station has been upgraded and safely operated for decades and at CNL we remain confident it will continue to be operated that way in the proposed licence period. Given its exceptional safety record, the role Pickering plays, especially in greenhouse-gas-free electricity emission, there are many benefits to the community as well as the environment through this and we at CNL give our strong support here.

Thank you for your time, for the opportunity to speak here today. Mr. President and Members of the Commission, that concludes my remarks and I would be happy to answer any questions about CNL's views.

THE PRESIDENT: Thank you.

Questions? Dr. Demeter...?

MEMBER DEMETER: Thank you for your presentation, Mr. Cotnam. If you were responsible for the operation of Pickering from this point on, given what you know, and you are sort of an insider, and acknowledging all of the positives you have said, what do you think will be the biggest challenge that you would pay the most attention to to maintain that safety assurance standard? I'm sorry to put you on the spot.

MR. COTNAM: A thoughtful question. Thank you, Commissioner Demeter. In fact, we at CNL have recent experience in this. In 2015 the government announced the NRU reactor would be closing, so in those three years we did something similar that's being planned by OPG here for the safe permanent shutdown of operations. So I can say that those very attributes, I would say there are three, strong leadership starts right from the top with the CEO, CNO, for us it was NRU management, for OPG that's Ops management. I believe they have that in place, strong leadership to deploy our -- many of you Commissioners would have heard us talk about our three R's: to retain, retrain and redeploy. So strong leadership, I see that they have that. Secondly, as our former CEO Dr. Walker used to say, in those three years we had time to plan but not time to

waste. I have used that quote many times with staff and it applies here. In fact OPG, although Pickering being a bigger organization than the people we managed through NRU, they are not trivial numbers in either case and we are talking about people and that gives you time to plan. I believe this licence period gives them about double the planning period that we had. So it can be done and I think they have time to plan. And I would say the third point is to have an engaged and strong workforce. I listened in yesterday. They certainly have early engagement with the unions, that is particularly important.

We are quite proud of what we were able to do, all the accomplishments of NRU that were recognized at the CNS conference out in Saskatoon, but that was built on those last three years of planning, strong leadership, CNO, NRU management, junior management, shift by shift to make sure you don't have a distracted workforce towards the end.

So I would say those three things, the leadership, they have it; the time to plan, they have more than sufficient for the numbers involved; and the third point, engage workforce and they have had the union engagement, which is very important.

THE PRESIDENT: Questions?

So you heard us talking about aging management and it was mentioned that they pull a channel

and send it over to CNL. Are you guys still able to do those tests? They allow the NRU?

MR. COTNAM: I am glad you asked that question. Yes, sir, we are. In fact, what they were talking about was two different tests. The fuel channels that are sent up for what's called surveillance testing, there is a whole suite of hot cells between our universal cells and our building 375 fuel material cells. Those are unaffected, those are planned to be in place to support industry. Those continue. In fact, they have benefited from getting good nuclear operators, those are valuable people to have working in the cells that have come over from NRU as part of the 3 Rs. So we are able to do both surveillance testing, but most importantly, and I've lost track, I thought it was 34 burst tests that we talked about, I personally have witnessed two of those in our universal cells, they are very interesting to watch where you subject the pressure tube to very serious and significant pressure to see how it handles. These are mimic tests for the R&D that OPG and CNSC are better equipped to talk about than I am. We are certainly able to and are still doing those tests, sir.

THE PRESIDENT: So did you participate in developing the model that will actually predict the burst?

MR. COTNAM: The best experts are

essentially between Kinetrics, ourselves, and CNSC and the industry folks and everybody is building this database together. I personally don't even remember the genesis of the model, but I can tell you I've seen the charts where they plot all these burst tests and talk about the hydrogen.

We now have a proprietary process that we've developed just recently at CNL which will be able to mimic much higher hydrogen concentrations should there be need to test in that vicinity. So the R&D program looks well ahead.

I'm not sure the Commission realizes this is about a 10-plus million project a year that has gone on for probably more than a decade now. I think we're on burst test number 34. So we can do both those surveillance testings tests, we still do them. We can do the burst tests, which we still do them in universal cells. We're fully able to support them going forward.

THE PRESIDENT: Anything else?

Okay, thank you. Thank you very much.

The next presentation is by Mr. Cuttler as outlined in CMD 18-H6.35 and H6.35B.

Mr. Cuttler, the floor is yours.

CMD 18-H6.35/18-H6.35B

Oral presentation by Jerry Cuttler

DR. CUTTLER: Good afternoon. For the record, I'm Dr. Jerry Cuttler. I'm a Canadian scientist with 54 years' experience in nuclear science and engineering and 25 years of radiation health studies.

My submission has two parts, the licence renewal and the radiation health effects.

I studied the OPG application, the two CMDs, one from OPG and one from CNSC staff, and I listened to the April 4th webinar. My conclusions are based on my 47 years of knowledge and experience regarding the Pickering station.

The documents are of high quality and comprehensive. The presentations I found were accurate and effective. The design of the Pickering nuclear plant is very safe. The plant is being maintained in very good condition. The pressure tubes are being monitored. The reactor can tolerate a pressure tube fracture with no public or safety concerns. If we had that experience, a pipe failure, which I personally experienced, would not release any radioactivity to the environment.

The Pickering plant could operate safely beyond 2024, in my view. So I recommend that this licence

application be approved. And I also recommend that OPG considers submitting an application to operate the reactors beyond 2024, as it's economic.

Now, onto part B, about health effects. Radiation was used for 120 years to treat many diseases. Low doses of radiation cured many types of cancers, infections, wounds, asthma, arthritis, inflammation with no apparent long-term effects. In 1924, based on more than 28 years of experience, the tolerance dose limit set for workers was 2 milligray per day or 700 milligray per year.

After atomic bombs were used in 1945 to end World War II in Japan, US scientists created a great radiation scare to stop further bomb testing. However, this scare also stopped the medical treatments using low doses of radiation. All government regulators accepted the LNT and ALARA ideology without examining the evidence, and there is none that support that LNT model and ALARA. This, the evidence, shows that low doses stimulate beneficial effects, not harmful effects.

We know that breathing air produces DNA damage naturally at a very high rate due to oxygen reactions with biomolecules in our body. So organisms have many powerful protection systems that prevent, repair, remove oxidative damage, and they protect also against other toxins and pathogens in our environment.

The damage rate due to low level radiation is negligible compared to the natural spontaneous damage rate caused by oxygen. However, low doses of radiation stimulate protection systems and therefore produce beneficial health effects which are easily observed.

Large doses, however, produce harmful effects. The dose thresholds for onset of harmful effects are known. This is the threshold for radiation-induced leukemia, cancer. And this is the dose rate threshold for reduction of life span. And it's also compatible with the limit that was set for radiation workers.

Now, if we look at Chernobyl, 28 firefighters were killed by high doses of radiation, 106 had acute radiation syndrome and were treated. They survived more than 19 years with no delayed effects -- basically same health as unexposed people.

Okay, looking at Chernobyl, the residents received an average of 17 milligray, which is very low. Many suffered post-traumatic stress due to fear of radiation. The thyroid radiation doses were low. Screening for thyroid nodules leads to overdiagnosis of thyroid cancer, which is a special self-limiting cancer, and this resulted in many unnecessary thyroidectomies.

And at Fukushima, worker doses did not exceed the 1924 dose limits for workers -- radiation

workers. But 1,632 residents died early because of stress of the evacuation. Evacuation caused great hardship to 300,000 residents. The radiation dose levels ranged up to the level of high natural background radiation. So this level that initially was released did not really exceed background radiation that's found in the environment and special places.

And if you look at the highest annual dose integrated over a year -- this was in the location A, place A -- it did not exceed the upper limit range in Ramsar, Iran. So this is natural radiation that people are exposed to living in Ramsar.

So my conclusions are that radiation protection standards are too restrictive. Nuclear accident would not harm residents. There's no medical reason for evacuation. Fear of radiation blocks important medical treatments such as cancer. And we can treat Alzheimer's and Parkinson's disease with low doses of radiation. I have three cases that are successful in that.

So my recommendation comes down to we should examine the evidence and study the mechanisms; discuss revision of radiation protection policy with other people, other countries; find a way and inform Canadians about the real effects of nuclear radiation, the beneficial effects from low doses. We should be changing radiation

protection policy away from LNT -- linear no threshold model -- and ALARA. And we should go back to thresholds for the onset of harmful effects. This is what we had before the scare was brought in the 1950s.

We pay a very high price for fear of low radiation. We should have science-based radiation protection policy.

So that's my presentation. Thank you.

THE PRESIDENT: Thank you.

Who wants to start? Dr. Demeter, we're waiting for you.

MEMBER DEMETER: Thank you very much for the presentation. It was very interesting.

I'm going to ask my radiation oncologist whether they've ever used therapy for dementia when I get back, but.

One of the realities is in an industry which has a potential for very high dose risk, especially related to internalization of alpha emitters, from a regulatory point of view, you set the limits based on as a canary in a coal mine, not because of the health effects of that radiation but because it's a surrogate that looks at the system to stop high risk exposures.

So how do you feel about the use of -- it's not an LNT thing, it's a surrogate for reducing the

risks for higher risk exposures, understanding it's not a health risk limit, it's a regulatory safety limit. How does that philosophy work?

DR. CUTTLER: We had a problem with -- early on, I mean, when X-rays were discovered and radioactivity were discovered. Immediately, thousands of medical practitioners were using radiation to treat patients. They discovered that high doses were harmful, sure enough. In fact, they used to measure radiation by putting their hand in the beam and seeing when it got red. So they didn't have measurement instrumentation.

But they found out soon enough how to treat patients, and they were treating thousands and thousands of patients.

There were lots of publications and medical journals way back 100 years ago, 120 years ago, on treatments. A lot of these workers were getting exposed, and because whereas you treat one patient and another one comes, the radiation practitioner, he is getting repeated doses, so there was a big concern for the doctors so they set up protection standards. People were getting overexposed. They started putting shielding in, distance, time, all these factors, and they got it down, after about 28 years, to what is a safe level for practitioners. In fact, they even did studies, epidemiology studies. Smith

and Doyle did one on a British radiologist, and they found that after they brought in these protection standards these practitioners were having lower mortality and lower cancer incidents than their colleagues who weren't working in radiation, so they had a pretty good idea of what was a reasonable radiation protection.

Today, we've been treating patients -- not long ago, in fact, I have a colleague in Japan who treated my wife with low-dose radiation. He treated himself, in fact, but he also treated over 200 patients with a low dose of radiation. They got a better outcome than the traditional treatments with either a high-dose radiation local and chemotherapy. For example, for non-Hodgkin's lymphoma, we're getting a cure rate of about 50 percent, and when he introduced half body or full body low-dose radiation, fractionated, the cure rate went up to 84 percent, so they got a two-thirds improvement in curing patients. This is long term, 10 years.

We've been doing studies recently on patients with breast cancer that has metastasized, I've got papers on that I've published recently, prostate cancer, fractionated low-dose treatment, and I have a new paper that's coming out maybe in a week or two on arthritis, rheumatoid arthritis, using radon treatments. A radon dose every day, and after 15 months a complete reduction in the

markers for arthritis, rheumatoid arthritis, going down from very high levels, like 100 times normal, down to normal levels. This is after 15 months of treatment, so I've gotten results.

Now you'll say, "Okay, these are anecdotes, it's not 1,000 people." It turns out that this happens with everyone.

THE PRESIDENT: Are you doing those tests here, on people in Canada, because I want to know --

DR. CUTTLER: My wife was treated in Canada, yes, at the Credit Valley Hospital. The doctor prescribed it from Japan, and the radiation oncologist delivered it. This was in 2011. It's now 2018, and she is looking very good, my wife.

THE PRESIDENT: But I'm trying to understand which medical authority will allow you to do those tests in Canada.

DR. CUTTLER: The chief radiation oncologist at Credit Valley Hospital wrote the ethics case, and it went through the Research Ethics Board at the Credit Valley Hospital, and the treatment was approved and they delivered it.

I'm going through an ethics board now for -- remember I mentioned the slide on Alzheimer's disease? I'm trying to get it started here in Canada.

It's a big problem, Alzheimer's disease. You know that. I'm working with the Baycrest Hospital on Bathurst Street and Sunnybrook Hospital. Baycrest has lots of patients, and they're working on Alzheimer's treatments, but they cannot do low-dose radiations, so we're doing the radiations -- the proposal is to do it at Sunnybrook, so we've gone through the Research Ethics Board approval at the Baycrest. I've got Health Canada approval for using CT scans for treatment and not just diagnostic, and Sunnybrook, they've given me comments on the proposal. There are six intervenors. There's no funding. I'm paying the transportation of the patient from Baycrest to Sunnybrook. We're trying to make progress in Canada. It's very difficult because everyone is afraid of radiation. It's very difficult to get people to look at this to even fund it. I presented enough evidence to convince them to go ahead on a pilot study of three patients.

THE PRESIDENT: Good luck to you with the medical profession --

DR. CUTTLER: Thank you.

THE PRESIDENT: -- but we're still dealing with Pickering, and I'm more interested in your observation that we shouldn't worry about a rupture of a pressure tube.

DR. CUTTLER: We already had one in '83, and it didn't even break the calandria tube. The leak rate

that came out of that rupture, that was a two-metre rupture, and what came out was 17 kilograms per second. There was no concern, not for the public for sure, and not even for the workers.

THE PRESIDENT: But why was there a leak before a break being detected or was it --

DR. CUTTLER: These were old pressure tubes, the zirc-2 design. The pressure tube ruptured in 1983, and the operator shut down the plant and they replaced it. In fact, they replaced all the pressure tubes. They re-tubed all the Pickering A reactors from zirc-2 to zirc-niobium alloy, that's the alloy we now use. It's a much better material.

We've also had a pipe break at Pickering. I was there when it happened. The three-inch pipe broke because of a liquid relief valve that failed. I wrote all this up in my report and submission. We've had three-inch pipe breaks, no big deal, so we're overreacting to a lot of these concerns.

The safety analysis is very, very conservative. I mean they're postulating double-ended header breaks. We're very, very safe. The plant is very, very robust, and I personally am very confident that it's a safe plant.

THE PRESIDENT: I saw that you've stirred

some reaction from both CNSC and OPG.

Do you want to comment on that? Does anybody want to comment on what was just said or not?

MR. FRAPPIER: Maybe I'll start, and then we can move over to OPG for more details.

CNSC, Gerry Frappier, for the record.

Certainly, as mentioned, one of the design-basis accidents is to have a pressure tube fail. Although we're more and more talking about beyond-design-basis accidents and extreme circumstances for the design for things that are probable to happen or might happen, such as a pressure tube rupture, the design of the plant is such that that would not be of any kind of concern to the public or to workers. There's mechanisms in play, and the design handles that completely.

With respect to if the question is the failure of the pressure tube in the 1980s and what exactly happened, I'd ask Mr. Glenn McDougall to provide that data.

MR. McDOUGALL: Glenn McDougall, for the record.

Yes, that was one of the only instances of break before leak in the history of Canadian reactor operation.

As Mr. Cuttler pointed out, that was an old fuel channel design and an old pressure tube design.

The pressure tube material has been replaced specifically because of that, that particular incident. The problem with that pressure tube was that it accumulated a lot of hydrogen in a relatively short period of time. The newer alloy that's been used since the mid-1980s in all Canadian CANDU reactors doesn't suffer from that problem.

The second difficulty was that the channels at that time had only two spacers separating the pressure tube from the calandria tube. The specific root cause of that particular event happened in Pickering Unit 2. The specific cause was that one of the spacers moved out of position, and at that time designers hadn't realized that that could happen with CANDU fuel channels, so at that point there was no inspection tooling to look for spacers that were moving, but as a result of that event two changes were made. CANDU fuel channels now have four spacers, and to take account of the fact that spacers can move during service, industry developed tooling that can be used during outages to look for the location of the spacers and to even move them back into position if need be.

There were a lot of lessons learned from that particular incident and, as a result, there hasn't been another incident like that or anything close to it since that time.

THE PRESIDENT: Okay. Dr. Lacroix?

MEMBER LACROIX: Dr. Cuttler, thank you very much for your presentation. I read your document, and I really enjoyed it.

What would be the consequences on the safety of nuclear installations if we were to abandon the linear no-threshold model today?

DR. CUTTLER: The stations would perform as before, it's just that our reaction would be totally different. I mean if we're looking at a threshold before people get harmed, if low doses are released, they're certainly not going to cause any harm, if anything a benefit, so you wouldn't have this fear.

At Fukushima there were 1,600 people who died prematurely because they were dragged out of their homes, I mean long-term care homes, hospitals, and they were put in evacuation centres and were sitting in cubicles on the floor, so many of them died of the stress and lack of care.

This is not the right way to react to a nuclear plant accident.

The workers in the plant didn't exceed the limits of what was acceptable to radiologists in the days before they brought out the radiation scare.

So, I'm saying we need to change the way we deal with nuclear safety. I know this is going to upset

a lot of people who work in this field, but if we're concerned about our nuclear technology and the energy for the future and a good environment, we really should change.

Now, there's a big problem, a lot of people in the world and many countries, international standards, there's a world consensus on the linear model and that's 60 years old. And I just can't understand how people can hold a model like that, 60 years old, when we've got all this evidence that contradicts it.

And when I go to meetings, we've had three meetings. We had one in Wingspread, we had one in Aerlie and we're going to have another meeting this year at the end of September in Pasco, this is in Washington State on the Columbia River near Hanford. We're going to be talking about the same problem is, when are we going to get rid of the linear model and start using models that are based on biology?

And there's a lot of radiation protection people coming there and it's going to be very difficult to persuade them to use a science-based model because they'll say this is conservative and we like this and it's easy to calculate. And I said, well, what's easier than having a threshold? And anyone exposed below that threshold is not harmed and may be getting a benefit. I don't know. It's difficult to argue with -- to reason with people like that.

And when I think of the medical benefits that are waiting; first we're having a problem with people getting diagnostic x-rays. I mean, they're trying to discourage people, people are frightened to go in and get diagnostic x-rays and dental x-rays, people are afraid of those and so -- and that's just very low dose.

Now we could use the proper doses for treatment, we could cure cancer and arthritis, a lot of these diseases, Alzheimer's, Parkinson's.

I have a patient who's been getting -- a Parkinson patient who's been getting CT scans of the brain every four weeks, been getting this for two and a half years and he's been examined by his doctor, neurologist and says, man's good, his eyesight's improved, his hearing's improved and he's no longer taking medication to stop the tremors.

So -- and his family doctor's prescribing the CT scans and he's asking me to write a case for him because he's getting nervous. Two years he's been prescribing CT scans. The patient's very happy. Every time he starts to get the shakes he goes back and that's for another prescription. This is in Michigan, in Midland, Michigan, a friend of mine.

So -- and I have three Alzheimer's patients who've shown positive results. One two and a half

years. She was in a hospice, she was a total vegetable and after she had the CT scan she began to eat by herself, began to talk a bit, recognize things. I even asked her to look at the camera and she turned and looked at the camera and I snapped her picture. In fact, that's the slide I showed you up there.

So -- and this happens on every person. The only difference is you'll say, well, this is an anecdote. No, it happens on every person because everyone has protection systems, everyone's breathing oxygen and low doses of radiation stimulate these protection systems.

Now, what is different is people have different genetics, so some have a higher degree of protection, some have a lower degree. So, you can -- the amount of stimulation will depend on the individual.

But the fact that there is stimulation is there. Now, you may argue, well, maybe the threshold moves a bit because different individuals. So, we can determine those things, but I'm not seeing a change in threshold going down less than half. So, if I see a threshold that's 500 mSv, then we can certainly set a limit at 300 and not be concerned that there's -- sensitive people might be compromised.

The other thing that's very interesting is, I done a study with -- people have done studies with

dogs and I've taken those studies and analyzed the data. And what we found was that weak, or short-lived dogs benefit more from low-dose radiation than a long-lived dog. And you'll say, well, why would that -- how can that be? Well, it turns out a short-lived dog has got a bigger margin for improvement for stimulation than a strong individual who's already at the limit.

So, if you're looking to improve the health with low-dose treatments, the weak ones get the bigger benefit.

THE PRESIDENT: So look, this was a fascinating reading and nice little history of what was, really enjoyed reading it, but we're not a medical authority.

DR. CUTTLER: I know.

THE PRESIDENT: So, until you get the medical authority to --

DR. CUTTLER: You told me that already.

THE PRESIDENT: -- to bless your findings and then get some from the ICRP and the UNSCEAR and all the rest of the bodies to go along --

DR. CUTTLER: Well, I'm working with the medical people as you recommended and Dr. Tubiana from the French Academy of Sciences warned me, he says, don't do anything unless you do it in a hospital with Ethics Board

approval.

So, I'm following his advice, and so I'm doing the best I can to change something, change what is to what should be. But my recommendation that was in this report is, I think the regulator should start to look at the data and start to talk with other people and not to -- you promised me we have science-based regulation and I don't think we're there yet.

THE PRESIDENT: I saw CNSC here, somebody jumping to make a comment?

MR. RINKER: Yeah, Dr. Binder, there was an element in the intervenor's presentation that I think brought up a question that was raised by Dr. Demeter yesterday that I wanted to clarify.

And the question was about the differences in the rates of thyroid cancer that observed around Ontario's nuclear power plants; namely, Pickering rate of thyroid cancer was observed to be higher than Darlington which is not statistically so, but observed to be higher than what is observed at Bruce.

And so, we know that the doses surrounding the Ontario nuclear power plants are consistently very low and they're very similar. And what I mean by that is, the public dose for the most critical person ranges from 2 to 4 microsieverts per year, very low doses, and we know that

the dominant contributors to dose are very similar and that the dominant contributor to dose are the noble gases, followed by various elements of tritium, tritium in water vapour, tritium in water.

And what we also know is that iodine has not been observed above detection limits in the environment. This is confirmed by the CNSC's own independent environmental monitoring program, it's also confirmed by Labour Ontario surveillance where they look at iodine in food stuff and in milk.

And so, what that means is any variation in cancer incidence amongst the Ontario power reactors is independent of the radiation dose and must be explained by other factors.

And we can only speculate what those factors are, but based on other studies around the world, it's likely that the differences result from perhaps the differences in intensity of surveillance for thyroid disease.

And the Pickering Region being within the GTA has a higher density of physicians and maybe better access to ultrasound screening, as an example, and this is supported by the observation that other parts of the GTA, like York, Toronto, Peel, Halton have higher incidences of thyroid cancer than Pickering. So, the more dense you are,

the higher the rate you get.

That's a correlation, we don't know if that's actually true, but certainly there isn't the idea that Pickering is higher than anywhere else in Ontario, it just happens to be higher than the rural areas around the Bruce area.

THE PRESIDENT: Thank you.

You have a final word.

DR. CUTTLER: Well, I can answer -- address his comment. Do I get to answer his comment?

THE PRESIDENT: We're dealing with -- go ahead.

DR. CUTTLER: I wrote an article here with Dr. Ludwig Feinendegen which we're going to present in September.

You know, because of the high incidence of cancer mortality, that's 25 per cent generally, is a broad statistical variation. So, the epidemiology alone is very limited in its ability to predict radiation induced risk at low doses because of this huge variation in, or statistical variation in cancer mortality.

So, risk assessment requires biology and they're not using biology. There's a whole spectrum of subspecialties. So, there's a wealth of data there in radiation biology that we have and it needs to be

considered. The people doing these epidemiological studies are not including biology in the study.

And on the matter of thyroid cancer, thyroid is a special type of cancer, it's self-limiting. It starts naturally in children, sometimes very early, and it grows to a certain point and it stops, and then later on it may continue again.

So, there's a new paper that came out, a review paper last November on the subject of thyroid cancer and the models that we've been having, it's not behaving like a normal cancer, it's a self-limiting cancer.

And if you do a screening you'll find lots of nodules in thyroids of -- a lot of them happen in children and you just can't take those screening results and start doing thyroidectomies, it's immoral because you're basically taking out the child's thyroid gland and he's on pills for the rest of their lives.

There are better ways of diagnosing when a surgery should be done.

I can send you that new article, review article on thyroid cancer and I'll send you my new article for Pasco conference in Washington, as I always do.

THE PRESIDENT: Thank you.

Any final thought? No?

DR. CUTTER: Well, I told you I would like

science-based --

THE PRESIDENT: Good. I don't want to speculate.

DR. CUTTLER: -- regulation.

THE PRESIDENT: Thank you very much.

I'm told that we have Health --

MR. LEBLANC: Canada.

THE PRESIDENT: Oh no.

MEMBER DEMETER: I just have to say one thing because this is a public record.

If you look really hard you'll find a lot of thyroid cancers that may mean nothing. The problem is, when you look really hard you can't tell the natural history of what you find. So, if you look really hard you can't -- some of these thyroid cancers are devastating and they're metastatic and they're very aggressive.

DR. CUTTLER: Yes.

MEMBER DEMETER: So, the problem is if you look really hard you'll find things that maybe don't have any natural history of progressing, but you can't tell the difference between them.

So, I don't want people to be left with the thought that all thyroid cancers are benign and self-limiting and self-correcting because I treat a lot of people with thyroid cancer that are metastatic.

So, I just wanted to clarify that, that looking hard finds -- you find things that you may not want to have to deal with, but then you have to deal with them and the problem is the looking hard part, not the fact that there's some benign cancers.

DR. CUTTLER: So, the point I want to make is it's different than normal cancers that many people are familiar with and you've got to look at it in a different way than normal cancers.

THE PRESIDENT: Okay. Thank you. Thank you very much.

So, I'm told that we have Health Canada on line and they want to make a statement on emergency planning.

Sorry?

MR. BUCHANAN: President Binder, it's Kevin Buchanan from Health Canada. And I just wanted to address something earlier on in the presentation on international standards and emergency standards as they're applied in Canada.

So, I just need to clarify our understanding and make sure everyone fully comprehends how Canada is aligned with international standards.

So, in Canada the current international standards are aligned -- or the current standards are

aligned with international standards. So, in the area of preparedness and response for a nuclear radiological emergency, International Atomic Energy Agency develop safety standards and technical tools to support its member states, of which we are one, in strengthening their emergency arrangements. This provides for capacity building in member states and performs at the request of member states peer reviews on established emergency arrangements.

So, these standards it's important to note recognize the findings of the United Nations Scientific Committee on the Effects of Atomic Radiation and the recommendations of international expert bodies; notably, the International Commission on Radiological Protection, and these are taken into account in the IAEA standards.

The standards, notably also recognize or are developed in cooperation with other bodies in the United Nations system and other specialized agencies. So, this includes the food and agricultural organization of the United Nations, the United Nations Environmental Program, the International Labour Organization, the OECD Nuclear Energy Agency and the Pan American Health Organization and the WHO, the World Health Organization.

So, I just want to make everyone aware that this year and leading into this year, Canada has

requested that the International Atomic Energy Agency conduct an emergency preparedness review, commonly referred to as an EPREV, and this is a review of the nuclear emergency arrangements in Canada and those nuclear emergency arrangements are assessed against the standards that I had mentioned before in those contributing organizations to those standards all support those standards.

So, EPREV, if it's not clear, it's a peer review service by international experts, sorry, it's provided by the IAEA to appraise the level of preparedness for nuclear radiological emergencies in member states.

So, nuclear emergency preparedness, as you know, and response in Canada is a shared responsibility. The scope of the EPREV in Canada will implicate federal authorities, provincial authorities and nuclear reactors. This is being done in Ontario and New Brunswick.

So, what we expect is that the findings of the EPREV, based on currently conducted self-assessments, will be largely favourable as we're rating ourselves against those current standards that I spoke of above.

The EPREV will serve to identify any remaining gaps within Canada's overall current preparations in the event of a nuclear emergency occurring on Canadian soil and will help increase Canada's level of preparation

to protect public health and safety.

So, that's a statement, President Binder, that wasn't well timed. It did feed into some of the discussions that were recently presented and some of the discussions earlier on, but I just -- I was recognizing the need to put out the message of the EPREV and our alignment with international standards.

THE PRESIDENT: No, that's very useful and I understand that the actual visit will be in 2019.

MR. BUCHANAN: That's correct.

THE PRESIDENT: So, we look forward to get our international expert's view about whether Canada has a good emergency plan.

So, thank you for that. And we are going to take a break for 15 minutes, coming back at four o'clock.

--- Upon recessing at 3:43 p.m. /
Suspension à 15 h 43
--- Upon resuming at 4:02 p.m. /
Reprise à 16 h 01

THE PRESIDENT: We are ready to proceed. Could we have everybody sit down, please?

The next presentation is by Mr. Dan Rudka,

as outlined in CMD 18-H6.28.

Mr. Rudka, the floor is yours.

CMD 18-H6.28

Oral presentation by Dan Rudka

MR. RUDKA: Thank you, Mr. Binder.

Thank you, Members of the Board, for listening to me today. I must start by saying after Mr. Cuttler's version you might wonder what rock I climbed out of if you're not familiar with me, but anyway, here I go.

In my written statement I mention the concerns of a nuclear power plant having eight reactors in one vacuum building and the possible trouble with one vacuum building and a multi-reactor incident, and this is just one of many concerns of a 47-year old reactor if it fails.

We are very aware of the many scenarios. We've heard many of them today. There is too many possibilities.

Now, recently in Scotland they put all reactors built in the same period as Pickering on alert as cracks in the reactors' concrete became of obvious concern and due to old age and deterioration. Escaping radioactive emissions are at an increased risk over time due to

deterioration, which we have heard today, and with that a very increased possible risk to the health of the population.

In fact, a serious emergency situation which has been discussed in this very old facility and requiring the public alarm will set off a secondary emergency and that of evacuation. Both in their own accord, no matter the extensive planning, will result in a disaster, the nature of which I have already presented.

But most important of all is the exposure to the population. Now, on this alone I will mention medical costs. I am an example of an exposure victim from Port Hope nuclear facilities, exposed by way of inhalation, ill for 20 years, a double lung transplant survivor. Since initial exposure my continuing health costs the Canadian taxpayer has been around $2 million. Now, one exposure victim -- you know, take 5,000 at one-quarter the cost; it's $2.5 billion. The overall cost of a disaster at Pickering, the medical costs alone would financially destroy Ontario and, further, be very adverse to the country as a whole.

Now, my largest concern after what I have learned since suffering from radiation exposure is the safety of the health of the population. Recently, the CNSC decided not to further study radionuclides as a chemical of

mutual concern.

Now, I will mention tritium released into Lake Ontario waters and the air somewhat regularly. It does cause genetic mutations, birth defects; cancers. It is proven in lab animals. We humans are another species. Our DNA, 97.5 percent similar to that of a lab rat. So around these facilities, not of our own knowledgeable choice, we have become unmonitored, untested lab specimens. Breathing in radionuclides, inhalation is 200 times more dangerous than any other method of exposure and people can't avoid this if there is a release.

KI pills, I mean seriously, folks. You're worrying about the thyroid and you're inhaling this into the lung. It's past the thyroid. It's into your lungs. It's the worst place to be putting it. You know, all this talk about KI pills just -- it's a false flag. It's false protection.

You know, the population around these facilities everywhere need to be tested for exposure and what have we got? Urine analysis testing for nuclear workers, a method that is not efficient nor does it go far enough into analysis. The public has nothing but predictions based on cancers, and that's the end count. That's not good enough because after exposure there are many symptoms prior to cancer, and this I know personally.

These symptoms can be easily misdiagnosed and confuse physicians.

My concern about exposure around nuclear facilities are initially based around personal experience from the incident in Port Hope, and observations since. For example, you know, just in Port Hope, right off the battalion, extensive nuclear background, community of 16,000, and has seven pharmacies. I live in a community of about 10,000. We have two pharmacies and there is no nuclear facilities or anything like that in the area. There is a reason for this. There really is.

You know, health studies in Canada, well, they're not real time. A lot of them have been disputed. Now, an example of a more picture of health would be taken and could be taken if an inventory of all drugstores within an area were inventoried like Port Hope, for example. I lean on that because it's my experience. We can do this here in Pickering.

The inventory of the drugs prescribed would include a number of clients, medications they require; what these medications are intended to treat. This would be expensive or inexpensive, non-invasive to the population, taken on a monthly basis calculated over a year. Possibly more detail could be put into it later, but meanwhile the same could be done on a similar demographic

that is absent from anything nuclear and compare the findings. Maybe more concerning is why has the CNSC and nobody else ever done this?

Now, I have a bit of a negative. Excuse me -- expressed feelings often with the CNSC and with the regulatory committee, but it results from the history. For example, you know, some years when I asked my epidemiologist to please take a look at my skin, and show, you know, remark on the damage and they had no comments. I have given the Commission pictures today of a Nagasaki victim that has very similar skin damage to me.

With that in mind, you know, what can I ---

MR. LEBLANC: Just for the record ---

MR. RUDKA: Yes.

MR. LEBLANC: --- there is two things. The Commission did not accept those pictures. They are not on the record and they have not been accepted nor are your working notes.

Thank you. I just wanted to be clear.

MR. RUDKA: No, and I can understand and it's for your own personal inspection then, okay.

Okay. But those pictures you can see that we have the same damage, and I will leave it at that.

Now I have tested positive for uranium

inhalation and something is very wrong if our regulators through the testing and through the evidence and the years I have given you in the past, just do nothing at all with this situation.

Now, immediately after my inhalation exposure, I had symptoms. Prominent was the decline in my hemoglobin, okay? The red blood cell count was low within a few weeks after exposure and it was not expected as part of exposure. I wasn't expected to be exposed at the time.

Radiation, as we know, travels to the bone where the blood is produced. This requires time and thought to appear too soon in my case but since I've required medical intervention, struggle to keep a blood count but never returned a normal count. It's remaining low, requiring constant effort just to stay at a low level. It's difficult.

In 2015, almost immediately after my lung transplant, my hemoglobin went up better than was my normal count. It was not immediately understood, thought to be relevant to the transplant but nobody knew how, and the blood cell count eventually, though, unfortunately, went back and settled to the previous low level.

What happened was I got fresh lungs. They were clean. The blood count went up. I'll tell you why in a moment. The lungs got re-contaminated from my body and

things went down again.

In 2017 -- and the speaker before me had no idea of this information -- a remarkable medical finding was shown and proven that lungs actually produce blood. I have given you documents on that. I hope that you will accept them. It was also discovered that considerably more platelets leave the lung than actually enter. This is also explains how contamination spreads throughout the body from the lungs, transfers in the blood immediately throughout the organs, throughout everything. Those findings are included.

Now next there was a study on Fukushima monkeys. I know this is not about Fukushima but this connects. The study started in 2008 before the Fukushima disaster, had no intent of being part of the incident. It was a study of the monkeys in general. Because of the situation the study director was asked and did a study of the exposed monkeys. Sometime after the incident, the newborn of the exposed were found to be underweight, smaller bodies, smaller heads and brains, but also the monkeys were found suffering from anemia, a reduction in blood components, red and white blood cells.

In tests in 2002 to 2017 there has been no change. The problem is chronic and will not change, as in my situation. What is most immediate is that the nuclear

exposure victims are exposed by -- that are exposed to inhalation, will most likely -- the most likely method -- will suffer immediate anemia, red blood cell loss and white blood cells; lower hemoglobin count. The effect is immediate and does not repair itself.

Now, with this new information, testing the public over a large demographic is possible for liable indications. Quite obviously nuclear inhalation victims will show low hemoglobin in a very short period. In Port Hope, for example, blood testing for low hemoglobin should be very informative without waiting and waiting on cancer findings. Without expense or much personal intrusion, it can be done around Pickering. Low blood indicators around these facilities should be a concern, could be an indicator but nobody has ever looked at it and checked into it.

And nuclear energy workers, the first and most likely exposure victims, they should have more time or better, more accurate, immediate -- I wanted more time -- testing regularly upon request or concern. A more immediate a method for detecting exposed compromised workers is needed and then properly acknowledging and responding responsibly to these individuals.

There are few that are recognized, if ever at all, after exposure and conveniently the industry lacks the proper accurate methods to test. And without any, many

ills will slip through the cracks of convenience as I have.

And also to this, nuclear energy workers need special compensation recognition for nuclear exposure and the many illnesses caused by exposure, just as fire fighters have due to their work as it is dangerous.

That's why we have the CNSC and they should be doing all they can.

But without true independent medical oversight I doubt that this will ever occur. And the idle unions, they should be damned ashamed of themselves just for not fighting for such simple rights under this type of dangerous work for years.

In the end OPG Pickering is asking to operate longer than intended, longer than agreed, to decommissioning. That time has passed and add another ten years to the lifespan, six years, whatever you want to, is to go back in the standing and in doing so risking the public.

Unfortunately and ultimately in the past, the CNSC I expect will give a ten-year licence. The Board will retire Pickering. Port Hope, Bruce, Chalk River will continue to be problematic with a ten-year licence and shut down upset public.

Nothing lasts forever, you, me, highways, buildings, reactor, concrete, nuclear incident, total

destruction of a large central area of central Ontario's business, the population gone, health damage to the population. The plant will not last forever, nor will the components. None of us do.

The money to repair that can never be returned to the same that is being wasted. You are throwing money into something and wasting it away and the extension of the life is no longer worth the risk. It's no longer needed medically for isotopes. Quebec can supply our power.

We need to decommission this plant and regardless of what you do, you need to start testing the people around these facilities because this is what it's all about: is our public health.

We are doing all this for the safety but nobody has done any real significant studies.

I've suggested a couple of possibilities that I hope you will take most seriously today.

I thank you for your time.

THE PRESIDENT: Thank you.

Questions?

Dr. Demeter.

MEMBER DEMETER: Thank you very much for your intervention.

The one question I had that timely came up

in this is more of a plant safety issue you brought up.

There is one vacuum building for the facility and I would like to know its capacity, how many reactor units worth of venting will that one building hold? What is its capacity?

To OPG, sorry. Staff can comment if they see fit, after that.

MR. MANLEY: Robin Manley, for the record.

First off, I would like to thank the intervenor for bringing his intervention today. You know, regardless of the cause, we obviously have empathy for anyone who suffers from serious illnesses, like we would for any member of our own family.

He expresses a great interest in nuclear safety and the safety of workers. We share that interest and I will just speak briefly, before we get on to the vacuum building issue, if I may.

The radiation protection of workers is one of our commitments, the public workers and the environment, and we have an extensive Radiation Protection Program whereby we have to make sure that we understand what the dose consequences are to our workers at all times.

We can talk further about that, if you like, but I'm going to next turn it over to Steve.

MR. GREGORIS: Steve Gregoris, for the

record.

The containment system in the vacuum building structure specific to Pickering is an excellent example of what we discussed yesterday as a robust design of our CANDU multi-unit plant.

Just to describe containment, each reactor building is surrounded by a containment structure. It's concrete. It's about one metre to two metres thick, so it's very robust.

Each of those reactor buildings is connected to a pressure relief duct which is then connected to the vacuum building. The pressure relief duct, as well as the vacuum building, the same size, the same thickness in concrete structure.

All of the containment is kept sub-atmospheric, under negative pressure. So anything is drawn into containment.

And under an accident condition where there is a release from a reactor, everything is drawn towards the vacuum, which is kept almost at perfect vacuum, maybe 5-7 kPa.

So everything is drawn in there in an accident scenario and it's held in there. And it's held in there for a long time.

I would say that's again a unique design

for us because it can hold everything in there and allow any kind of protective actions to be taken. In fact, it can be held in there and in a lot of accidents there is no release required because that vacuum building has a dousing capability so that the pressure is continuously reduced. And as long as the dousing is available, it will continue to douse and release pressure as pressure builds in that building.

Eventually, though, if in some accidents venting may be required to maintain containment negative, the filtered air discharge system is there to do that. What the filtered air discharge system does, it ensures not only that we keep containment negative but whatever release we control it, we filter it and we monitor it.

So with all that said, what I would say is for all our design basis accidents, the vacuum building and the containment structure I described is fully effective.

For beyond design basis accidents, including multi-unit accidents, containment in the vacuum building is also fully effective.

MEMBER DEMETER: Remind me if I'm wrong. In the Bruce hearing I think they talked about an additional safety factor of filtration technology for venting that would reduce.

It sounds like this is more than adequate

for a single reactor vessel, for venting it. But beyond that, it may require some venting in addition to the vacuum building.

So maybe you can talk about mitigation of venting.

MR. FRAPPIER: Gerry Frappier, for the record.

Yes, the Bruce does have a bit of a different design as to how they want to move forward. But in principle it's the same idea.

You have a big vacuum building that, as was just described, is a feature that allows for all the products coming out of an accident to be contained into that building.

One of the features of it, though, of course is that you've got to maintain that vacuum. So it's very important to be able to do the venting as in the case you are talking about beyond design based accident where there's more than a single unit that would require at a certain point that the venting occurs so that you can maintain the vacuum in the vacuum building.

It's one of the things that's different than other designs but it's not necessarily a problem.

For a little bit more detail on how that works I would ask Mr. Noreddine Mesmous to give us a sense

of how the accident progression would go.

MR. MESMOUS: Noreddine Mesmous, for the record, Director, Reactor Behaviour Division.

It's already well explained for the containment, including the reactor building, the vacuum building and the pressure relief duct.

What I would add is the improvements as part of the Fukushima specifically for OPG for Phase 2. So they have large power supply so they can restart the system, the filtered discharge system, and also they can start the main vacuum bank.

So it ensures any release would be thorough controlled venting. This is mainly for a severe accidents where you have multi units.

MR. JAMMAL: Ramzi Jammal, for the record.

Just to transform it at a high level, post Fukushima we put requirements in place on the licensee to ensure that the emergency mitigation measures and equipment are in place.

What my colleague is saying is that -- your question is: What is the capacity of the vacuum building?

If you are able to control the filtered venting and you are able to maintain the power for the vacuum pump, it's indefinite.

In other words, as long as you have controlled filter venting, you are controlling the contamination so that it's filtered.

So as long as the pump is in place and you have the power, and as long as you have power for the controlled filtered venting, the volume capacity is irrelevant because you are maintaining that vacuum building as is.

With respect to the design itself, I'm just going now by more or less memory.

If you do nothing and it can be corrected, the vacuum building is approximately one and a half reactor capacity more or less.

But the key point here is post Fukushima if you maintain power to maintain the vacuum capability and the filtered venting, it's indefinite with respect to the capacity.

MR. GREGORIS: Steve Gregoris here.

Can I just add to that because I want to make sure that the whole picture is clear around accident progression, the likelihood to have to vent and then all the different things we've done to ensure venting capability is available.

If we go right back to EME Phase 1, so EME Phase 1 adds additional ways to cool the fuel. You can add

it to the heat transport, steam generators or the calandria vessel. That's there to prevent accident progression to the point where the likelihood of venting would be required in a severe accident case.

On top of that we did EME Phase 2.

So in the unlikely event we progress to the need to vent, then EME Phase 2 adds to the current capability of FADS. So FADS without EME Phase 2 has the ability to vent, keep containment negative through many operations.

That's without power and for multi units.

EME Phase 2 then gives power to FADS and you can use FADS in additional diverse ways with power. So you have a couple of different venting paths and pieces of equipment, fans and valves available, so that you have more different ways to use FADS if you should need to vent.

On top of that, then we are committed to installing the PSR mods. Those PSR mods are part of the Periodic Safety Review. In the Integrated Implementation Plan there's specific actions which will allow fire water to be added to Units 1 and 4, again to the heat transports, steam generator, or calandria vessels. Again, that is proactive, it's to prevent the accident from progressing to the point where you should have to vent.

Then, lastly, there's one additional

action, it's a PSR and IIP action, and that is to give power to the main volume pumps along with cooling supplies to the main volume pumps for yet an additional way to use FADS.

So in all of this, what I'd like to describe is multi different ways to cool the fuel and prevent accident progression to the point where you need to vent, and multiple different ways to vent, filter, and monitor through FADS should you have to vent.

THE PRESIDENT: Okay.

MEMBER PENNEY: I have a quick question. Thank you for your intervention.

You said recently the CNSC decided to stop studying radionuclides. When I look in your written presentation, page 3, I think it says, "Recently, the CNSC has decided that radionuclides are not chemicals of mutual concern in the Great Lakes."

The question is for CNSC to clarify that. What does that mean?

MR. FRAPPIER: Gerry Frappier, for the record. So, just to be clear, there's two questions in there. One, has to do with whether we're doing research or not, and the second one has to do with a very specific thing, in the context of the Canada/U.S. management of Great Lakes, what we wanted to do with radioisotopes. In

both cases, I'd ask Mr. Mike Rinker to explain that for us.

MR. MCALLISTER: Andrew McAllister, Director of the Environmental Risk Assessment Division. I am also the CNSC representative on the Great Lakes Executive Committee under the Great Lakes Water Quality Agreement.

What the intervenor has made reference to was a nomination by a group of non-governmental organizations for radionuclides to be considered chemicals of mutual concern under Annex 3 of this agreement. Environment and Climate Change Canada, through their memorandum of understanding with the CNSC, reached out to us to do an assessment of that nomination.

We undertook that assessment, have posted it on our website, and it's correct, in that we have concluded or have recommended that it not be considered chemicals of mutual concern given that the science related to the health and environmental risk is well developed, it's continuously evaluated by international and national scientific organizations, there's a robust regulatory framework, and that the risks to humans and the environment are very low.

Likewise, the U.S. Nuclear Regulatory Commission undertook a similar assessment at the request of the United States Environmental Protection Agency. So both

assessments have been provided to the parties to the agreement.

Environment and Climate Change Canada and the U.S. EPA have not rendered a decision yet on this nomination, and are anticipated to do so later this year.

THE PRESIDENT: I'm very surprised. We've got Environment Canada and Climate Change in the room here, maybe it's a good time for you to come forward. Because I thought that the council itself already decided that -- in fact the radiation level has been decreasing in the lakes over the time. So what am I mixing up here?

MR. RINKER: Mike Rinker, for the record. So the CNSC did an assessment and we published our assessment online, and that included data that was collected by Environment Canada in our report, collected by many other agencies across the Great Lakes Basin.

So what you've heard was the results of the CNSC assessment which was provided to Environment Canada.

THE PRESIDENT: Environment Canada, anything to add?

MS ALI: Nardia Ali, Environment and Climate Change Canada. So just to give a little bit of context. On March 2nd, 2016 a number of non-governmental organizations submitted to the Great Lakes Executive

Committee a nomination for radioactive substances to be added as chemicals of mutual concern, which is one of the annexes under the Great Lakes Water Quality Agreement.

Environment Canada is still evaluating the nomination but, as Mr. McAllister said, through our MoU with the CNSC, because they're experts in this area, we asked them to do the assessment and give us some advice. So that was done and the CNSC actually did a lot of work for us, helped us and provided a document. That is the document that's referred to on your website, it's posted. But that document's been provided to the people who manage the Great Lakes Water Quality Agreement.

We're still evaluating the nomination and Environment and Climate Change Canada is developing transparent decision-making criteria to facilitate the decision on the nomination with a target to have a decision by December 2018.

Now, both the CNSC and the U.S. NRC submitted to us that there is no evidence to suggest that radionuclides pose an unreasonable risk to environment, health or safety within the Great Lakes Basin ecosystem.

Activities are already in place federally which would satisfy all Annex 3 commitments for designated chemicals of mutual concern, therefore designating radionuclides as a CMC, or chemical of mutual concern,

would not lead to or enable any additional action on the part of the Canadian Federal Government.

So the signatories, just for the benefit of people who aren't familiar with the Great Lakes Water Quality Agreement, the signatories are Environment and Climate Change Canada and the U.S. EPA.

MEMBER PENNEY: I had a question --

THE PRESIDENT: So just to finish this. Did the EPA also submit and publish their report?

MS ALI: Well, just like how we went to the CNSC, they went to the U.S. NRC. So we have the CNSC's submission, and they have the EPA, and all of that information is being considered, and they hope to have a decision by December.

MR. MCALLISTER: Dr. Binder, the U.S. NRC assessment is posted as well on Binational.net, which is the website associated with the Great Lakes Water Quality Agreement.

THE PRESIDENT: Okay. Ms Penney?

MEMBER PENNEY: If you are a chemical of mutual concern, what does it mean?

MS ALI: Nardia Ali, Environment and Climate Change Canada, for the record.

So the criteria under which the nomination was evaluated, so the criteria that are being used: Is the

chemical present in the waters of the Great Lakes? Is the chemical considered to present a potential threat to the ecological or human health in the Great Lakes Basin? Are the sources of the chemical entering the Great Lakes well-understood? Is the current management regime for this chemical, regulatory or voluntary, considered effective? Are the management efforts regarding the chemical warranted?

So those are some of the criteria that were used in the assessment done by the CNSC.

MEMBER PENNEY: Sorry, my mistake for asking the wrong question. If you are a chemical of mutual concern, does it mean you're monitored for more often or there's more research done into you, like...?

MS ALI: Nardia Ali, for the record. Yes, it means that more of the limited resources that are now available for work under the Great Lakes Water Quality Agreement would have to be put into those chemicals. So for a chemical that is already well-understood, that money could be spent, you know, elsewhere, yes.

MEMBER PENNEY: Thank you.

MR. FRAPPIER: Gerry Frappier, for the record. So, like I said, there was two questions in there. So I think you've got the answer to one of them with respect to the agreement between Canada and the United

States and how that affects things.

But I think it's important that we not conclude therefore that we're not interested in research in radioisotopes or in tritium and that. So, for that, I'd just ask Mr. Mike Rinker to confirm that.

MR. RINKER: Mike Rinker, for the record. Yes, tritium behaviour in the environment, other radionuclide behaviour in the environment, has always been a focus of our research and support program, and we're going to continue to do so.

When the new impact assessment comes into play there's a need for regional study, so there's a really good candidate; thermal loads to the Great Lakes, other types of loading to see how -- whether that behaviour that we've observed in the past has continued, and we'll collaborate with our federal partners on that.

Similarly, outside the Great Lakes, tritium cycling in a marine environment, like at Point Lepreau, is on our list of future research projects.

So I guess what we're saying is there's perhaps not a need to have a joint bi-national management plan for something that is unregulated. As an example, one of the first chemicals of mutual concern was phosphate, where phosphate loads to the Great Lakes were causing nutrification, big problems in Lake Erie.

There was no regulator in charge of that. So there was a need for U.S. and Canada to work together for something that's unregulated being put into the lakes and causing harm.

In this case, there's two regulators responsible. Nevertheless, we do continue to work on it, just not under this agreement.

THE PRESIDENT: Questions? Ms Velshi.

MEMBER VELSHI: Mr. Rudka, in your written submission at the bottom of page 3 and the beginning of page 4 you raise some concerns about lack of transparency. You say, "In Canada we're expected to believe that nothing ever happens and the situation is mostly unknown to the public." Then you talk about the CNSC needing to make itself more available within the community and getting a better pulse on concerns.

So I was a little surprised to read that. We've heard from the licensee and CNSC Staff that even very low levels of incidences get reported, they're posted on their website immediately. So from your experience, what more would you like to see?

Even as far as being more available in the community, I mean, we're here today, CNSC Staff are there at community meetings, and CNSC 101 and I know the licensees are out there all the time. What more would you

like to see?

MR. RUDKA: I thank the Member for the question. I am on the other side of the coin of all this. Like I said, I've come out from under a rock, I guess, compared to everything else that promotes what's safe and good. I don't disbelieve their promotions of safety and whatnot, but things do happen.

Now, with everything that we're looking at today, we're studying risks, possibilities, all sorts of model scenarios and, you know, we've pounded this and tested that, and everything else, can you tell me how much actual real testing has been done to the population of workers and to the populations of people around?

We are talking about all this to protect the people. And we heard earlier how this radiation can actually enhance us. Now, I don't believe that for a moment. I know that some 95 percent of cancer treatment patients eventually die from cancer anyway, a return of or whatever.

My point is we need to be studying the people and not the damn plant, no offence. But I mean we have studied it, we have beat it up, we see all these assurances, but who has studied the population? That's what I'm trying to present to you today.

You know, one scenario that we discussed

about the vacuum building was very well covered. You know, I appreciate the expertise involved, but there is a measure there that could go wrong. But that was one example.

So we hear all the people saying that, you know, we hear things, good things, everything is safe, and I hear all these studies about, but I find otherwise. There is an underside. There's people like me that are exposed, they won't come here. They have been threatened. I have been threatened. I have been assaulted over this. People don't want us here. I just find that this is more important than me, it's about other people.

Now, you don't get all the upfront -- because I know, I can give you an example of Port Hope, what I have gone through. I mean they basically chased me out of town for being so vocal. What happens then is people become reserved, they become frightened, okay. They start to listen to the fact that we are fearmongers. This is not about fear. Fear is the unknown.

What I would like to see is more public education about not the safety and not all the precautions, about the actual risks and the actual dangers of what happens to people. Because I think that that will also ensure that the plant managers, the CEOs and everything, not from the back rooms, get a forward face on what's happening. They need to meet people like me.

I came here years ago very angry with you people. I wanted to tear you people apart. Today I want to help, okay. I have had the gift of life again, so I don't want anybody else to go through this. I mean you have talked about all these other things with thyroids and that. My thyroid is fine. Everything else is messed up. You know, it's these false flags we have to get past and get to the public the actual truthful knowledge, not wait for Fukushima to happen for God sakes and then say, guess what we have learned. Thank you.

THE PRESIDENT: So you have mentioned that nuclear energy worker is a dangerous job. We are going to have -- Thursday we are going to have Dr. Kyle, who is the Health Authority here. So I'm trying to understand if there was something peculiar healthwise with the nuclear energy workers. The Health Authority, the Cancer Care Ontario, all of the studies that were done surely would have detected that this is an unhealthy profession. There were literally dozens of such studies. So what more studies do you need to verify what you said is right?

MR. RUDKA: Thank you, Mr. Binder. Initially I was studied. Your analysis studies, they do that at the plant, but they don't go deep enough, they don't go far enough. As you know, mine were done from the Uranium Medical Research Centre, they were extensive. I

won't get into it. We have gone on beyond those studies even to this day, we are working on other information. Now, the thing is with the studies that they do are quick, accurate to a point, but they do not break down isotopes. They found spent reactor fuel in my system, which we found the company was not supposed to be working with, but they were. There is no excuse for that.

Now, if these people had a breakdown they would see what's in their body. And also, as I mentioned to you about, you know, the anemic situation, I bet you you would find a majority of workers have low hemoglobin just from being in the atmosphere of it, okay. Now -- please go ahead.

THE PRESIDENT: Maybe some of the experts here that have done some of those studies, I think the energy workers have been monitored for years now, maybe you can shed some light as to what you are actually finding that would suggest that you need to get further into the studies.

MR. RUDKA: Excuse me, Mr. Binder, before they do. People get missed, okay. I got missed. No matter what they tell you, people are slipping through the cracks. I did not have a high dose, as they said, from the company figures, but it was higher than the company initially let on. They said not high enough to be

effective. However, I inhaled it and there is part of the thing I want you to consider. This is just not an exposure of wherever, it's inhaling it, getting it into the body. And as I told you, the most important thing is discovery of blood being produced in the lungs. This is new and this should be considered by the CNSC. I think you may have to do it more extensively eventually yourselves. I hope you do.

THE PRESIDENT: Staff...?

MR. FRAPPIER: Gerry Frappier, for the record.

So I would ask -- I mean I think there is a specific question with respect to a specific sort of research, but there was also a broad statement as far as, you know, we certainly do a lot of assessments on safety and we are going to continue doing that. But we do a lot of assessments associated with people as well and in particular workers and I would ask Dr. Rachel Lane and Lydia. Yes, I'm just going to say Lydia because -- anyways, Rachel...?

DR. LANE: Dr. Rachel Lane, for the record.

Yes, there have been many, many studies of workers over the years. There have been Canadian studies of nuclear energy workers, there have been studies of MAYAK

workers, atomic veterans, U.S. radiological tests. There is a U.S. million person study right now looking at nuclear workers. There is an international collaboration study right now referred to as INWORKS that looks at nuclear workers. There are also studies, there is a whole multitude of different studies looking at the effects of radiation.

As CNSC's epidemiologist, I have been involved in looking at the health of Canadian nuclear energy workers, Canadian uranium miners and Canadian uranium processing workers. Dr. Zablotska has worked on these studies with me and I will leave it with her to talk more about those studies as well as the Chernobyl cleanup workers.

DR. ZABLOTSKA: Lydia Zablotska, for the record.

I empathize with Mr. Rudka's story and I am very grateful that he came here to tell us about his story so we are not missing these experiences and they are on the record. And I wanted to tell him that I was the external expert hired by CNSC, among many individual researchers who competed for the project, to analyze the data from several reports. So CNSC hires an external radiation epidemiologist to conduct independent research analysis.

I am the first author of the analysis of Port Hope workers and just to explain this particular example, the way it was done is that we got all the records of exposures of all workers from Cameco Corporation. An external expert was hired to do dosimetry, to evaluate the annual dosimetry for each worker. We then worked with Health Canada and Statistics Canada to link the records of employment to mortality in Canada and also mortality in the U.S. to make sure that we didn't miss any worker who died so we know their causes of death, and we also looked at the incidents in Port Hope workers. This was published -- this work was published in 2014 and CNSC asked me to come to Port Hope and speak to the community, where workers and people who live in the city could come and ask me questions about this analysis. And the main finding was that the doses from radon exposures were very low. They had doses from external exposures, gamma rays, but we didn't find any specific increase in any cancer, either mortality or cancer incidence.

The cohort in Port Hope is not very large, so since 2014 I have been working on trying to combine these data with the data from Germany and many other countries. And again, we haven't seen any increase in any particular cancer. So this is just to demonstrate how we take care to make sure that we don't miss any workers, any

exposures, any outcomes.

THE PRESIDENT: Okay. Go ahead.

MR. RUDKA: Thank you, Mr. Binder. I would like to respond to that and just state that here we are playing again the cancer game. I don't have cancer right now folks and I hope never to but I probably will or expecting it. This is not the way to be doing it, is calculating on cancers. They may have information on cancers, but could they tell me how much information they have on people with low hemoglobin, anemic workers? That might be another route to go.

And as far as Ms Rachel Lane, no offence, but that's the epidemiologist I asked in Ottawa to look at my arms and she had no statement of no effect as to what happened to me. As the picture you will not release, you will see I look very much like a Nagasaki victim. And I want to tell you, the first qualified physician, his exact words, walked into the office, took one look at my face and arms and said -- "That's secondary to radiation exposure. What happened to you", were his exact words. No offence to her credentials, but obviously there is a conflict there.

And I will tell you, you asked me why people won't speak out, these doctors have a great deal of trouble putting that actually in writing for the Worker's Compensation Board and it's because of the underlying

repercussions of industry, of government. They need funding to continue their work, so they are protecting their butts too. So I needed to answer with that. And I also think that really, again, waiting on workers, checking them out for cancers at the end, that's just ridiculous. Why are we totaling deaths? Thank you.

THE PRESIDENT: Okay. Thank you.

MR. RUDKA: Thank you very much.

MR. LOCKWOOD: Randy Lockwood, for the record.

While I empathize with the intervenor, there are a couple of comments. This is a hearing about Pickering relicensing and there are a couple of comments I cannot leave on the table, I feel very strongly about. I feel sorry that the individual was assaulted, but I want to assure the Commission and members of the public that we have a very healthy safety culture at Pickering, an engaged workforce, and we encourage our employees to come forward with any concern or low-level event, and this is pulsed more or less daily, as well by our management quarterly. And in addition to that, we have a full review of our safety culture every three years, with surveys plus focus groups. In addition, the safety culture is evaluated by external evaluators such as WANO, OSART, our Nuclear Safety Review Board. And lastly, there's a number of things that

would touch on this, the safety culture of the plant through inspections by the CNSC staff.

THE PRESIDENT: Okay. Thank you. Thank you for sharing with us. Any final thought you want to share with us?

MR. RUDKA: Yes. Thank you, Mr. Binder. Just that this is -- to me, it's all about risk assessment for health, for population, for people, for unborn children. But, you know, let's not burden our medical system, let's not produce any more people like me. You know, I am happy that I can speak to you because many others that have been in my shoes have passed, they can't speak to you today.

And I will just end with saying that I didn't want to do this today, but a lady yesterday ran into me, her daughter just got a job at a mill in Port Hope and she asked me to speak to you today because she's worried about her daughter, okay. So as much as the people are on the floor and, as this gentleman says, the people on the floor, his office, no offence to that, they have a different view, a different understanding, a different take on it and we need to go there. Thank you very much.

THE PRESIDENT: Okay. Thank you. Thank you for your intervention.

I think that the next intervention is

coming to us via teleconference and it's a presentation by the Provincial Council of Women of Ontario, as outlined in CMD 18-H6.64. I understand that Ms Janes -- Ms Janes, can you hear us?

MS JANES: Yes, I can.

THE PRESIDENT: Okay. Go ahead.

CMD 18-H6.64

Oral presentation by the

Provincial Council of Women of Ontario

MS JANES: Yes. Good afternoon. I am presenting today on behalf of the Provincial Council of Women of Ontario, which was formed in 1923 with the mandate to work together towards the betterment of women, families and society. Currently our membership includes many thousands of Ontarians through our nine provincially organized Society members, four local councils and a study group. We develop policies through the circulation to members and voting in these groups and then adoption by majority vote at an annual general meeting. We are one of six provincial councils of women who are members of the National Council of Women of Canada which was established in 1893, and the others being Ontario, Quebec, Manitoba, Saskatchewan, Alberta and British Columbia.

The first National Council of Women precautionary nuclear policy was adopted in 1955 and PCWO's first policy in about 1980. We have used these policies to intervene in such nuclear-related procedures as the 1996-97 Seaborn Commission hearing on the burial of high level nuclear waste in the Cambrian Shield and we were cited in the panel's final report as saying:

> "The public at the end of phase II {technical hearings} was left with a feeling of grave unease. The best that could be said in favour of AECL's concept was stated by SRG- that it could, might, should be doable."

We were also involved in other interventions in 2000, 2007 and 2008. We had intervenor status at the Ontario Energy Board hearings on the Ontario Power Authority's integrated power system plan that the Board delegated responsibility to deal with the lifecycle costs and risks of nuclear waste management. Before the hearing was halted by the provincial government in the fall of 2008, our expert witness was Dr. Marvin Resnikoff, the top nuclear waste expert in the United States. In 2008 PCWO commented to the Ontario Drinking Water Advisory Committee on the need for Ontario to update the regulatory

standard for releases of tritiated water to reflect the 1994 recommendations of the Advisory Committee on Environmental Standards, that these be reduced from 7000 Bq/L to 20 Bq/L by 1999. In 2017 we intervened in the CNL application to build a dump for the burial of low and intermediate nuclear waste at Chalk River, on the shore of the Ottawa River. In 2018 we had a presentation to the Ontario Fire Marshal and Minister of Public Safety on corrections to their Provincial Nuclear Emergency Response Plan. And most recently we commented to the Toronto Board of Health regarding our support for Toronto's declaration to be a nuclear-free city.

So to begin our brief, in 2013 the Provincial Council of Women of Ontario presented a brief in opposition to Ontario Power Generation's plans to lengthen the operational life of the Pickering B nuclear reactors to 2018 as they were based on faulty assumptions, lacked independent and convincing scientific validation, and neglected the strong public interest and concerns at the time. OPG's current application to extend its deadline for shutdown even further to 2024 and its other plans for stabilization to 2028, leaving its nuclear waste in place on the shores of Lake Ontario rather than securing it and storing it in a safe dry place away from the lake, exacerbates our very strong opposition.

Additionally, we are aware that there is little if any need for the plant to continue operation as its output can be replaced from Quebec sources, alternative energy and energy conservation and efficiencies, and the surplus power it produces is often sold into the American market.

At the 2013 CNSC hearing on the Pickering life extension, many individuals, community groups and broad-based public interest organizations, including us, made strong arguments against the five-year Pickering B life extension and Commission Members raised serious concerns, such as Chair Binder's insistence that OPG must look at the worst-case scenarios and ensure the residents were notified properly and regularly about the potential for such a nuclear event. Up to that time the usual notices didn't even mention the possibility of a nuclear emergency.

Nevertheless, rather than follow what we and many others felt were less than an adequate plan for operation and shutdown of Pickering B nuclear stations by 2018, OPG is here again asking CNSC to ignore the huge risks of operating this aging plant with a track record of nuclear incidents as it presents its current application for a 10-year extension. It is also disturbing that OPG has admitted at a recent Ontario Energy Board hearing that

investments in safety upgrades to counter the known risk may not be affordable and, as Dr. Gordon Edwards has noted, Bruce and Darlington are being refurbished at a huge cost, but Pickering was judged early on not to be worth this kind of investment, so it forges on at a great risk to the people of Pickering, Toronto and further away, even to those in my tiny town of Niagara-on-the-Lake just 69.2 kilometres due south across Lake Ontario.

As thousands of new residents move into Pickering and the Toronto area each year, encouraged by the requirements of the provincial places to grow intensification policies, legitimate concerns for public health and safety, environmental protection and risks of damage to livelihood should there be a disaster are growing even stronger. This is evidenced by the public's significant participation in the 2013 Pickering hearing, the recent public review and comments on Ontario's nuclear disaster plan, Durham and Toronto requests for strengthened nuclear emergency planning, Durham's plans to mitigate negative social effects of station closures and very recently Toronto's reaffirmation of its nuclear-free status and the comments of the Toronto Board of Health public meeting on this issue on April 16th which drew attention to the added danger of 400,000 irradiated fuel bundles in its spent fuel pools which could provide a target for any

planned hostile attack. It is also evidenced most recently by a request to the Commission from Durham Nuclear Awareness, CELA and Greenpeace to mandate that OPG establish the Nuclear Emergency Preparedness Awareness Campaign in the GTA; from Northwatch, CELA and Greenpeace that the Commission ask the federal government to subject OPG's closure plans to an environmental assessment; and by CELA and Greenpeace requests that if the Commission does approve a licence that it remove wording from OPG's licence that gives CNSC staff the power to allow Pickering to operate past 2024 without a public hearing. PCW supports all of these requests.

PCW is hopeful that such grave public concern and municipal awareness, backed by the evidence of unbiased, independent experts will be recognized by the Commission and just perhaps for once will outweigh pro-nuclear evidence of OPG experts, support from nuclear-related businesses and various program-funded organizations such as hospital auxiliaries, counselling centres, Chambers of Commerce and nature groups, and even staff advice that gave credit to inaccurate, out-of-date information to justify CNSC's extension of the earlier Pickering B licence in 2013.

A clear example of the latter issue can be found in the CNSC background rationale for its decision,

which disregarded evidence cited by PCWO from a lengthy 2003 study by Dr. Mohajer and E. Neyles. This documented the steadily increasing numbers of clusters and intensity of earthquakes near the Pickering nuclear station, which lies directly above an active fault line. This opinion was also supported by J. Robert Janes, a degree in geology and author of "Geology and the New Global Tectonics" and co-author of "Airphoto interpretation and the Canadian landscape". Instead, in the background to its decision CNSC cites an in-house OPG review and a Natural Resources Canada argument based on a one and a half day study with very old 1940 references.

It is notable that at the 2013 licence hearing, CNSC expert Dr. Adams admitted the study was extremely short. In fact, when one reads an article later, Dr. Mohajer said it's just a couple of hours. Dr. Adams summarized his position by saying, on page 431 of the hearing transcript:

> "So we are left with an estimate together with uncertainty which is effectively an extrapolation of a 180-year record which, rather than providing a good rationale for keeping Pickering in operation, underlines again the kind of risk

that OPG and CNSC staff are willing to accept." (As read)

Questions that need to be answered are these:

Is it socially, environmentally and economically responsible to allow an operating life extension for Pickering B reactors when they are well past their initial planned lifespan, having an old and flawed operational design and a history of significant events?

Are the astronomical costs of a disastrous nuclear event, for example environmental damage, death, injury, sheltering, evacuating, business lost over a potential lengthy time, rebuilding homes and businesses worth a life extension for nuclear plants that provide such a small fraction of Ontario's energy demand and most of which is sent to the United States?

How can the public trust OPG's promised plans given its failure to date to comply with the 2013 CNSC licence requirement, the main one being to cease operations by 2018?

We would add that contrary to staff assurances that operational safety standards are very high now, Northwatch cautions for instance that it is troubling that the irradiated fuel pools at Pickering have been performing poorly for over a decade and even at this late

date Ontario Power Generation appears lax in their maintenance and unable to address fundamental operating issues.

Our conclusion. To conclude, we believe there are three underlying issues for the Commission to consider. These are:

First, that there are no valid reasons for life extension, but rather, it appears to be in front of you once more, as noted by OPG, to satisfy their principal shareholder, i.e. the province;

Second, a contract was made between the Commission and OPG in 2013 that Pickering would close in 2018. And if a new licence is granted, will it be back here in a few years to extend it further? The evidence I heard today makes this as clear as mud.

Finally, what rationale can the Commission give to ignore the evidence of qualified independent CNSC-funded intervenor experts for groups such as Northwatch and well respected expert Dr. Gordon Edwards and others that a licence should most certainly not be granted and that Pickering should be shut down immediately.

Therefore, PCWO reiterates our view that it's time to close OPG's aging and troubled Pickering nuclear reactors which lie on the edge of Lake Ontario over an active geological fault and close to millions of people

on both sides of the border. Their continued operation will pose unacceptable risks to the health, safety, environment, and economy of millions of residents in Pickering and Toronto which is the urban heartland of southern Ontario as well as further afield. If there is a nuclear disaster, whether it be through failed operating systems, human error, nefarious actions, or natural events, we sincerely hope we will not have to repeat these much-stated but futile-to-date words at a future hearing on this issue.

THE PRESIDENT: Thank you.

MS JANES: Thank you.

THE PRESIDENT: Questions?

Dr. Lacroix.

MEMBER LACROIX: Yes. Thank you for your presentation.

I just discovered a new issue here. Might be interesting to discuss this matter. Pickering is sitting on an active fault line. Could staff comment on this.

THE PRESIDENT: We may have the person that was referred to, Dr. Adams. I don't know if he's on his way or he's here or he's online. Anybody knows?

MR. LEBLANC: We're trying to reach Dr. Adams. He was flying, but he will only be available by

phone, if he's available. So we are trying to reach him.

THE PRESIDENT: Okay, thank you.

Go ahead.

MR. FRAPPIER: Gerry Frappier, for the record.

But I could get Chris Cole, who's in Ottawa, to answer the -- where we are with respect to the work we've done with NRCan on seismicity around the Pickering plant and the conclusion on a statement that would suggest there's a fault line.

MR. COLE: For the record, this is Christopher Cole. I'm the director of the Engineering Design and Assessment division at the CNSC.

I'd like to state emphatically from the beginning that there is no evidence of a fault line directly underneath the Pickering Nuclear Generating Station. We work closely with NRCan and the Geological Survey of Canada, and we consider the Geological Survey of Canada to be the authoritative expert on seismic hazards in Canada. So therefore we have full confidence in their analysis.

What we see around the Pickering site is there's a minor fault line that runs along the bottom of Lake Ontario. And there has been some activity recently. In fact, in April there was a 3.0 moment magnitude

earthquake that took place. That earthquake, at 3.0, was considered to be very, very small and was not even felt at the nuclear power plant. The nuclear power plant did not undergo any damage whatsoever and, in fact, it didn't even shut down.

Overall, there are some opposing theories with respect to fault lines in that area, and the intervenor has mentioned a couple of people such as Wallach and Mohajer, and these are well known to us and to the Geological Survey of Canada. They have opposing views that, as I mentioned, we stick our confidence in with the National Research Council of Canada.

So overall, we'd like to indicate that there is not a major fault line underneath Pickering Nuclear Power Generating Station. The seismic activity in the area is considered low to medium. And I'd like to emphasize that the nuclear power plant in Pickering has been designed in accordance with CSA standard 289 to withstand such earthquakes and is considered safe.

MEMBER LACROIX: Thank you, Mr. Cole.

THE PRESIDENT: Thank you.

Questions? Questions? Questions?

Dr. Demeter.

MEMBER DEMETER: Thank you. I think, if I misheard this, forgive me to the intervenor. I think you

talked about the City of Toronto Board of Health reconfirming the nuclear-free zone. I think the -- if I have misheard that, it's declared as a nuclear weapons-free zone. There's quite a difference in that. It would affect the practice of medicine in radiation oncology significantly if it was a nuclear-free zone.

Anyways. The question I have is based on the comment that was just made about seismic qualifications. Is there any difference in the seismic qualifications for the Pickering units compared to the rest of the fleet of nuclear power reactors in Ontario?

MR. FRAPPIER: Gerry Frappier, for the record.

I'll pass it to Chris Cole in a minute, but certainly every design has a very customized assessment. Although they go through the same processes, each design does have different features with respect to seismic response. But with respect to the standards that they have to meet, they're the same.

But perhaps Mr. Cole would like to add to the Pickering seismic design.

MR. COLE: Christopher Cole, for the record.

There are subtle differences between the Pickering A and the Pickering B seismic evaluations.

Pickering A was built much earlier and it was designed to the *National Building Code* of Canada and it was fully qualified to that standard. Pickering B was built at a later date, and by that time there was a new CSA standard that had come into play, CSA 289, and it is built and designed to that standard.

We've gone back to Pickering A to evaluate it against a larger earthquake known as a review-level earthquake. And it has shown to have the capacity against that earthquake. So in accordance with CNSC opinion, we believe that the earthquake -- or the nuclear power plant is seismically qualified and is safe to operate.

MEMBER DEMETER: Thank you very much.

MS JANES: Mr. Chair. Mr. Chair?

THE PRESIDENT: Go ahead.

MS JANES: Yeah, just wanting to read just a tad just to respond about the -- I may have not -- I stated it rather broadly about being right under the actual plant. But this is what is from the article written by Mr. Mohajer here, just a response he made to Dr. Adams at one point.

> "Wallach and Mohajer (1990) noted that if the St. Lawrence rift system extends upstream through Lakes Ontario and Erie, as proposed in

three different papers by Adams and Bascham (e.g., 1991), then an earthquake of M = 7 in western Lake Ontario must be considered to be a credible event."

And they stick by their position that there is a possibility, and it's more to do with, according to Mr. James, the clustering. And there have been earthquakes of 4, magnitude 4 in and around Pickering through that area. So that we're seeing more of it.

But the main thing is that the -- is the clustering plus the evidence that they're dealing with is just 125 years of history. And it's all very big in Dr. Adams' explanation. But if you go back further than that, this reference person, this Dr. Mohajer and his compatriots who wrote this paper and other papers and did the long study -- not the couple of hours' study -- they're talking about the history that goes way back, and they are sticking with their position. They've written other articles since then.

So I'm sticking with our position that there is this danger. And I'm not sure of the security of Pickering.

I will note that in Ottawa on the Chalk River, the mound that is being proposed there by the

private sector group that is running it now, that's an area that is -- everybody admits is geologically active. It's extremely active. And yet they think it's fine to, you know, put something there.

So I'm not sure how much we pay attention to the issue of the earthquake potential and the disastrous results. Surely there, there should be considerable concern. But there doesn't seem to be. And here, I can understand why one can sort of slip it under the radar, but one can't -- you have to look at the worst-case scenario. And you have to look at the potential and can't rule it out.

And so that's my last word on that.

THE PRESIDENT: Okay, so let's deal with your worst-case scenario. So let's assume there is a seismic level disaster level 7, whatever that might be. What will happen to the plant? Tell me about what will there be, all the provision you put in for severe accident to shut it down. Who's going to take it on?

MR. FRAPPIER: Gerry Frappier, for the record. I'll start, and ...

So it's very important to understand the geology to have an understanding of what are the potentials for seismic activity. And that's as Mr. Cole mentioned, we rely on the Geological Survey of Canada. That is one of

the primary functions in the Government of Canada is to understand the geology and to provide advice to other government departments such as ourselves with respect to seismicity.

So if we go by that, the plant, as Mr. Cole has mentioned, has been assessed against we believe it's the worst-case scenario from -- for a seismic event and has demonstrated that it would be able to shut down safely and maintain the fuel cooled.

THE PRESIDENT: OPG?

MR. GREGORIS: Steve Gregoris, for the record.

I'm going to ask Jack Vecchiarelli to expand on my answer.

But I will start by saying that specific system structures and components at the plant are designed to seismic requirements. They are also qualified to seismic requirements, and those requirements meet CSA standards.

The probabilistic safety assessment is also done with a wide range of seismic events, and I'll let Jack speak to that assessment. I can tell you that, as Mr. Frappier mentioned, in a seismic event, the components chosen as seismically qualified are there to ensure that for the reactor systems the water stays in the reactor. We

have seismic systems to add water to the reactor so that the fuel is cooled at all times. And that's really the key function is to ensure that we continue to top up the water and cool the fuel.

And so that's the basic design for a design-based accident. And I've described the many ways that we can add water through EME and eventually through PSR mods that would add to that as well.

But I'll ask Jack to expand now.

MR. VECCHIARELLI: For the record, Jack Vecchiarelli. I am the manager of Pickering Relicensing.

Just like to build on what Mr. Gregoris mentioned regarding the probabilistic safety analysis or PSA. In compliance with the regulatory requirements for PSA, we have included for the Pickering plant a comprehensive assessment of seismic hazards and quantified the associated risk. The risk associated with seismic hazards for Pickering is very low. The plant is very robust to deal with seismic hazards as well as other external type of hazards.

The seismic hazards that are considered cover a wide range of frequencies and magnitudes. The underlying scenarios, or postulated seismic events, consider information that dates back to hundreds and thousands of years based on paleoseismological evidence, so

it encompasses a wide range of information, both empirical and expert judgment-based. The resulting risk metrics, in particular severe core damage frequency and large release frequency, they meet the safety goals. This is a very strong indication of the robustness of the plant for seismic hazards.

THE PRESIDENT: Thank you.

Any other questions?

MR. LOCKWOOD: Randy Lockwood, for the record.

I'd just add to maybe simplify all those comments and speak to your question directly, President Binder, and to add to Mr. Gregoris, the systems are chosen such so that we can shut down the reactor, right, cool the fuel, and contain the reactivity and ensure monitoring.

THE PRESIDENT: Okay. Thank you.

MS JANES: Mr. Binder, again, can I --

THE PRESIDENT: Just a sec. Just a sec. You'll have your chance. Just a sec.

Do you have a question?

Okay. Over to you.

MS JANES: I just wanted to mention something that came from the Northwatch brief to you, you funded them for intervention, and it --

THE PRESIDENT: Northwatch will be with us after dinner, so you're welcome to join us.

MS JANES: Yes. You will perhaps hear there about their comments that:

> "Additional safety, maintenance and / or operational issues with the irradiated fuel bays and associated systems include:
>
> - seismic capacity of the current spent fuel basket stacking arrangements in the Pickering IFBs not being adequately documented
> - seismic capacity of the Pickering 058...conveyor not being adequately documented"

So when they come, perhaps you could ask them about their comments on seismicity.

THE PRESIDENT: I'm sure Northwatch can speak for itself, so thank you for that.

MS JANES: I'm sure they can.

THE PRESIDENT: Any final comments you want to share with us?

MS JANES: Yes, I would like to say something here.

I've carefully read many of the presentations to this hearing, and it's clear that those of the public who support the life extension of Pickering are groups who legitimately fear for the withdrawal of all that Pickering offers to this community, that is, jobs, and support for important activities in many areas of their lives.

We would argue that not only would closing Pickering make theirs and millions of other lives of those living as far away as my hometown safer, but the many years it will take to dismantle, clean up, and in some cases solidify nuclear waste, as well as monitor and keep the site safe will help mitigate negative social effects of the station closures as it is being worked on their behalf by the Municipality of Durham.

We join with Ms Tilman and others in arguing again that the Commission should take the important mandated step of helping ensure public health, safety and security to persons and the environment by turning this application down.

Let's not have to come back again. Let's move forward to the status where we are stewards of this waste and we're going to keep it safe forever.

THE PRESIDENT: Thank you.

I'd like to move now to the next

presentation by the Durham Chapter of the North American Young Generation in Nuclear, as outlined in CMDs 18-H6.79 and 18-H6.79A.

I understand that Ms Urrego will make the presentation. Go ahead, please.

CMD 18-H6.79/18-H6.79A
Oral presentation by the
North American Young Generation
in Nuclear, Durham Chapter

MS URREGO: Dianna Urrego, for the record.

Good afternoon. I am the current public relations chair of the North American Young Generation in Nuclear, Durham Chapter. I have more than three years of experience in the nuclear industry.

I am here today with my colleagues to share our professional and personal reflection of what a Pickering licence renewal means to young professionals supporting the nuclear industry.

NAYGN is a non-profit organization whose purpose lies in bringing together young professionals working in the nuclear industry by providing opportunities to develop leadership and professional skills. The NAYGN Durham Chapter is, today, the largest and most active

chapter in Canada, and was awarded the best overall NAYGN chapter in Canada as well.

We support the Pickering operating licence renewal, as this facility has been safely operated since its construction. Currently, Pickering provides 14 percent of the province's clean and reliable electricity. Also, Pickering has been supplying the world with valuable radioactive isotopes used in global medicine, sterilization, food preservation, and fusion research.

With a Pickering licence renewal, OPG will continue to demonstrate its ability to safely operate nuclear reactors, with public and personnel health and safety as the overriding priority. The province will continue to benefit from this source of clean and reliable electricity, which not only supports the Canadian economy but also contributes strongly to our fight against climate change.

MR. SALIBA: Michael Saliba, for the record. I am the Durham Chapter VP, as well as a worker in the energy industry for four years, three of which have been with the nuclear industry.

For more than three decades, Ontario Power Generation has demonstrated its commitment to the community, environment, and safety. As young professionals, we have witnessed and been a part of this

first-hand. Due to their design, multiple safety systems and barriers, CANDU reactors are a proven, robust, and safe technology.

Pickering Nuclear has received the highest possible safety rating of "fully satisfactory" from the CNSC in the most recent safety report. A periodic safety review was performed by OPG in 2016, and subsequently was reviewed by yourselves in the CNSC. The evaluation took into consideration 15 broad safety factors. The report concluded with the following statement:

> "OPG is committed to [the] continuous safety enhancement at its nuclear facilities and has robust comprehensive programs in place aligned with industry best practices. The PSR identified no safety issues for [the] continued...operation of Pickering [Nuclear Generating Station] through [until] 2024...."

Furthermore, the International Atomic Energy Agency's operational safety review team independently arrived at the same conclusion following a 19-day review in September 2016, that Pickering Nuclear can be safely operated until 2024. This team was comprised of international nuclear safety and operational experts, with

a total of almost 400 years experience.

The report highlights a number of good practices, one of which is especially pertinent in today's hearing. The report stated that OPG's plant obsolescence program is very thorough, giving confidence that the plant's systems, stations, structures, and components will reliably operate with the same efficacy as when they were initially commissioned.

Personally, I grew up in the Durham Region with a father who was a plant manager at the Pickering Nuclear Generating Station, and I recall during my first job, my first day at work at the car manufacturing plant at Chrysler, he pulled me aside and handed my lunch pail and said, "Don't forget your lunch, but also work safe, home safe", an OPG mantra that stuck with me throughout time and I believe I will pass on to my children.

Our personal experiences, as well as the evidence provided by industry leaders, leads NAYGN Durham Chapter to trust in a future lead by Pickering Nuclear, and we are advocating for its continued operation until 2024.

MR. GOODCHILD: Good afternoon. I'm Mark Goodchild, for the record. I'm the current NAYGN Durham Chapter treasurer, and I have just over two years of experience in the nuclear industry.

Today, it is my absolute pleasure to

highlight the importance that Pickering Nuclear has to the environment.

First, as you've probably already heard, Pickering Nuclear is a key contributor to reducing Canada's greenhouse gas emissions. It is estimated that keeping it open until 2024 will reduce emissions by 17 million tonnes, which is the equivalent of keeping 3.4 million cars off of our roadways each year. When we look around the world at other jurisdictions that have made the decision to close down their nuclear power plants, such as California, Florida, and Germany, this generation has been replaced by fossil fuel generators. In Germany, for example, key places like the Hambach Forest, are being demolished to get the fuel they need to power their country. It is likely that if Pickering Nuclear were to close today it would be replaced by fossil fuel generators. These have a greater environmental footprint, as well as higher costs. Pickering's contribution to helping Ontario reach its carbon dioxide reduction targets cannot be understated.

The next point I'd like to highlight is nuclear power has a very efficient land footprint when compared to other forms of generation. Nuclear power can generate 30 times more power when compared to solar power, and 15 times more when compared to wind per unit area. This means nuclear power delivers more power with a smaller

footprint, allowing more liveable space for our communities, our friends in the wildlife, and vegetation.

Thirdly, OPG and Pickering Nuclear have been excellent stewards of the environment around their sites. For example, in 2017, Pickering was recognized by the Wildlife Habitat Council for its biodiversity and conservation work. The programs that were recognized include the peregrine falcon nesting and monitoring initiative, involvement in the bring back the salmon program, and wetland and woodland conservation work done around their sites.

All around the world regions are facing the impacts of climate change, and until a reliable green source of energy has been implemented nuclear power will have a role to play. Keeping Pickering open will reduce our carbon emissions, optimize our land use, and continue great environmental programs at OPG.

NAYGN believes that shutting down Pickering prematurely will cause irreparable harm to Ontario's environment.

Thank you.

MS PALINKA: Karissa Palinka, for the record. I am the current membership and networking chair at NAYGN Durham. I have a Bachelor of Science degree in Chemical Engineering. I'm proud to say that I was raised

right here in Durham Region. I have two years of experience working in the nuclear industry.

Having grown up in Oshawa, I'm very familiar with Ontario Power Generation and the impact the company has on the surrounding community.

Aside from the economic benefits of having such a large technical employer in the region, Pickering Nuclear has been an engaged member of the Durham Region community for over 40 years.

Today, OPG Pickering provides charitable not-for-profit support to over 140 grassroots community initiatives annually in Pickering, Ajax, and Whitby.

Last year, Pickering Nuclear employees raised over $35,000 to support established local charities such as United Way Durham Region, Grandview Children's Centre in Oshawa, the Humane Society of Durham Region and Nova's Arc.

Other community initiatives connect Pickering Nuclear employee volunteers directly with community members. Operation Clean and Sweep which is co-hosted by NAYGN Durham is a semi-annual initiative that links volunteers with elderly homeowners to assist in yard maintenance in both the spring and in the fall.

I've personally attended this event for the past two years and it's always a delight to see the joy

on seniors' faces after helping them clean up their yard.

As an engineering-based company, OPG recognizes the importance of education and developing strong communities. Pickering Nuclear fosters scientific curiosity by partnering with scientists in schools to send engineers and scientists into classrooms at both the elementary and high school level.

At the post-secondary level, Pickering Nuclear has strong ties with local schools such as Durham College and University of Ontario Institute of Technology and provides co-op and internship opportunities for numerous students every year.

In conclusion, we believe that Pickering Nuclear is an excellent corporate citizen and neighbour who consistently demonstrates a strong connection with the host community.

Pickering Nuclear through its charity support, volunteer initiatives and commitment to educational excellence directly improves the well-being of Durham Region. As such, NAYGN Durham Chapter is advocating for continued operation of Pickering Nuclear through to 2024.

MS URREGO: Diana Urrego, for the record. As young Canadians seeking to continue to enjoy the high quality of life Ontario affords, we rely on clean,

dependable electricity supply power to our fast-paced lives, from charging our phones and computers every day, to powering advanced life-saving medical equipment to eventually replacing carbon fuels as the primary vehicle fuel source.

NAYGN Durham Chapter strongly advocates for the continued operation of Pickering and its license renewal to 2024.

We believe continued operation of the plant is in the best interest of the residents of Pickering and the surrounding community as an excellent neighbour and corporate citizen, Ontarians in general, and as an inexpensive, dependable source of baseload power and Canadians at large, as a 99 per cent carbon-free energy source that will help us meet our Paris Agreement emissions target.

Thank you for considering our statement in your decision.

THE PRESIDENT: Thank you. Question? Dr. Lacroix?

MEMBER LACROIX: Well, thank you for this dynamic presentation. I really appreciate it.

You're the future of nuclear power in this country, you're the future of the industry. Are you concerned about this industry? Are you concerned about

knowledge transfer? Are you concerned about the recruitment of a new generation in nuclear power?

MR. SALIBA: Michael Saliba, for the record. It's funny you speak to that. As you were asking some of the previous interveners, you've asked for the biggest risk you saw to the nuclear industry, and the question that came to my mind was definitely knowledge retention and we have a very skilled, technical taskforce that we've built up in Canada by choosing the CANDU technology and we have individuals, designers, individuals who have committed themselves to the industry. And I believe knowledge transfer is the key focal point, the pivot if you may, and OPG does hire new graduates from UOIT and is partners with these universities to continue that focus.

And as long as OPG can continue to provide that and have that knowledge transfer, I believe there is no threat to the industry and I am looking forward to not only having CANDU through to 2024, but also small modular reactors or other future CANDU Gen 4s in the future of Ontario and Canada as a whole.

Thank you.

MEMBER LACROIX: Thank you. Thank you.

THE PRESIDENT: Ms Penney?

MEMBER PENNEY: Thank you very much for

that presentation. Very interested in the scientists in schools. You said that your organization supports or works with promotion of STEM science, technology, engineering, and maths. Is that correct?

MS PALINKA: Karissa Palinka, for the record. Yes, we are working to get members of NAYGN Durham into schools. Maybe Diana can speak more to that, but just within our Executive and our membership base, we're very engaged to have lots of female representatives on our Executive Committee and in our membership base as well.

Diana, do you want to speak to the school initiative?

MS URREGO: Diana Urrego, for the record. Currently, NAYGN Durham Chapter is planning on an initiative for high schools and elementary schools. We are preparing a presentation to explain to young generation, young kids how nuclear power is made.

We are very interested in targeting the elementary schools and high schools because we believe that from understanding and education we can actually make more women to come into engineering, more young generation to come and work in our nuclear plants.

So, that's something that we are working on and we believe strongly that education is the power that we need for bringing new generation in engineering and STEM

as you were asking.

MEMBER PENNEY: Thanks very much.

MR. LOCKWOOD: Randy Lockwood, for the record. I appreciate the Commissioner calling out that they are the future of the industry. I, too, agree and I would just like to acknowledge that I feel our industry's in good hands and our company's in good hands.

THE PRESIDENT: Go ahead.

MEMBER BERUBE: Yeah, I love what you're doing actually, it's really critical that you sit together and get organized and figure out what you're going to do with your future.

To that end, because of the fact you're starting in your careers and we have a lot of people over here that are maybe a little later on in their careers with a whole lot more experience in this particular technology and area.

Have you actually considered a structured mentoring program? Is there anything on the books with OPG, for instance, or with employers that you might be working with in the nuclear industry where you've actually got something that's absolutely set up firm and being monitored?

MR. SALIBA: Michael Saliba, for the record. When I was hired on by Ontario Power Generation I

was -- went into the mentor/mentorship program. So, we do have something in place at our facilities, both Pickering and Darlington, to have the new graduates come in, have someone who's kind of been in there, not for too long, but for five or so years to mentor the individuals on how to get attention from your supervisors to how to escalate and advocate for issues in the plant.

So, there is a structure already for those items, however, sometimes being a new employee you're kind of shy to the industry or you may be shy to having higher powers above you.

So, there is a program in place right now and I'm transitioning now to becoming a mentor for the mentees that are coming in, the new generation.

MS URREGO: Diana Urrego, for the record. In addition to the support that we receive from OPG in regards to mentoring, NAYGN promotes that networking among new hires and senior management in regards to that to have mentors, to have that relation and to establish those relationships from the very beginning of their careers or our careers. Presently, I have a mentor as well in the company and I agree that it's something that is very powerful and helpful.

Thank you.

MEMBER BERUBE: So, one of the biggest

concerns you brought up was that of knowledge transfer. One of the most effective ways to transfer knowledge is senior mentorship, junior upcoming leaders and to tag them very early, as you are probably well aware.

So, if you have something structured as people are leaving, thinking about leaving, certainly that would help bridge that gap fairly effectively.

MR. GREGORIS: Steve Gregoris, for the record. I'm going to ask Jason Wight, our Director of Engineering, to speak to mentoring and the knowledge transfer program.

MR. WIGHT: Jason Wight, Director of Engineering for Pickering Nuclear.

First of all, I do agree our future is in good hands. I would like to comment first on STEM because that came up.

We actually do incorporate STEM in a lot of different activities and we talked earlier about our X-Lab and our Innovation Centre.

We had STEM come to the Innovation Centre. One of our employees, part of the X-Lab and the innovation Centre is female and had a great experience exposing everyone to what we can do in nuclear power and it was a really great experience for everyone.

With knowledge management, so we

understand its importance, we understand its importance for nuclear, we understand its importance for the future of engineering, especially as well, and knowledge retention.

So, the approach we take is very systematic, it's very multi-disciplinary. Mentorship is a key part of that, whether it's a new employee or whether it's an employee that's been there a while. There's different types of mentors. There's mentors for engineers and there's mentors for leaders, as well. And, we treat that very seriously.

We have a qualification process for every role, which is part of the knowledge retention. We do have knowledge retention matrices. So, basically, based on the technical expertise of each individual and what we expect of them, we put a matrix together to make sure that we understand their critical role and how that knowledge is being transferred as time goes on because throughout the business we like to move people to different positions, get different experiences and it's important that we capture that retention plan.

We do a broad scope interview. We actually use external vendors to come in to take a look at our knowledge retention; where we're weak, where we can help transfer information to protect the critical information in our business.

We do incorporate it in business and succession planning. It's very important for us to make sure that that's captured and we also use that in talent and recruitment, as well. The UOIT diploma program -- so, we talked a bit about the partnerships with the UOIT and I do want to talk a bit about it, it means a lot to me as well.

What it is, it's a four-course diploma program, a graduate diploma program. So, once an individual has graduated from university, they come working for OPG and, as an engineer, you are required to take a graduate diploma program in either design or in operations in order to keep your job. It's one of those activities that we use to actually promote experiences and a higher understanding of nuclear energy and nuclear power, and what it takes to be a nuclear employee.

We've had great feedback from everyone that has taken that course and part of that development we've used, you know, former chief nuclear engineers at Ontario Power Generation, we've used externals at the Bruce Power plant as well. Some very good experiences in that opportunity.

We also have for mentorship an accelerate program. An accelerate program is identifying high potential individuals that could be future leaders in the

organization and put them through kind of the paces and different experiences to help them stretch themselves and we give them some education, some leadership opportunities, some teaching opportunities to help them accelerate in their career. I think that is very important.

So, as you can see, there is a lot that we do with regards to knowledge retention and management because we do care quite a bit about it.

MR. SALIBA: Michael Saliba, for the record.

Just to add to that, I am a graduate of that graduate diploma program and if you haven't gone to it maybe you're not sure, but UIT does hire individuals who were past shift managers and ANOs, so the knowledge retention is also from that aspect. Although they are retired, they come in, have education training; not so much for themselves, to be able to teach students, but once they have that, then they are able to transfer their own knowledge not just by the books but in the field, and have that knowledge given down to new graduates as well.

THE PRESIDENT: Comments? Go ahead.

MEMBER DEMETER: Thank you very much for your presentation. I always appreciate the opportunity to learn from others and how they approach problem solving or communication, especially risk communication.

So when you're with your colleagues of your generation and you say, "I work at a nuclear power plant" and they want to know about radiation risk, what phrases or how do you approach risk communication to your generation about radiation?

MS URREGO: Diana Urrego, for the record.

I have had those questions and I have mentioned that before for my family they are really afraid of nuclear and here as well with the people that I relate that are not in the nuclear industry. They always come with that question. That's why our purpose of education.

I think that everything -- the way I usually approach it is by informing people with facts, with real facts. I think that that is the key. That's the way I approach it. Obviously I don't go in details, in technical details, but it is important the people understand what nuclear power is, how it is generated, and all the risks that are around it but, at the same time other things -- there is more things that we have done to actually contain all that risk and prevent and mitigate that risk.

So that's the way I approach it.

MS PALINKA: Karissa Palinka, for the record.

Just to add on, I have several family

members that are in the medical industry as well as one of my cousins is actually an airline pilot. I find it useful to just compare in terms of dose. The OPG lives by the mantra like as low as reasonably achievable. So we track dose and it's -- the amount that I have taken like the past two years of working in the nuclear industry is minute compared to those experienced in the medical industry or in aviation.

So I think just putting it in context for people, really helps understand better.

MEMBER VELSHI: You talked about having courses at UOIT. So approximately what percentage of your time is spent on training and development?

Or maybe OPG, you can answer it.

MS PALINKA: I'll take a stab first. As a new employee coming, I didn't have a background in nuclear. I studied chemical engineering, and I found the training program that OPG puts their new employees through, amazing. At the beginning, obviously, there is a lot more of a learning curve. So they do send you on more training initially. However, the continuing training through the graduate diploma program and just the opportunities to take various training courses of interest is fantastic.

I wouldn't be able to put into a percentage, but I know that my personal goal is to do at

least one day of training per month, in addition to the graduate training diploma, which is about three hours a week during a semester.

MR. SALIBA: Just to add to that -- Michael Saliba, for the record -- I know OPG mandates 40 hours of continuing training per year for an individual. However, I know of colleagues of myself far exceed that.

From NAYGN we are able to bring in continuous learning, lunch and learns from our partnerships with the CNL, with the CNSC, with other individuals in the nuclear industry, as well as opportunities that come and arise. Our measurement is definitely very responsive and it is onboard with us going out and receiving some new training.

MS URREGO: Diana Urrego, for the record.

Maybe I will not be able to, as like my colleagues said, put it in a percentage or hours, but the thing that I know and I have learned since I started working at OPG is training is priority number one. That's the way we take it.

MEMBER VELSHI: After safety, though, I hope?

MS URREGO: Yeah.

--- Laughter / Rires

MEMBER LACROIX: Yes, I cannot help

observing that you've contaminated this Commission with your enthusiasm. Thank you very much.

This morning or earlier today, we had a presentation by the Member of Parliament, Mr. O'Toole, and he mentioned to us that he created a caucus on nuclear, so you should contact him.

MR. SALIBA: Michael Saliba, for the record.

Thank you. He has actually come to our facilities and done one of our lunch and learns. And he is in contact with our Canadian Affairs Chair, Matthew Mairanger, for internal meeting between each other.

MEMBER LACROIX: I have a question for you. Is there an age limit to join your organization?

MR. SALIBA: Michael Saliba, for the record. There is no age limit to join the organization. However, you must be under 35 to hold a position of leadership.

MEMBER LACROIX: I just missed.

--- Laughter / Rires

MR. SALIBA: But feel free. I'll send you an invite later. Thank you.

THE PRESIDENT: Anything?

Okay, back to real business here now. On page 4, I forgot all about the OSART mission that you

mentioned -- maybe for staff also -- and I wasn't aware that the OSART people actually commented on the feasibility of going beyond 2024. Is that true, and how come nobody talked about that?

So thank you for that little observation here.

I mean that's a peer -- this is the IAEA peer review, right? Maybe OPG can start?

MR. LOCKWOOD: Randy Lockwood, for the record.

Specifically you're asking -- your question, did OSART look at us going beyond 2024?

THE PRESIDENT: Well, the intervenors claim that IAEA after 19 days of review, commented about the obsolescence of management, the challenge of maintaining the components -- structural.

So nobody mentioned the fact that an international group of experts taking a look at your plan here and have some comments on this.

MR. LOCKWOOD: Yeah. Randy Lockwood, for the record.

OSART came as you said, back in September of 2016, 19 members from all over the world. They did an extensive review for anyone that's been involved in an OSART. In the end, they concluded that our management was

focused on improving operational safety. They left us with 10 recommendations, 11 suggestions and eight good practices in 13 different focus areas. All but two are closed at this point, one of which if you're about to ask me, was the fitness for duty associated with drug and alcohol testing. As the Commission knows, we are working our way through a plan to implement that.

THE PRESIDENT: Did they talk about the fitness of the fuel channel?

MR. JAMMAL: Its Ramzi Jammal, for the record.

The OSART mission did not look at the technicality with respect to the OSART mission. The OSART mission looked at -- it's operational safety. In addition to the report itself, we had staff who were observing it, but it was a logical extension with respect to leadership, management, capability, procurement, process, and so on and so forth. But they did not technically review the periodic inspection program, the testing with respect to pressure tubes or fuel channels.

The key point here is the OSART and the international missions, what they do is they compare the operations or the regulator against the safety standards of the IAEA. But there was no -- for the record, there was no discussion associated with the fuel channel or life

extension of the fuel channels.

MR. FRAPPIER: Gerry Frappier, for the record.

I have the OSART report here. So if you can give me -- there is three good practices that the IAEA team noted. One was:

> "The plant sponsors a community-based education and leadership development program that engages partners such as local universities and theatre groups. The long-standing program which includes mentoring for high school students and other components provides a form for the plant to educate the public on its operations while also promoting environmental awareness." (As read)

The second good practice was:

> "The plant has developed an effective program to manage the supply of spare parts ...[So that's against the aging management.]...for aging equipment, which takes into consideration long term operations and transitions to decommissioning." (As read)

And the third good practice was:

> "The plant is ensuring that new residents who move to areas near the plant are included in the distribution of iodine pamphlets."
>
> (As read)

So those were the sort of three good practices.

I'll let you add that.

Alex is going to add something here as well.

MR. VIKTOROV: Alex Viktorov.

Again, OSART's focus is mainly on operational aspects of plant performance and there are some recommendations and suggestions, and also good practice is noted. In particular, with respect to aging management, there was a good practice noted that bears on long term operation. I will read it:

> "Obsolescence management taken into consideration, the long term aging management assessments and transition to decommissioning requirements."
>
> (As read)

So that was, as I mentioned, as a strength in Pickering.

THE PRESIDENT: Okay, thank you. I just wanted to know what that was all about.

You have the final thoughts. Do you want to share with us?

MS PALINKA: Yes, just thank you for this opportunity. This is a unique experience for all of us and it's great to be able to promote nuclear power for the young generation.

THE PRESIDENT: Thank you. We are going to break for dinner. Okay. We are coming back at 20 to 7:00.

--- Upon recessing at 5:47 p.m. /
Suspension à 17 h 47
--- Upon resuming at 6:45 p.m. /
Reprise à 18 h 45

THE PRESIDENT: Are we ready to go?

The next presentation is by Northwatch, as outlined in CMDs 18-H6.55 and 6.55A.

Ms Lloyd, the floor is yours.

CMD 18-H6.55/18-H6.55A

Oral presentation by Northwatch

MS LLOYD: Thank you, President Binder and Members of the Commission.

My name is Brennain Lloyd and I am presenting on behalf of Northwatch.

Northwatch is our regional environmental non-governmental organization in northern Ontario.

I want to begin by acknowledging that we are on the territory of the Haudenosaunee Confederacy, including the Mohawks of the Bay of Quinte, who you've heard from earlier, and also of the Mississauga Anishinabek.

Our interest in the Pickering Nuclear Generating Station is with respect primarily to the short, medium and long-term management of the radioactive waste that will be generated through continued operation and are already on site.

Northwatch's three key areas of focus in the licensing review are: OPG'S management of the irradiated fuel, including while in the irradiated fuel bays; OPG's preparedness for the transition from preliminary decommissioning to actual decommissioning; and OPG's overall approach to the management of radioactive

waste that generates over various timeframes.

With the management of radioactive waste of irradiated fuel, this is the lasting legacy, the most lasting legacy of using nuclear reactors for the generation of electricity. In the case of the Pickering Nuclear Generating Station there are definite concerns around the waste in condition in the irradiated fuel bay.

There have been, at least since as far back as 2007, chronic leakages from the irradiated fuel bays and despite multiple instances of being directed by the CNSC to correct issues associated with the irradiated fuel bays, Ontario Power Generation continues to lag in repairs and in addressing these issues.

And these include, to date, uncompleted repairs and issues identified with associated equipment and also with availability of space in the irradiated fuel bays.

In the Periodic Safety Review there was a corrective maintenance backlog across all bays and systems identified and this, President Binder, I think is an issue that you pursued in the Day One hearings. And it is certainly an issue that we share your concern about.

In particular, the review noted that the IFB leakages from the IFB to collection sumps had been increasing since 2007.

In the April 2018 CMD H6 by OPG they indicated that in 2013 OPG initiated repairs -- and this is I believe to the sumps -- and they were expected to be completed by the end of 2017.

By the June CMD, H6-1B, they indicated that the repairs would be completed by September 2019.

So I think it's still very much a work in progress, or we hope progress is part of that description.

In more than one instance the CNSC Staff or OPG documents emphasized that there is no off site -- oh, sorry, I missed an item.

One of the concerns that flows from this is the contamination of groundwater, tritium contamination of groundwater in the vicinity of and, as we understand it, coming from the irradiated fuel bays and associated workings.

In more than one instance CNSC Staff or OPG documents emphasized that these groundwater contaminants are not going off site. But I think that we have to look at that in context. It's a relatively large site and it doesn't mean that there's not extensive contamination just because it's not going off site. And there are indications that there is tritium in the perimeter wells.

So it's difficult to accept that it's not

going off site when it's in evidence at the perimeter wells. Logic sort of doesn't fit with that.

In the age of impending closure decommissioning, and I think OPG's vision is site release, there will be no off site.

So I think the groundwater contamination and the chronic problems with the irradiated fuel bays travel together, and I think that it is really quite disturbing that they have been so long standing and the date for repair resolution appears to still be moving off into the future.

The irradiated fuel bay capacity I think needs further examination. We did raise this. We've heard from OPG that there is sufficient capacity but we're not actually yet confident of that.

From the number crunching that we did, it was difficult to determine. But even if under normal conditions there is sufficient capacity, there are other conditions where that capacity, different scenarios where that capacity might be reduced.

I think one is impingement on fuel bay capacity. Another would be upset conditions where one or multiple reactors had to be emptied rapidly. Another is upset conditions which would require the return of dry storage containers to the irradiated fuel bay.

We haven't had discussion of that in the context of this licensing but there has certainly been discussion of that in other reviews when we were looking at licensing, for example, last year of Pickering Waste Management Facility. And we have at various times posed the question of: What happens when the dry storage containers, when there's a failure?

And OPG has said well, we just do it backwards. We just put them back in the irradiated fuel bay. Well, I think that raises issues around capacity.

But returning to that first one, impingement on fuel bay capacity, according to the Periodic Safety Review there is already existing impingement on fuel bay capacity.

I will just quote from the Periodic Safety Review: Recent field walk-downs have identified unusable space in each of the bays.

And it goes on and it counts up to equivalent of five reactors' worth of unavailable space.

And this is, as I read the document, basically due to clutter.

So I think there is already impingement.

We have heard from OPG that yes, there is capacity. I can't really say confidently that their quick answer on that addresses these additional concerns around

impingement and upset conditions.

There are continued concerns with irradiated fuel transfer, and these are issues that we raised in the Pickering Waste Management Facility licensing review last year. I know not all of the Commissioners were there at that time, but I think they continue and are perhaps even elevated, having read the Periodic Safety Reviews for this station.

Dave Lochbaum from the Union of Concerned Scientists had flagged for us last year the risks, the concern around fuel drop as the fuel is being transferred out of the irradiated fuel bay. At that time we didn't contend that it was an elevated risk. We just weren't confident that the risk was properly evaluated and identified.

As we read the Periodic Safety Review and came to get some window into the world of equipment, spare parts not being available, equipment breakdowns, equipment being basically just not up to snuff, that risk of fuel drop raised for us again.

And as we said last year, Dave Lochbaum said we weren't contending it was elevated. Well, maybe it's a bit more elevated now, having read the Periodic Safety Review and having got a little sense of the state of disrepair of the associated equipment.

We make a number of recommendations with respect to that.

And I see that I am down to less than a minute once again.

I just want to say that in terms of preparedness for closure and decommissioning, we think that both OPG is not in a state of readiness nor is our regulatory framework in a state of readiness.

In terms of radioactive waste management, OPG continues to rely on the "it will go away" strategy. And I think that there are uncertainties with both the proposed geological repositories.

I would be happy to discuss that at whatever length you would tolerate.

In terms of the radioactive waste management more generally, we continue to have some of the same deficiencies around information available.

And additional issues include continuing issues around the safety control areas and how they are expressed and calculated and issues around the overall acceptability and the non-acceptability of OPG having applied for a ten-year licence and applied to extend to 2024 when clearly in 2013 the discussion was all about 2020. And it was a stretch to let them go that far.

Thank you.

THE PRESIDENT: Thank you.

Questions?

Dr. Lacroix?

MEMBER LACROIX: Yes. Now I would like to hear about the irradiated fuel bay from OPG, safety concerns, management problems, challenges.

MR. LOCKWOOD: Randy Lockwood, for the record.

I would like to address a number of these items. But first and most important is the backlog made reference to by the intervenor.

I completely disagree. We've reduced the deficient backlog by over 90 per cent, and I will come back to that.

Most important is the CCs and CNs, most critical work order backlog across the site: zero. Not per unit, not some things on fuel handling. Across this site, zero.

And it's been like that since the start of this year.

That's industry best, by the way.

The second category is deficient.

We set a target this year across the station of driving the backlog and deficient down to 15 per unit, work orders per unit.

We are about ten or 11 per unit now already, only halfway through the year.

Associated with fuel handling there is no CCs, as I said. There's none across the site. There's nine DCs, second priority, and only one associated with the fuel bays.

And it is assessed, meaning it has parts and people assigned, and scheduled to be completed by September of this year.

In terms of fuel bays water leaking to the groundwater, absolutely incorrect.

I will say in front of the Commission there is no water leaking from the IFBs to groundwater.

MR. MANLEY: Robin Manley.

I'm just going to add a couple of quick points and then I'm going to pass it back to Lise Morton.

As the intervenor herself has pointed out, many of these issues were already spoken to in the 2017 Pickering Waste Management Facility hearing and addressed at that time. So a lot of this is repeated, such as, for example, the irradiated fuel transfers and the dry storage container drop, and also the question about sabotage and the security of these containers while in transit.

Maybe Lise can speak to the kinds of things she's responded to in the past.

MS MORTON: Lise Morton, for the record.

To continue with what Robin Manley is saying, and the intervenor noted, Pickering Waste Management Facility has its own licensed facility, and we discussed that facility at length last year in the ten-year licence renewal for that facility.

So just on a couple of the items.

We did discuss last year and I will just reiterate that with respect to the transfer of dry storage containers on site, they occur within the site boundary of the Pickering site. Therefore it never travels on public roads. It's always at all times accompanied by a nuclear security escort.

We have a very robust transportation security plan which is submitted to the CNSC, and we produce a design basis threat document which complies with requirements in the *Nuclear Security Regulations*.

With respect to the drop of the DSC, again we discussed that last year at the Pickering Waste Management Facility licence. I'll give just a little bit of information and then Carlos Lorencez can certainly speak to that further with respect to the drop in the pool.

But with respect to a drop of a DSC during transfer again, that's one of the modelled scenarios for a DSC drop during transfer across site, and the dose

consequences are acceptable on that and less than 1 per cent of the limit.

But, again, Carols Lorencez can certainly speak to the drop of the DSC in the IFBs themselves.

MR. LORENCEZ: Carlos Lorencez, Director of Nuclear Safety. That is correct, the safety analysis that we have for Picking includes the drop of DSCs inside the irradiated fuel bay, several metres above the level of water. Also the other accident is dropping the DSC on top of the pool deck. In both cases the consequences, the releases, the dose is very well within the regulatory limit.

So those accidents have been deeply analyzed and we are ensuring that the safety of the employees and the public is assured.

MR. WIGHT: Jason Wight, Director of Engineering, for the record. I'd also just like to talk a bit about the IFB and the reviews that we've done for the IFB itself. So as part of the PSR review a Safety Factory 2 report, which is actual condition of structure, systems and components important to safety, we have concluded that the programs in place and that the IFBs and supporting equipment are in good condition.

Action came out of that, is complete, and that is the IFB condition assessments. The action plans

are implemented and incorporated into station health reports. That's important to know.

We've also had that integrated in to our aging management plan. That includes inspection, includes maintenance, monitoring, to manage any vulnerabilities and maintain their operating margin with regards to the IFB, and that's also included into system health reporting and system health monitoring.

With regards to the one concern of the PSR and the documentation, it is not a safety issue, it is specifically an administrative issue, a documentation issue, which will be updated into the safety report for the next revision.

THE PRESIDENT: Can somebody tell us, did you have any fuel drop recently. Staff, I assume that would be a reportable event. So can somebody give us statistics? Does it happen? Does it happen often? Did it happen at all?

MS MORTON: Lise Morton, for the record. We have had no fuel drops.

THE PRESIDENT: Not ever or the last few years, or what?

MS MORTON: Lise Morton, for the record again. I'll speak for during the transfers of DSCs. We have never had a fuel drop, and I'll just get Carlos

Lorencez to confirm in the bays.

MR. LORENCEZ: Carlos Lorencez, for the record. That is correct.

THE PRESIDENT: Staff, do you want to add?

MR. FRAPPIER: Gerry Frappier, for the record. We would concur with that.

THE PRESIDENT: Ms Velshi?

MEMBER VELSHI: So I'll ask the intervenor, how do you reconcile what you have told us about these chronic leakages, increasing since 2007, and repairs that are not completed, and then we hear from OPG categorically incorrect?

MS LLOYD: Well it's difficult to reconcile. I mean, I can only go by the documentation that I had available before I walked into this room. So it's difficult. I mean, Mr. Lockwood seems upset, I'm sorry for that, for him, but I can only say what I know for the records that are before us.

I find it very difficult to reconcile him making an absolute categorical statement there are no leaks when the documents say there's been chronic leaks and there are outstanding repairs.

So I don't know how to reconcile that. I would wish that when they're going to make those categorical statements it was referenced, it was

documented. You know, we see this happen in the hearings over and over again where OPG can make statements, sometimes they make statements that I will then go back and look and check, and I think, ah, not quite.

They made statements in Bruce about the inventories that are available in the preliminary decommissioning plans. They were not the comprehensive inventories that they implied were there. I look and they're not there.

So it's a challenge, it's maybe one of the most difficult things as an intervenor, is that we do our best, there are thousands of pages, we do our best to read them, summarize them, identify the issues that we think are most important for your consideration, and OPG can come and say whatever categorical statement they like to make.

It's not referenced, it's not documented, and it won't be even when we leave this room. I don't know that you'll ever get the documentation. I don't think you will get the documentation that follows up his statement, that there are no leaks from the fuel bays to groundwater.

THE PRESIDENT: Okay. Well, you raised a very good question, and that's what gave us reason to ask those questions.

So I'd like it to be reconciled right here and now. So we have inspectors, we have Staff that are

supposed to tell us who is right in this discussion. Staff?

MR. FRAPPIER: Gerry Frappier, for the record. So, as usual, nuclear power plants have some complex designs. So, in a sense, they're both right. So there is leakage from the IFB, but because the designers envision that, there is an area after that that leads down to a sump where that water can then be collected and processed and put back into the pool. So the water, although we consider it a leak from the radiated fuel bay, it's not a leak outside of the plant, it's a leak within things.

Still of concern though for Staff, and so we have been looking into it because we do believe that it's not supposed to be there or should be minimized.

In fact, just recently we had done an inspection on the irradiated fuel bay at Pickering, and I would ask perhaps Mr. Steve Cook, who was on part of that team, to give us a little bit of a sense of what we found.

MR. COOK: Steve Cook, for the record. Yes, last week we did inspection of the fuel bays. The focus was on the epoxy line or repair work that was being done. But we also wanted to follow-up on some other issues, you know, that were looked at in the past.

For example, in 2015 an inspection was

done of the bays, there were a number of action notices that were -- two action notices that were raised with respect to maintenance backlog. Those have since been closed.

We also wanted to go and have a look at the EME equipment, so we did that.

As far as the bay goes, we just want to be clear that there's a difference between the epoxy liner leakage and the concrete structure integrity. So OPG has in place an epoxy liner repair program, we've completed Phase 1 of that repair. They're into Phase 2 now, and Phase 2 should be completed by December 2018.

The leak rate, we have seen it come down. It was originally around 2,000 litres per hour, it's now down to about 200. We verified that through sampling, sample data.

Also so we want to make sure it's clear that that leaks is to the interspace between the inner bay and the outer bay, the IFB. There's two structures, and so any water coming from the liner leakage goes to the sump and can be re-circulated back into the bays or through their decontamination sump.

THE PRESIDENT: So I understand what is being said here is no leak to the groundwater, but there is a leak that is being contained. So that why you're saying

both right?

MR. LOCKWOOD: That's correct, and I was very clear to say there was no leakage of irradiated fuel bay water to the groundwater --

THE PRESIDENT: But it's still of a concern to you, why? Why is it a concern if it's still being captured?

MR. FRAPPIER: Gerry Frappier, for the record. So as part of our compliance program, we are always looking to ensure that the design is working as it was intended to, and certainly the liner is intended to keep the water in the irradiated fuel bay, and we would like to see that repaired so that we don't have such a leakage.

Although, it perhaps is not a very high safety significance, and that's why we haven't increased our enforcement action, if you like, beyond doing inspections, getting some action notices. We still think that the overall maintenance program has to be such that it's --

THE PRESIDENT: So just to close this. So the intervenors say that this is chronic, it's been around for a long time. Why is it taking so long to fix it?

MR. FRAPPIER: I think OPG would be in a better position to answer that.

THE PRESIDENT: Well, it was an action item that you suggested they do, so why wasn't it done? I'm trying to understand who's overseeing what.

Go ahead while they're thinking about it.

MS LLOYD: Brennian Lloyd. While they're conferring, I'll just add in. I think -- I can see now that the categorical statement comes from the irradiated fuel bay, and I think that we should consider the irradiated fuel bay as a system. So if the way of dealing with leaks from the irradiated fuel bay, there was an intended strategy to maintain water levels in the collection sumps below groundwater level so that any leakage is inward rather than outward.

I considered that to be a fairly makeshift approach. So I don't think it's helpful to you or to us for OPG to make these categorical statements which they can technically make because he was saying the IFB not to the liner, not to the pump. I just don't think it's helpful.

Thank you.

MR. FRAPPIER: Gerry Frappier, for the record. So perhaps I'll ask Mr. Ed Leader, who's the Site Supervisor for the inspectors, to talk a little bit about when we started putting some pressure on with respect to repairing the liner.

MR. LEADER: Ed Leader, for the record.

I'm the Power Reactor Site Office Supervisor within the Pickering Regulatory Program Division.

We did initial inspections in 2014 and 2015 of the bay. We identified that there was equipment deficiencies, the corrective action backlog was high and that there was a liner repair that was required. OPG had a project in place, Project Number 1340703, to repair the liner. They were aware of it. Perhaps they could provide more detailed information on why it took so long to get the repair completed. We understand the tooling that was required to fix the epoxy liner had some problems with the original equipment manufacturer and the testing of that equipment had to be done outside the bay, they could not do the testing inside the bay, so it did take longer than they expected to make the final repairs. But as Steve Cook indicated, the repairs have now been completed for Phase 1 and Phase 2 is in progress.

MR. JAMMAL: It's Ramzi Jammal, for the record. I would like to complement what Ed has said.

The repairs for a fuel pool or the IFB is not trivial. As mentioned, they require special equipment. In addition to this special equipment, the Commission recalls that when repairs had to be done at Gentilly-2 they had to sometimes move the fuel so that the work is exported to the individual or the workers. So at G-2 they had

divers, they had equipment, they had everything else, so there is manipulation of the fuel. So why it took so long, that would be OPG. Staff kept an eye on it, but I would like to go back to the fact that with respect to risk, with respect to risk from the design itself, risk, is it being contained and recycled, is there impact offsite? The answer is no. So we apply the risk-informed decision-making, but the repair is delayed for multiple reasons, maintenance of the machine itself and the volume and the fuel in the pool that has to be managed accordingly, but it is up to OPG to determine how they are going to fix it.

THE PRESIDENT: Go ahead.

MEMBER BERUBE: Staff, maybe you can bring me up to speed. I mean when I was with Pickering they had two IFBs in service. Have they decommissioned one of them, is that what's going on, one of the main bays in operation or are both bays still functional?

MR. LEADER: Ed Leader, for the record.

There are actually three bays, IFB A, IFB B and the auxiliary irradiated fuel bay, and they are all in service.

MEMBER BERUBE: So which bay are we talking about here in terms of leaks then?

MR. LEADER: IFB B.

MEMBER BERUBE: Okay. Which is where?

MR. LEADER: It's on the B side.

MEMBER BERUBE: Okay.

MR. LEADER: It's 058.

MEMBER BERUBE: Okay. I know where it is now.

THE PRESIDENT: Ms Velshi...?

MEMBER VELSHI: So if there is a leak from the sump, presumably it will contaminate the groundwater, and if it's from the IFB, it's not elevated tritium levels that you would expect to see. So what are the groundwater levels around the IFB contamination levels in there?

MR. GREGORIS: Steve Gregoris, for the record.

So we are going to go and look up the information. Raphael McCalla is going to get you the exact numbers. We don't have that handy.

Just for perspective, I think Mr. Jammal gave an excellent summary of really what's happening here. So there was leakage from the liner in -- from the bay into the liner, it went to the sump. Those sumps are repaired, they are leak-tight now. Prior to those repairs we did see a change in our groundwater monitoring program, a change from baseline, and Raphael will talk to those numbers, but I can assure you that as soon as that was determined -- and

it gives I will say some credit to our robust environmental monitoring program -- as soon as we saw that change we went and looked, determined that the sump needed repair. We were able to immediately put in place an operating procedure to ensure the level stayed below the place where repairs were required. So we stopped anything from going to groundwater immediately. We then went in to repair both the sump and the liner. As you can appreciate, those are difficult repairs. Some of them are underwater, there was remote tooling using a crane, we had to move baskets around, and so that's why it took some time to do all those repairs. I can assure you in all that time we were not leaking to groundwater and we worked through those repairs. In doing the first phase of repairs, which took care of most of the liner leakage, there was some discovery work. So, you know, as we went and did the initial set of repairs, we saw that discovery work. In some cases there is some leakage and some of it is proactive to ensure no leakage going forward. So we see that as obviously prudent to do for the health of the bay liner and we will continue to do that.

I will just see if Raphael has the data now. You do? I'm going to pass it over to Raphael.

MR. McCALLA: Raphael McCalla, for the record.

So, first of all, I would like to assure the Commission that Pickering has a very well-established groundwater monitoring program. The program has been in existence for over 20 years and the program is designed to do three things: to confirm the predominant onsite groundwater flow characteristics at the site, monitor changes to the onsite groundwater quality to ensure timely detection of inadvertent releases, and also to ensure that there are no adverse offsite impacts from contaminants into the groundwater.

With respect to the actual value around the IFB, the tritium concentration, the maximum tritium concentration as measured in 2017 with 5.48 times 10 to the 5th Bq per litre, and I would like to assure the Commission that there are no offsite impacts. When you look at the perimeter wells for the site, the highest value that we see is around 5000 Bq per litre and that is in the southwest corner of the site. But if you look at the actual graph that the intervenor presented on Slide 5, what you see is you see a cluster around the actual reactor units themselves and the groundwater is actually localized in that area. The groundwater travels north and it actually is discharged through monitored pathways, but based on the values that we see in terms of tritium at the water supply plant, which was mentioned earlier, which is between 4 and

8 Bq per litre, we can demonstrate that there are no offsite impacts as a result of groundwater leaving the site.

MEMBER VELSHI: So I want to get to one of your reasons you gave was to see if there was anything abnormal happening. So when did you start seeing elevated levels in the groundwater monitoring around the IFB?

MR. McCALLA: If you can give me just a few minutes to actually pull that out of my report here, I can tell you.

MR. JAMMAL: Ms Velshi, it's Ramzi Jammal here, for the record.

From the CNSC perspective and in fairness to the intervenor, we do analysis and we do the trending. I will ask Mr. Mike Rinker to provide you with the information with respect to the tritium in the groundwater and the historical levels that existed at that site.

MR. FRAPPIER: I just want to be clear here because I know what Mike's going to be saying. So far we have been talking about groundwater coming from the IFB and I think we do have, as we mention in our CMD, concerns about groundwater contamination, but it's not because of the IFB. So I think Mike is going to give a wider scope of groundwater and where we are at with that. I just don't want to make it as a one-to-one connection to the IFB.

MEMBER VELSHI: So I just want to make sure you understand why I'm asking this. The intervenor has raised concerns that there are issues with leakage from the IFB into the liner, into the sump, and I just want to make sure how proactive OPG has been in trying to address that issue.

THE PRESIDENT: And just to piggyback on this, I understand they have all kinds of monitoring wells. Where is the data and do you -- like in many other sites you are monitoring the plume migration all the way from the site to the environment. Do you do it here too?

MR. RINKER: Mike Rinker, for the record.

So tritium is a bit different than many other constituents. First of all, the tritium that is released to the air becomes entrained in precipitation and moisture and so often you see the shape of what is in groundwater influenced not by groundwater plume migration but by aerial plume migration and entrainment to deposition. So that's very important for understanding the concentrations of tritium in the perimeter wells near residential -- in the direction of residential areas around the Pickering site, because the prevailing wind direction is what would influence those wells. Those wells are generally less than 100 Bq per litre around the perimeter. There is one well that is in the order of 6000 Bq per litre

to the southwest of the facility, so not in the prevailing wind direction, more influenced by site activities than what is being transported offsite.

And secondly, there is some historical groundwater contamination that dates back to the 90s and that is why you saw the intervenor presented a graph of monitoring locations. There's more than 140 locations for monitoring groundwater at that Pickering site, which is extremely intensive. Most of the monitoring locations are in and around the facilities because there was multiple sources of tritium leakage at that time. We have been monitoring the groundwater. There are annual groundwater monitoring reports that are submitted from OPG to us. The tritium levels in the groundwater have been stable for many years, on the order of decades, and so the mitigation measures that were put in place back in the 90s we're confident are not continuing to cause increases in tritium concentration in and around the facility and we're confident through our monitoring and the assessment of tritium in air concentrations that there isn't a significant load through aerial deposition that is going more towards the residential areas.

THE PRESIDENT: Go ahead.

MS LLOYD: Yes. Brennain Lloyd from Northwatch.

So, Mike, you said that it's been stable, tritium has been stable over many years, but now I am two years out of date, but the 2016 staff environmental assessment report said that in many cases concentrations have remained nearly constant or decreased, in a few cases tritium concentrations increased unexpectedly over recent years. That to me was another flag that there is an issue. I associated the tritium with the irradiated fuel bay. If there are other sources, that would be very interesting to know. We have requested the groundwater sampling results from OPG and they have declined that request, so it's difficult for us to understand what is actually happening at this site. So it's difficult to reconcile stable over many years with what's in your 2016 EA report.

MR. FRAPPIER: Gerry Frappier, for the record.

I will get Mike to add some characteristics to this, but there's sort of the actual groundwater itself as the major body of water that's under there and then there's responses that are measurements that are taken at the wells. You will remember that a little while ago we brought to the Commission concerns about some of the well -- the sampling that was elevating and actually OPG started an investigation and found some leaks with respect to the construction joints within Pickering itself

and those were determined to be the source of it and there has been a repair program for that. But perhaps I would ask Mike to give some more details around what the intervenor is talking about.

MR. RINKER: Mike Rinker, for the record.

So those events that Mr. Frappier is talking about were described in the CNSC staff's supplemental CMD. What I want to make sure that is clear, I don't want to give the impression that we are trying to minimize the issue of tritium in groundwater, we see this as a concern as well.

None of the samples that we are talking about the monitoring locations are drinking well or source of drinking water, they are monitoring wells to look for performance. And at the time of closure, moving into decommissioning, that reservoir of tritium is going to be something that is going to be very important to ensure safety when the decommissioning plans are put forward.

Now, the tritium reservoir is being maintained and contained by hydrodynamic isolation where drawdown, much like a tailings facility, you lower the water level so water flows into it, but eventually you're going to have to decide when you are going to stop that and we will be taking that into consideration, that that containment must be maintained in place until we are

satisfied that the groundwater reservoir is safe to do so.

THE PRESIDENT: Okay. Other topics?

MR. McCALLA: Raphael McCalla, for the record. I just wanted to provide the information that was requested.

So in 2013 is when we discovered elevated tritium concentration in the IFB and at that time the maximum concentration was 3.96 times 10 to the 6 Bq per litre. So the actual concentration has gone down by tenfold dilution, gone down by a factor of tenfold.

MEMBER VELSHI: And just before we leave this issue, so the intervenor said she has asked for this information from OPG. Is there a reason why that hasn't been disclosed?

MR. McCALLA: Raphael McCalla, for the record.

So in terms of -- we have talked about our environmental monitoring program -- environmental management program and one of the things we talk about is to ensure that we keep the risk to the public and the environment as low as possible. With respect to groundwater, our goal is to demonstrate that as well and the way we see best to do that is to provide the data for the perimeter wells because that is where the interface is between what's happening on the site and where it actually

impacts the public and the environment, so to speak. So in terms of the perimeter data, we have actually started posting that information and that was actually -- that actually was as a result of the Pickering waste management relicensing last year, where a request was made for information and we took that away to see if we could actually provide additional information. So we started in March of this year to provide perimeter data for monitoring wells and we have actually provided that information for 2016 as well as 2017 to the intervenor in response to the request.

MR. GREGORIS: Steve Gregoris, for the record.

I just want to restate for the Commission here. So our commitment specific to impacts of operation, so impacts of plant operation to the public, the workers and the environment are low risk and will continue to be of low risk and adequately mitigated. So we are committed to do that. And Raphael McCalla has outlined our extensive environmental monitoring program and with that our extensive program for monitoring groundwater on the Pickering site. We have demonstrated that there is no adverse impact offsite from groundwater and that we have an extensive program. The pertinent data that the public would want to know about, we publish that, we put it on our

website, we make it available. We also are sensitive to any changes and will respond to those changes in a quick manner to ensure that we address any pathways and we will continue to do that going forward.

THE PRESIDENT: Just -- and again, this is a commentary. You are measuring the impact on the environment and the perimeter and I think that's the right thing to do, but everybody knows that you also measure -- you have onsite wells and by refusing to release it you always get into this conspiracy theory, maybe you are hiding something, blah-blah-blah. So if your perimeter number is okay, I don't know why you are afraid to publish the whole thing, but I leave it up to whether it's a regulatory requirement or not, I'm not sure if it's a regulatory requirement as long as the perimeter figures are okay.

Let's go into another topic, please. Dr. Demeter...?

MEMBER DEMETER: I just -- I need to talk about it. This is going to come up again on Friday with the groundwater. So if you look at -- for staff, if you look at the presentation from the intervenor on Slide 5 and you look at all those purple dots, I take it that OPG shares with you the results for all those dots. Is that information protected or privileged in any way when you

receive it?

MR. FRAPPIER: Gerry Frappier, for the record.

So we do receive it, we have access to the information we want, but it is considered OPG information and they have asked us not to release it to the public.

MEMBER DEMETER: Okay. So Mr. Rinker had talked that in the end game with this, this is still going to be an issue of how to manage this reservoir, so it's not inconsequential and I think it would lead to some degree of certitude by intervenors and the public that if you are sure that there have been decades of stability in some of these, then it's a reasonable risk to manage. If it's a performance indicator, it's also a potential safety indicator. So I really disagree with this information not being shared, especially if it benefits your case. And if it doesn't benefit your case, I even want it more so shared. So I have to say I respectfully disagree with OPG's position on this and I'm not sure how they can compel CNSC to not release it if it's not security-related or privileged in another way, but that's my opinion.

THE PRESIDENT: Okay. I think we got the messaging here. Let's change the topic now. Ms Penney...?

MEMBER PENNEY: Thanks for the presentation. So I want to turn to one of your

recommendations, actually two of them. So I'm looking at your presentation here and I'm looking at Slide 11 and Slide 14. So I will just go back to 11 where you recommend that the OPG's decommissioning planning process be subjected to strategic environmental assessment under the *Impact Assessment Act* currently under revision. And you say to assess the various options using a science and evidence-based method that is transparent and participatory, knowing that OPG is going to have to come back to the CNSC for a decommissioning licence, because we are not -- that's not what we are being asked to consider here now, and knowing that under their Act, the NSCA Act they do, they currently do an environmental assessment, there would be a public hearing somewhat like this, like this, and there would have been an environmental assessment done in advance of it.

So my question to you is doesn't that meet your science and evidence-based method that's transparent and participatory and why do you feel that it needs to be subject to the currently under review IAA, *Impact Assessment Act*? And then I will ask the CNSC to comment.

MS LLOYD: Brennain Lloyd from Northwatch.

A strategic environmental assessment is different from a project assessment. A strategic environmental assessment typically would go before a

project. So if we had a strategic environmental assessment on OPG's decommissioning planning process or approach, that would develop the framework for decommissioning projects more generally, not just Pickering Nuclear Generating Station but Pickering Nuclear Generating Station Waste Management Facility, the other stations. So that is how a strategic environmental assessment is different from a project, and so the project -- and then there would have to be a determination made at the conclusion of that strategic environmental assessment whether there would also be a project-specific environmental assessment required or whether licensing could deal with the remaining -- the site-specific issues. That, you know, neither I nor I think my colleagues are down to that level of detail yet.

So a strategic environmental assessment has the benefit or the advantages of it's science-based, it's participatory, it's early. Now we're getting a little late to be early in the planning process for a Pickering decommissioning project, but --

MEMBER PENNEY: Well no, but that's 10 years out; right?

MS LLOYD: It should be early. It should be early in the process.

I think it would be of assistance to the CNSC because I think you've got a number of different

moving parts in terms of your decommissioning framework.

When someone asked -- and I apologize, I don't remember which intervenor's presentation it came up in -- but there was a discussion about the decommissioning framework yesterday. And Ms Glenn answered from the Ottawa office and she referenced the *Nuclear Fuel Waste Act*, which doesn't deal with decommissioning; the Radioactive Waste Policy Framework, which doesn't deal with decommissioning; the Joint Convention Report, which it describes the decommissioning sort of what I would call the ad hoc process used for Gentilly, Gentilly-2. It describes that, and it describes that there is decommissioning -- preliminary decommissioning plans required for the stations. But it doesn't -- it's not a substantive discussion.

The substantive discussions, to the degree that they are, are I would say G-219, the discussion -- the 2016 discussion paper on radioactive waste and decommissioning, which dealt only in a really limited way with decommissioning, and the CSA standard. And there are differences among those documents. Even the language is different. The CSA piece uses different language than the CNSC uses, and they're -- you know, I'd have to go back to my notes, but in one of those three pieces, end states are to be defined in preliminary, and in the other two pieces

end states are defined later. There's no real substantive direction around end state determination.

So there's a whole bunch of moving pieces. And I think a strategic environmental assessment can assist with that as well as providing a good framework for this very important first OPG decommissioning. I know we had Gentilly-2, but Gentilly-2 was very, very limited. There was no public hearing. The documents, all except one CMD, were in French. So it was very limited, you know, from my parochial Ontario, northern Ontario perspective, it was limited.

So a strategic environmental assessment could serve the CNSC very well, as well as providing that platform for future work on decommissioning.

THE PRESIDENT: I actually don't see -- just listening to you with all the moving parts, until we get a decision on DGR, until MPMO made their own determination of a particular fuel DGR, what a strategic thing will bring to the table that can facilitate beyond the preliminary decommissioning plan that exists now?

MS LLOYD: Because I think those potential or conceptual DGRs, they're about end disposition of the waste. There's a lot more, by my expectation, to decommissioning and decommissioning planning than end, you know, end disposition of the waste. Yes, there will be

fuel waste. Yes, there would be decommissioning waste. But there's a lot more to decommissioning.

I mean, there's the -- I think a fundamental question is characterization of the site. What's the end state objective, which I think certainly those framework documents that I referenced, CSA I think most clearly says there should be public participation in the determination in the development of those end state ... that end state is, you know, that's the really big-ticket question. How much ...

Now, there was one of the documents, I think it was CSA made -- no, it was the discussion paper made an odd separation between decommissioning and remediation. To me, decommissioning and remediation -- decommissioning is all about what's that site going to be like when you're done. To get there, you need -- and that's why I think they're late in the day, because certainly maybe OPG and CNSC have some sight of the -- sense of the site, how to characterize it. I don't think the Commission or the public do.

And so how do we start thinking about the end state, what's achievable, what are the steps towards that when we -- that information isn't even part of the discussion? In mining, you develop the closure plan before you open the mine, and there is progressive rehabilitation

throughout. This isn't a mine; I know. But I think the principle should remain, should be in play as well.

So how they deal with the groundwater contamination might be -- might be, I don't know -- but it might be affected by what the end state objectives are. And what's achievable at the end might be affected by how they did -- what they did or didn't do around the groundwater contamination.

And you know, the tritium is just one. I think Commissioner Velshi asked what the other contaminants were, and I don't think we heard. But that's -- you know, that's one that's in the documents so we refer to it. I don't know what the other groundwater contaminants are.

But we need all that. That's all part of decommissioning planning.

MR. JAMMAL: It's Ramzi Jammal, for the record, sir. If you'll allow me, please, with all due respect here.

Allegations are made by comments made by staff. And I would like to have -- give an opportunity for staff to really set the record straight. Because what Ms. Glenn spoke about is the framework. What's being presented here with respect to the understanding of the CSA go back to the fact that the decommissioning and the options -- sorry, the CSA provides option. And it's the

responsibility of the proponent to propose what option they're going to do.

So I don't want to mix apples and oranges and I do not want to take away from the fact that the decommissioning and its decommissioning activity is the responsibility of the proponent, not the CNSC. I'll get into the plan afterwards. And it's really unfair to really state that if a document proposes and allows an option to be presented, it's not being presented as there are gaps or uncertainty.

But since Mrs. Glenn made the comments yesterday about the framework and the regulatory oversight for the decommissioning, she should be given a chance to really clarify what she said yesterday on the record.

With respect to the future element of the decommissioning, as we said it today, refurbishment and the enhancement or even the going into safe shutdowns layup or the GSS state of the reactors is part of normal operations. So we are going -- we are still in the operational phase. We have not even come close to decommissioning.

But the record should be set straight with respect to what Ms Karine Glenn described to the Commission yesterday with respect to what we have as a policy in the Government of Canada, what there is exist with respect to the framework that establishes the requirement. In

addition, we go out in consultation for regulatory documents. We go out for consultation on discussion papers. So we welcome the input through the process.

I'm not sure if Karine is in Ottawa.

THE PRESIDENT: Ms Glenn, you still with us?

MS GLENN: Yes, I am. Karine Glenn, for the record. I am the director of the Waste and Decommissioning division.

And Mr. Jammal is absolutely correct. The statements I made earlier was with respect to the CELA intervention this morning was describing the regulatory framework that is currently in place in Canada. And under that framework, it is up to the licensee to propose one of four preferred decommissioning strategies that are outlined in both the CNSC document G-219 and also found in the CSA N294 standard.

OPG, in their preliminary decommissioning plan, which is available to the public on OPG's website, does describe which is their selected decommissioning strategy, which is deferred decommissioning. But it also does a benefit-detriment analysis and justification as to why they selected that strategy. And that is available in the PDP. It's actually in section 3.4 of their preliminary decommissioning plan, and that is available to the public.

Ms Lloyd is correct, the CSA standard does speak about public input and public information requirements for the licensees with respect to decommissioning. And it does mention that we expect, as is the CNSC requirement for all of our Class 1 facilities, that the licensee have a public information program, make the preliminary decommissioning plan available to the public, which OPG has done so, and further states that they are to communicate what the objectives, the end states, the preferred strategy is. All of that is found in the decommissioning project -- decommissioning plan, pardon me. And I'm sure that OPG would be more than happy to entertain any feedback that any of the intervenors would provide to them directly about their preliminary decommissioning plan.

And for just to set the record straight, also, the end state for the facility is that they would remove -- at this point in time, they propose to remove all hazardous materials and radioactive materials to levels that are below those that require regulatory oversight and return the site over for reuse as a brown field site.

THE PRESIDENT: Go ahead.

MEMBER PENNEY: My follow-up question was to CNSC staff about the need for a federal assessment, strategic environmental assessment for either the long-term management, which is already underway, but I guess the

decommissioning -- the decommissioning process.

MR. FRAPPIER: Gerry Frappier, for the record.

So I think as has been noted, there's lots of different words that are put together. And sometimes they sound like it's the same thing, but it actually is not. So what I'd like to do perhaps to start with is to ask Mr. Rinker to explain a bit of what a strategic environmental assessment is as opposed to an EA.

MS CIANCI: Candida Cianci, for the record. I'm the director of the Environmental Assessment division.

So under the current regime, there is a cabinet directive, and the cabinet directive outlines that a strategic environmental assessment is for a policy, program, or a plan --

MEMBER PENNEY: That's under CEAA 2012?

MS CIANCI: No. It's a cabinet directive. It's not within the legislation. It's just a higher-level document.

Given the earlier comments that we discussed when we were talking about CELA, it's not within the CNSC's purview to develop policies. That's the responsibility of other federal and provincial governments. As such, given that our focus is on regulation and not

developing policies, the requirement to conduct strategic environmental assessments is limited for the CNSC.

THE PRESIDENT: Let me jump in again. We're talking about hypothetical things that don't yet exist. There's no impact assessment legislation as of yet.

MR. RINKER: Mike Rinker, for the record.

Strategic environmental assessment has been around for a long time.

THE PRESIDENT: I know. I'm getting there. Just give me a chance.

There's no impact assessment, so the question is what is the big urgency right now for us to have a detailed decommissioning plan for all those facilities where there's so many unknowns into the future as to where the fuel is going to end up, where is the DGR? What's the big urgency right now? Is there an urgency?

MR. FRAPPIER: Gerry Frappier, for the record.

What we're talking about today is an operating licence to continue the operation of Pickering until 2024. They'll then move through a shutdown phase and move into a safe storage phase. None of that requires any of these decommissioning decisions, if you like, that are being talked about.

We do require them to have a preliminary

decommissioning plan so that there is something about where they're going to be going to. As Ms Glenn has alluded to, we have that in place. It meets all the requirements.

I think that perhaps this discussion is one where we're getting into the decommissioning licence that perhaps will be asked for like in 10 years from now.

THE PRESIDENT: Thank you.

Other questions? I think the intervenor raised a couple of other questions.

MEMBER VELSHI: I wanted to give OPG an opportunity to talk about concerns raised about IFB capacity. I know in your submission you had said that that wasn't seen as an issue, but if you can focus around this unusable space and is that really an issue for you.

MS MORTON: Lise Morton, for the record.

With respect to bay capacity, as was noted earlier, there are in fact three bays at Pickering, the IFBB, the IFBA, and the AIFB. I realize that's a lot of acronyms. In total, those three bays have a capacity of well over, about 496,000 bundles, and even I believe in the intervenor's submission there was information about bundle calculations and forecasts out to end of life, et cetera. Again, when you compare it to that capacity of 496,000 bundles, there is certainly sufficient capacity right now. There is sufficient capacity.

The intervenor raised concerns about, for example, unloading a dry storage container if for some reason you needed to. A dry storage container only holds 384 bundles, so obviously that would not impact on that kind of capacity.

So, in summary, there is sufficient capacity in the bays.

THE PRESIDENT: Let me ask you, now your policy is to keep it in water for how long before it goes into dry storage? Secondly, there's nothing preventing you from speeding up reducing the number of years in water and speeding up that going into the dry storage. Did I get it right? I don't understand how capacity gets into the equation here.

MS MORTON: Lise Morton, for the record.

I'll answer a little bit, but I'm sure Robin Manley also would like to talk about six-year-old fuel as an example.

Yes, currently, fuel is kept in the bays for 10 years prior to being transferred to dry storage.

The issue of six-year-old fuel, and could that be used, has been looked at before, and again I'll let Robin speak to that, but also, as we noted in last year's Pickering waste management facility licence, the capability exists to -- we sought approval for the construction of an

enhanced processing building that would increase the capacity for processing of dry storage containers, with an in-service date of 2024. With that, we will have sufficient processing capability to fully empty the bays by the required date in the mid-to-late 2030s.

I'll let Robin speak to the other issue.

MR. MANLEY: Robin Manley, for the record.

Just briefly on the six-year-old fuel question, OPG gave an update a couple of years ago at the regulatory oversight report meeting where we reported back to the Commission on the status of the fuel. To sort of just briefly recap, our assessment is that the fuel is safe in the bay for periods of time longer than 10 years. There's no safety reason that requires us to take it out at 10 years, it can stay there indefinitely. Obviously, we do transfer it out into dry storage as part of our overall program, and it is safe as dry storage as well.

We have done some preliminary assessments as to whether we could leave the fuel in the bay for a shorter period of time, toward six years. While that work is indicative of the fact that it could be removed sooner, we have not completed all of the analysis to support that argument, so at the moment our strategy is at least 10 years.

THE PRESIDENT: Between six and 10 there's

all kinds of options. Right? I don't know where six came as a number. I thought at one time I heard about seven as the number that I think staff were talking about.

MR. MANLEY: Robin Manley, for the record.

President Binder, you're correct. I mean you would do analyses over a range of different parameters, and heat capacity is one of the issues.

THE PRESIDENT: Okay. Other questions?

Ms Penny.

MEMBER PENNEY: One last small question to CNSC staff.

Is groundwater monitored in your integrated environmental monitoring plan?

MR. FRAPPIER: Gerry Frappier, for the record.

I'd ask Mike Rinker to talk about how we do independent monitoring of groundwater.

MR. RINKER: Mike Rinker, for the record.

How we do it? We don't. We don't have the facility for drilling, and so on, so we rely on the licensee's environmental monitoring program.

MS SAUVE: Kiza Sauve, for the record.

I would add on that one of the reasons we don't is that we're doing publicly-assessible areas, so places where you would swim, drink, play, so we don't

expect to see the public in the groundwater, but we do surface water, and we have all those results posted online as well.

MEMBER PENNEY: Thank you.

THE PRESIDENT: You have the final words.

MS LLOYD: Thank you. Brennain Lloyd, for Northwatch.

A couple of wrap-up points.

I think that one of the things that I found really troubling about OPG's application was the sense that they were telling you rather than asking you that they were going to 2024. When I went back to the 2013 transcript, and when I looked at your record of decision, the discussion was really pretty firmly fixed on 2020. Then their letter -- was it in 2017, I think it was, I've lost the date now -- where they wrote to inform you that they were going to 2024, I didn't really feel that was within their jurisdiction to do that. I think that's your decision, not theirs.

I want to really comment on the 10-year timeframe. A 10-year licence, it's the wrong timeframe. I think in five years you could direct OPG to have a detailed site characterization. It could be a milestone or a launch of detailed decommissioning. I don't think I have your agreement yet, President Binder, that detailed

decommissioning planning should start sooner than 2050 or 2045, but I really firmly believe that it should.

I think you should also consider a site-wide licence for the next stage. A site-wide licence, we talked about this at the Pickering waste management facility. I think we're moving into the time of decommissioning, and I think that there would be real benefits to looking at this as a single site for decommissioning.

I just want to note again that the NWMO program is conceptual. Their design continues to evolve. Every three to five years the design changes in a significant way. It is conceptual, and their siting process continues to evolve and to change, and I just would caution you to not be too confident of that particular outcome.

I think there's also real uncertainties with OPG's DGR. I know that it was characterized as, "We're waiting for information from Saugeen Ojibway Nation around their spiritual and cultural." I think it's much bigger than that. When you look at the Minister's letter to OPG or SON's letter to the Minister, it's much bigger than that. Saugeen Ojibway Nation is involved in a community process to consider project acceptability. It's much bigger than that.

I think there's many uncertainties, as well as all of the uncertainties that are going to punt forward into the licensing process, unresolved design issues with that. I think that you've got a lot to consider, and I wish you well with that.

President Binder, I wish you a relaxed retirement.

THE PRESIDENT: I'm going to miss you. Really.

--- Laughter / Rires

MS LLOYD: I'm sure you will.

Commissioner Velshi, I wish you a happy presidency. I hope to see you in five years at the next Pickering licensing hearing.

--- Laughter / Rires

THE PRESIDENT: Thank you. Thank you very much.

The next presentation is by the Canadian Nuclear Society, as outlined in CMD 18-H6.40.

I understand that Mr. Gammage, will make the presentation. Over to you, sir.

CMD 18-H6.40

Oral presentation by the Canadian Nuclear Society

MR. GAMMAGE: Thank you.

Good evening, ladies and gentlemen of the Commission.

My name is Daniel Gammage, past president of the Canadian Nuclear Society.

With me here today are Peter Easton, our Communications Director of Communications, and Colin Hunt, Secretary of the CNS.

The CNS is Canada's learned society for the nuclear industry. We are a not-for-profit organization representing more than 1,000 scientists, engineers, and other nuclear professionals who are engaged in various aspects within Canada's nuclear industry.

We do not represent any company or any organization within the industry. The CNS believes that the views of Canada's nuclear professionals, as embodied by its learned society, may provide useful assistance to the CNSC in its deliberations.

Our submission addresses three areas of interest with respect to continued operation of the Pickering station: the strong, continued safety record of all CANDU reactors; the consistent, strong safety

performance at Pickering, and the importance of continued operation beyond 2018.

Knowing that you've read our written submission and the fact that I am between you and the end of your day, I only want to indicate here our principle observations and conclusions regarding the proposed licence renewal for the Pickering reactor station.

I will start by noting that the six power reactors constitute the world's largest nuclear electric generating facility which operates under one roof within the world. For more than 40 years, the facility has been producing electricity safely and reliably.

As we noted in our main submission, performance of the Pickering reactors has been rising steadily in recent years. Last year alone, five of the six reactors had capacity factors of more than 80 percent; one of them, Pickering Unit 6, had an annual performance exceeding 98 percent. These performance indicators are important. For many decades now, it has become axiomatic within the Canadian nuclear industry that high performance can only be achieved with a high degree of safety performance as well. It is both safety and production for the nuclear industry, not either.

The importance of this facility to the province of Ontario cannot be understated. Today,

Pickering provides about 14 percent of all electricity used in Ontario. With respect to safety the long term record of CANDU reactors is second to none. Throughout its more than 50-year operational history, no worker at any CANDU plant has been killed or injured by exposure to radiation. A very large part of this safe operation has been the safety procedures, protocols and worker training implemented at Pickering.

The CNS notes that like other Canadian nuclear reactor facilities, its loss-time accident rate was 0.6 last year. A rate this low constitutes only 8.7 percent of the average Canadian's electricity industrial LTA rate of 0.7. The CNS considers the low LTA rate of Canada's nuclear facilities, and specifically that of Pickering, to be highly significant and an important statistic for the Commission to consider.

With respect to the matter of the licence renewal, Ontario Power Generation commenced its refurbishment of the Darlington nuclear power station in 2016. Bruce Power will be commencing its major component replacement program in 2020.

It is the view of the CNS that continued operation of the Pickering station will be essential to provide electricity to Ontario during the years ahead as Bruce and Darlington reactors are under refurbishment and

they will, therefore, be unavailable.

Therefore, in conclusion, the CNS agrees with the request to renew the Pickering operating licence. The CNS agrees with the proponent that the licence term is appropriate. The CNS notes that Pickering has demonstrated consistent improvement in its nuclear safety and workplace protocols and performance. These are what have permitted Pickering to perform so strongly in electricity production in recent years. They can be observed that the operating reactors at Pickering these days are performing better than nearly any time since their start-up in the 1970s and '80s.

The CNS observes that the CNSC has confirmed publicly the high safety performance of Pickering in recent years by giving it the Commission's highest safety ratings.

And, finally, the CNS believes that approval by the CNSC of the renewal of the Pickering operating licence will ensure that the refurbishment plan of Darlington and Bruce can be completed without risking the stability of the Ontario electrical grid.

Thank you for your time, and I'd be happy to take any questions that you may have.

THE PRESIDENT: Thank you.

Questions? Dr. Lacroix...?

MEMBER LACROIX: Yes, one quick question.

What's the difference between the Canadian Nuclear Society and the Canadian Nuclear Association?

MR. GAMMAGE: The Canadian -- I'll let Colin talk about this. This is something that he is quite interested in. But I'll give you the brief history as well.

So the Canadian Nuclear Society is who we represent. We are a technical society representing individuals, the scientists and engineers of the industry.

Canadian Nuclear Association is an organization representing the companies within the organization.

Very different mandates, I would say, and Colin can add some points to that as well.

MR. HUNT: Colin Hunt, for the record.

Thanks, Daniel.

The Canadian Nuclear Association originated approximately in the year 1960 as a gathering of institutions within Canada interested in the development of nuclear technology and nuclear science, writ large.

The Canadian Nuclear Society originated as the technical branch of the Canadian Nuclear Association and then went its own way, becoming an incorporate not-for-profit corporation in 1998. I could expand but I think you understand there is a clear difference. They are

a gathering of institutions. We are a gathering of individuals.

MEMBER LACROIX: That's great, and now my question.

How do you define performance? Is it the utilization factors?

MR. GAMMAGE: The performance that we're talking about here, we're talking about the capacity factor of the units over the year.

MEMBER LACROIX: Okay, that's great. Thank you.

MR. GAMMAGE: The amount of electricity that the unit is putting out versus what it's rated to put out.

MEMBER LACROIX: Yeah, okay. Thank you.

THE PRESIDENT: Dr. Demeter...?

MEMBER DEMETER: Thank you for your presentation.

So I noted in your conclusion, understanding that there is the current licence and the proposed licence, there is a difference of four years of operation. So in your conclusion you use very strong language that the station must continue, that it's essential for energy, a central part of the base load; a premature shutdown cannot be met in the short term.

So you have some confidence in that four years that all these problems will be solved by something else?

I'm just curious, like the fact you say that you're going to have a real issue if this closes in 2020, but you're okay if it closes in 2024.

MR. HUNT: Colin Hunt, for the record.

We haven't said anything that we can avoid future problems in 2024. What we have said is if there is premature closure in 2020, there will be problems.

MEMBER DEMETER: Okay, thank you.

MR. HUNT: President Binder, if I could just expand on that briefly, that analysis -- that conclusion is based on our understanding of what are the available sources of electricity either from within Ontario or that can be imported into Ontario over the next five to 10 years and they are far more limited than they were 15 years ago.

THE PRESIDENT: So I have only one question. Do you do anything -- you know, you hear about level of understanding or ignorance about nuclear. Are you doing anything to outreach into the community to people, to organizations, about your mandate?

MR. GAMMAGE: Thank you for that question. We actually do a fair amount in order to do that. The main

thing that the CNS does as part of its yearly activities is conferences and courses. A lot of those conferences are geared toward the industry itself and they are very technical in nature.

But there is also other aspects that the CNS is offering which are geared directly toward the public. One such example is our Nuclear 101 course and our course for -- nuclear for the non-technical individuals that are interested in gathering information. We take it very seriously that it's part of our mandate, part of our role to talk to the public, get public engagement, to have them understand what nuclear technology and information is, and to have them become comfortable with the fact that these facilities are operating and are present within our community.

So as I had mentioned, there is the courses that we do. We also have another program that we operate, which is the Geiger program, we like to call it. This is a program where we put Geiger kits together and we put them into schools.

The goal here is to have students that are part of the -- young in their scientific careers perhaps -- actually be able to put their hands on low level radioactive items, see the Geiger counters and how they respond to that, and become comfortable with radiation and

see that it's a part of the environment that's around us. It's not just in nuclear facilities. It's everywhere you look.

So that program is where we actually put together simplistic Geiger counters, put them together with a kit and we give them out to high schools and train the teachers on how to use those kits so that the students can be part of that. I think at the moment we have over 250 kits in circulation all across the country and that's a program that we're currently actively expanding. That's, I would say, one of the key points of the education and communication part of the CNS.

THE PRESIDENT: You don't know how much this is music to my ears where CNSC, I understand, were promoting this idea of explaining this technology or the environment we live in. So all the best with that program because that's where the education of the kids is about what radiation is all about. Good luck with that.

Anything else? OPG...?

MR. LOCKWOOD: Randy Lockwood, for the record.

President Binder, if you would allow me, I'd like to go back to the performance piece, looking down the chart here.

I would like to say that this does speak

to what we have been talking about during Part 1 and Part 2, and in our CMD, and on the record that performance at Pickering is really improving.

The backlog is going down. The equipment reliability index is going up. In fact, it's the highest it's ever been in the history of the plant. That speaks to record runs in 2017. The intervenors called out 2017. Unit 1, 622 days continuous, and I will point out to the Commission that's our oldest unit, as well as record run on Unit 5 of 632 days. And if I look down that list, Unit 6 was the third amongst everyone else.

THE PRESIDENT: Okay, thank you.

MR. HUNT: Colin Hunt, for the record.

President Binder, if there is just one additional remark I could make right in train with this.

I have been tracking performance statistics of Canadian nuclear reactors for nearly 30 years. It has been a case of -- and we can see this occurring time after time. The patterns only start to appear when you have many years of data to work with.

One of the symptoms of an improving facility or a fleet of facilities is that you start to see the annual performance consistently exceeding the lifetime performance. This is something that when you look at past years of data you can see that this is consistently the

case for Ontario's nuclear facilities and in specific Pickering for now quite a number of years, at least half a dozen years where all reactors have generally had their annual specific performance higher than their lifetime.

THE PRESIDENT: Okay, thank you.

Any final thoughts?

MR. GAMMAGE: I think I would like to wish you well in your retirement and let you know that there's always a place for you within the CNS if you don't want to go off into the sunset too early.

THE PRESIDENT: Thank you. That's the best offer I got so far.

--- Laughter / Rires

THE PRESIDENT: Okay. I think this ends our oral presentations for today.

Marc, you are not going to let us go before we do some.

MR. LEBLANC: No. We are going to do about 30 minutes of written submissions and we will re-assess at that time.

Is that okay for the Members?

THE PRESIDENT: Yes.

MR. LEBLANC: We are going to change the approach a little bit in terms of my going through the list.

The only change is I'm going to start now with numbers. As you have noticed, except for the President and myself, we are all using electronic means now. So it's easier to search by number than by name. It's more logical.

So in that context, I will start with CMD numbers and then we will name the intervenor.

The first submission to be considered by Members tonight is the submission CMD 18-H6.46, which is from E.S. Fox Limited.

You've done it? Okay.

Yes, sorry, I had the wrong day. I think William Shore, that's right.

That's why I thought we were not very advanced.

CMD 18-H6.100

Written submission from William Shore

MR. LEBLANC: We will start with CMD 18-H6.100, which is a submission from William Shore.

I have also agreed to wait at least ten seconds between each to allow Members to really get a good look.

CMD 18-H6.102

Written submission from Maimuna Hafiz

MR. LEBLANC: The next CMD is 18-H6.102. It is a submission from Maimuna Hafiz.

CMD 18-H6.103

Written submission from Sonit Nangia

MR. LEBLANC: The next CMD is 18-H6.103, which is a written submission from Sonit Nangia.

CMD 18-H6.104

Written submission from Harald Simon

MR. LEBLANC: The next CMD is CMD 18-H6.104, which is a written submission from Harald Simon.

CMD 18-H6.105

Written submission from James Ronald

MR. LEBLANC: The next CMD is CMD 18-H6.105, which is a written submission from James Ronald.

CMD 18-H6.106

Written submission from

Joe Dickson, MPP, Ajax-Pickering

MR. LEBLANC: The next CMD is 18-H6.106. It is a submission from Joe Dickson, MPP, Ajax-Pickering.

CMD 18-H6.107

Written submission from Bruce Power

MR. LEBLANC: The next CMD is CMD 18-H6.107, which is a written submission from Bruce Power.

Dr. Demeter.

MEMBER DEMETER: It's been alluded to a couple of times during the interventions about the importance for Pickering to backfill energy when Darlington and Bruce are down.

Maybe someone could just put that in context for me, the importance of filling that gap and how this licence application will achieve that.

I think that was one of the statements that Bruce Power said.

MR. GREGORIS: Steve Gregoris, for the record.

That statement comes from the Long-Term

Energy Plan and that plan discusses the Darlington refurbishments and the Bruce major component replacements.

Between the years of 2020 to 2023 there are five units simultaneously down in one of those states, refurbishment or major component replacement. So that's about 4,500 megawatts.

And in that time Pickering is seen as a very important supply of electricity.

MEMBER DEMETER: Thank you very much.

CMD 18-H6.108
Written submission from
The Wildlife Habitat Council

MR. LEBLANC: The next CMD is CMD 18-H6.108 from the Wildlife Habitat Council.

CMD 18-H6.110
Written submission from
The Greater Oshawa Chamber of Commerce

MR. LEBLANC: The next CMD is CMD 18-H6.110 from the Greater Oshawa Chamber of Commerce.

CMD 18-H6.111

Written submission from Jacquelynn Tanner

MR. LEBLANC: The next CMD is CMD 18-H6.111, which is a written submission from Jacquelynn Tanner.

CMD 18-H6.112

Written submission from

The Ajax-Pickering Toastmasters Club

MR. LEBLANC: The next CMD is CMD 18-H6.112, which is a written submission from the Ajax-Pickering Toastmasters Club.

CMD 18-H6.113

Written submission from James Scarrow

MR. LEBLANC: The next CMD is CMD 18-H6.113, which is a written submission from James Scarrow.

CMD 18-H6.114

Written submission from Boyd Reimer

MR. LEBLANC: The next CMD is CMD 18-H6.114, which is a written submission from Boyd Reimer.

CMD 18-H6.115

Written submission from Énergie NB Power

MR. LEBLANC: The next CMD is CMD 18-H6.115, which is a written submission from Énergie NB Power.

CMD 18-H6.116

Written submission from B.C. Instruments

MR. LEBLANC: The next CMD is CMD 18-H6.116, which is a written submission from B.C. Instruments.

CMD 18-H6.117

Written submission from Natasha Vaney

MR. LEBLANC: The next CMD is CMD 18-H6.117, which is a written submission from Natasha

Vaney.

CMD 18-H6.118

Written submission from Don and Heather Ross

MR. LEBLANC: The next CMD is CMD 18-H6.118, which is a written submission from Don and Heather Ross.

CMD 18-H6.119

Written submission from Jasmine Bruce

MR. LEBLANC: The next CMD is CMD 18-H6.119, which is a written submission from Jasmine Bruce.

CMD 18-H6.120

Written submission from Sherry Brown

MR. LEBLANC: The next CMD is CMD 18-H6.120, which is a written submission from Sherry Brown.

CMD 18-H6.121

Written submission from Bertie D'souza

MR. LEBLANC: The next CMD is CMD 18-H6.121, which is a written submission from Bertie D'souza.

CMD 18-H6.122

Written submission from Janine Carter

MR. LEBLANC: The next CMD is CMD 18-H6.122, which is a written submission from Janine Carter.

CMD 18-H6.123

Written submission from Fernanda Sierra

MR. LEBLANC: The next CMD is CMD 18-H6.123, which is a written submission from Fernanda Sierra.

CMD 18-H6.124

Written submission from Katie Weston

MR. LEBLANC: The next CMD is CMD

18-H6.124, which is a written submission from Katie Weston.

CMD 18-H6.125

Written submission from Cameco Corporation

MR. LEBLANC: The next CMD is CMD 18-H6.125, which is a written submission from Cameco Corporation.

Dr. Demeter.

MEMBER DEMETER: Thank you very much. I was just curious for OPG, supply chain issues, and if there are forest fires in Northern Saskatchewan Cameco ceases operation. What's the sort of time sequence before you would see any effect from mining operations would just stop? Like, the supply chain, how volatile is it or is it pretty elastic?

MR. LOCKWOOD: Randy Lockwood, for the record. We have contingencies for such things. I know that to be true. I don't have those numbers off the top of my head. We could bring that back though.

MEMBER DEMETER: That's okay. Just if it's not an issue, you've got contingencies, then it won't be an impact on your operations. That's just what I was curious about.

Okay, thank you.

MR. JAMMAL: Ramzi Jammal, for the record. Dr. Demeter, the issue is McArthur is not shutdown because of the fire, it was a planned shutdown due to the abundance of uranium in the market. So it was a commercial decision.

So the fire happened to be coincidental. So I'm pretty sure the industry and the supplier already have in place an arrangement. But the fire and McArthur are not linked together.

MEMBER DEMETER: Thank you for the clarification.

CMD 18-H6.126

Written submission from the

Ontario Federation of Anglers and Hunters

MR. LEBLANC: The next CMD is CMD 18-H6.126, which is a written submission from the Ontario Federation of Anglers and Hunters.

CMD 18-H6.127

Written submission from Mackenzie Floyd

MR. LEBLANC: The next CMD is CMD 18-H6.127, which is a written submission from Mackenzie Floyd.

CMD 18-H6.128

Written submission from I-Ping Wong

MR. LEBLANC: The next CMD is CMD 18-H6.128, which is a written submission from I-Ping Wong.

CMD 18-H6.129

Written submission from

University of Ontario Institute of Technology

MR. LEBLANC: The next CMD is CMD 18-H6.129, which is a written submission from the University of Ontario Institute of Technology.

Madam Velshi.

MEMBER VELSHI: Question for OPG. There's a statement in here about UOIT students providing insights into the repurposing of the Pickering Nuclear Station upon decommissioning.

I'm just curious on what kind of ideas did they come up with and share with you?

MR. ROB: Art Rob, VP of Decommissioning, for the record. So there was a study completed by an outside agency that OPG hired and they conducted a series of workshops. Through their workshops there was a number

of different options that were looked at for the Pickering site at the end of its life.

The students from UOIT and a series of other students, high school students, a whole series of different outreach was conducted in the community to get input. There was about 27 different ideas generated from that report, and they were sort of short-listed into about five or six different themes.

So they varied from repurposing the site for additional power generation, movie sets, UOIT itself actually looked at it as a technical campus opportunity where they might want to use some of the facilities for training. So a host of different ideas like that, storage areas, recreational facilities, and the like.

THE PRESIDENT: I'm actually disappointed that the dean of this university, where a lot of the workers are getting supplied, is not here, particularly since he was a co-author on a book on Fukushima and some of the observations. It's too bad that he's not here. I would have liked to hear from him. So maybe next time.

MR. LEBLANC: Dr. Demeter.

MEMBER DEMETER: Thank you. As I gather from the intervention, the UOIT is Canada's only undergraduate nuclear engineering program. From a supply point of view to the nuclear industry in Canada, do you

have other alternatives to people training elsewhere that would also fit your needs versus sole source?

MR. MANLEY: Robin Manley, for the record. I'm going to start and then Jason Wight will expand on that.

So myself, I graduated from Queen's, but our previous Chief Nuclear Engineer was a Queen's engineering physics graduate, and obviously we draw upon the university resources from across the country and beyond.

Jason.

MR. WIGHT: Jason Wight, for the record. The previous of the previous CNE was an engineering physics graduate from McMaster University. I am also an engineering physics graduate from McMaster University that has a nuclear stream, in fact has a nuclear reactor on campus.

So there is, I guess, a very diverse technical expertise within the university community and we deal with them all in many different ways. McMaster and UOIT, and UNENE, we have a nuclear engineering shared program. But we deal with all of them, and we're not worried about a diversity or an influx of talent from the university system.

MEMBER DEMETER: Thank you very much.

CMD 18-H6.130

Written submission from Rena Ginsberg

MR. LEBLANC: The next CMD is CMD 18-H6.130, which is a written submission from Rena Ginsberg.

CMD 18-H6.131

Written submission from Arielle Lefang

MR. LEBLANC: The next CMD is CMD 18-H6.131, which is a written submission from Arielle Lefang.

CMD 18-H6.132

Written submission from Doug Rylett

MR. LEBLANC: The next CMD is CMD 18-H6.132, which is a written submission from Doug Rylett.

CMD 18-H6.133

Written submission from Elaine Munro

MR. LEBLANC: The next CMD is CMD 18-H6.133, which is a written submission from Elaine Munro.

THE PRESIDENT: So, again, I think we discussed it many times, but this particular intervenor puts it differently. She says, "CNSC should require that OPG inform everyone within 50 km of Pickering that they should order KI pills."

What do you think about that?

Now, informing is not necessarily very difficult. You know, you can have it with a new information telecommunication system, you may be able to actually reach and tell them, why don't you go and get your KI pills.

Anyhow, it's an observation. I just thought it was kind of an interesting spin on it.

MR. LOCKWOOD: Randy Lockwood, for the record. I appreciate your observation and pointing it out for consideration. I particularly like the idea about using modern means to communicate this information the way that people want to receive it now. I appreciate that.

CMD 18-H6.134

Written submission from Cathy Tafler

MR. LEBLANC: The next CMD is CMD 18-H6.134, which is a written submission from Cathy Tafler.

CMD 18-H6.135

Written submission from Roger J. Short

MR. LEBLANC: The next CMD is CMD 18-H6.135, which is a written submission from Roger J. Short.

CMD 18-H6.137

Written Submission from

Tracy MacCharles, MPP, Pickering-Scarborough East

MR. LEBLANC: The next CMD is CMD 18-H6.137, which is a written submission from Tracy MacCharles, MPP, Pickering-Scarborough East.

CMD 18-H6.138

Written submission from Lingzhi Xia

MR. LEBLANC: The next CMD is CMD 18-H6.138, which is a written submission from Lingzhi Xia.

CMD 18-H6.139

Written submission from Brotech Precision CNC Inc.

MR. LEBLANC: The next CMD is CMD

18-H6.139, which is a written submission from Brotech Precision CNC Inc.

CMD 18-H6.140

Written submission from Plug'n Drive

MR. LEBLANC: The next CMD is CMD 18-H6.140, which is a written submission from Plug'n Drive.

CMD 18-H6.142

Written submission from Steps for Life, Durham Region

MR. LEBLANC: The next CMD is CMD 18-H6.142, which is a written submission from Steps for Life, Durham Region.

CMD 18-H6.143

Written submission from Pickering Rouge Canoe Club

MR. LEBLANC: The next CMD is CMD 18-H6.143, which is a written submission from the Pickering Rouge Canoe Club.

CMD 18-H6.144

Written submission from

Ontario Shores Centre for Mental Health Sciences

and the Ontario Shores Foundation for Mental Health

MR. LEBLANC: The next CMD is CMD 18-H6.144, which is a written submission from the Ontario Shores Centre for Mental Health Sciences and the Ontario Shores Foundation for Mental Health.

CMD 18-H6.145

Written submission from the Abilities Centre

MR. LEBLANC: The next CMD is CMD 18-H6.145, which is a written submission from the Abilities Centre.

CMD 18-H6.146

Written submission from Earth Rangers.

MR. LEBLANC: The next CMD is CMD 18-H6.146, which is a written submission from Earth Rangers.

CMD 18-H6.147

Written submission from

Big Brothers Big Sisters of South-West Durham

and Northumberland

MR. LEBLANC: The next CMD is CMD 18-H6.147, which is a written submission from Big Brothers Big Sisters of South-West Durham and Northumberland.

CMD 18-H6.148

Written submission from PineRidge Arts Council

MR. LEBLANC: The next CMD is CMD 18-H6.148, which is a written submission from PineRidge Arts Council.

CMD 18-H6.149

Written submission from the

St. Paul's on-the-Hill Community Food Bank

MR. LEBLANC: The next CMD is CMD 18-H6.149, which is a written submission from the St. Paul's on-the-Hill Community Food Bank.

CMD 18-H6.150

Written submission by Community Care Durham

MR. LEBLANC: So we'll do just one last written submission, it's CMD 18-H6.150, which is a written submission from Community Care Durham.

CMD 18-H6.151

Written submission from Kelly Clune

MR. LEBLANC: I'll just verify one more because it's unsure whether we did the submission yesterday, It was CMD 18-H6.151 from Kelly Clune.

MEMBER LACROIX: Yeah, we did the oral presentation and 152, the next one.

MR. LEBLANC: No.

MEMBER LACROIX: No, no, no, 152, the next one on the list --

MR. LEBLANC: Yes?

MEMBER LACROIX: -- it's a copy, cut and paste, from 151 that we did yesterday. It's essentially the same text, but this one is written.

MR. LEBLANC: Any questions on H6.151, Kelly Clune?

So we said it would be half an hour, so

we’re going to stick to that time, and we’ll finish the written submissions another time.

Good evening, safe travel, we’ll start again tomorrow morning at 8:30. We have several oral presentations tomorrow and the plan is to also finish the written submissions.

Thank you.

--- Whereupon the hearing adjourned at 8:40 p.m., to resume on Wednesday, June 27, 2018 at 8:30 a.m. / L'audience est ajournée à 20 h 40 pour reprendre le mercredi 27 juin 2018 à 8 h 30

Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Public hearing

Audience publique

June 28th, 2018

Le 28 juin 2018

Pickering Recreation Complex
1867 Valley Farm Road
Pickering, Ontario

Complexe récréatif de Pickering
1867, rue Valley Farm
Pickering (Ontario)

Commission Members present

Dr. Michael Binder
Ms Rumina Velshi
Dr. Sandor Demeter
Ms Kathy Penney
Mr. Timothy Berube
Dr. Marcel Lacroix

Commissaires présents

M. Michael Binder
Mme Rumina Velshi
Dr Sandor Demeter
Mme Kathy Penney
M. Timothy Berube
M. Marcel Lacroix

Secretary:

Mr. Marc Leblanc

Secrétaire:

M. Marc Leblanc

General Counsel:

Ms Lisa Thiele

Avocate générale :

Me Lisa Thiele

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Pickering, Ontario / Pickering (Ontario)

--- Upon commencing the public hearing on Thursday, June 28, 2018 at 8:31 a.m. / L'audience publique débute le jeudi 28 juin 2018 à 08 h 31

Opening Remarks

M. LEBLANC : Bonjour, Mesdames et Messieurs. Good morning. Welcome to the continuation of the Part 2 public hearing on the application by Ontario Power Generation for the renewal of the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station.

Please note where the emergency exists are. They are at the back of the room, there are two doors down there. There are bathrooms located near the entrance in the main lobby as well as on the side here.

During today's business, we have simultaneous interpretation.

Des appareils d'interprétation sont disponibles à la réception. La version française est au poste 2 and the English version is on channel 1.

We would ask that you please keep the pace of your speech relatively slow so that the interpreters have a chance to keep up.

I would also like to note that this hearing is being video webcast live and that the hearing is also archived on our website for a three-month period after the close of the hearing.

Les transcriptions seront disponibles sur le site Web de la Commission dans environ 2 semaines.

To make the transcripts as meaningful as possible, we would ask everyone to identify themselves before speaking.

As a courtesy to others in the room, please silence your cell phones and other electronic devices.

Monsieur Binder, président et premier dirigeant de la CCSN, présidera l'audience publique d'aujourd'hui.

Mr. President...?

LE PRÉSIDENT : Merci, Marc.

Good morning and welcome to the continuation of the public hearing of the Canadian Nuclear Safety Commission. Welcome also to those joining us via webcast and teleconference.

Mon nom est Michael Binder, je suis le président de la Commission canadienne de sûreté nucléaire.

For those of you who were not here yesterday and the day before and the day before, I would

like to introduce the Members of the Commission that are with us here today.

To my right are Dr. Sandor Demeter and Ms Kathy Penney; to my left are Mr. Timothy Berube, Ms Rumina Velshi and Dr. Marcel Lacroix.

We already heard from our Secretary, Marc Leblanc. We also have with us Ms Lisa Thiele, Senior General Counsel to the Commission.

Marc...?

MR. LEBLANC: This is the fourth day of hearing. We have heard so far the presentations from OPG, CNSC staff, 38 oral interventions and have addressed all written submissions.

Fifteen intervenors are scheduled to present orally today. Ten minutes are allocated for each presentation, with the Commission Members having the opportunity to ask questions after each presentation.

To help in managing time, a timer system is being used. The light will turn yellow when there is one minute left and turn red at the 10-minute mark.

We have in attendance or via teleconference, available for questions from the Commission, representatives from Environment and Climate Change Canada; Fisheries and Oceans Canada; the Ontario Ministry of Environment and Climate Change; the Office of

the Fire Marshal and Emergency Management; and Health Canada.

Your key contact persons will be Ms Louise Levert and Ms Johanne Villeneuve from the Secretariat staff. They are at the back of the room.

The break for lunch is anticipated to be around 12:30 and a break for dinner around 17:30. There will be short health breaks in mid-morning and in the afternoon.

Mr. President...?

THE PRESIDENT: Okay. So the first presentation is by Greenpeace, as outlined in CMD 18-H6.62.

I understand, Mr. Stensil, you will make the presentation. Over to you.

CMD 18-H6.62/18-H6.62A/18-H6.62B

Oral presentation by Greenpeace

MR. STENSIL: Thank you, President Binder.

Hello. Bonjour. My name is Shawn-Patrick Stensil, I am a Senior Energy Analyst with Greenpeace Canada.

That said, today I don't feel like me. Today I feel like Bill Murray in that movie Groundhog Day. Five years ago I sat in this very place and made a

presentation to the Canadian Nuclear Safety Commission, you. Just as today I made comments on a controversial application by Ontario Power Generation to operate the Pickering nuclear station beyond its design life.

And just like today, OPG claimed that the project was needed and economical, but its shareholder, the Government of Ontario, had exempted it from any review by the Ontario Energy Board, so we couldn't validate those claims.

And just as today, we are waiting for a study on the possible accident impacts of an accident to inform whether current emergency planning measures were sufficient to protect the public.

And just as today, OPG couldn't definitively tell us whether the radioactive waste that has been produced at the station over the past 40 years would eventually go to some offsite storage facility.

And just as today, OPG's shareholder, the Government of Ontario, was undermining public safety by encouraging population growth around the station.

And just like today, OPG presented with slogans like, "Our last day will be our best day", while the public warned you what you need to do is avoid that one bad day that will make none of it worth it.

And just like today, the shadow over these

hearings is the unexpected, whether from age, a regulatory blind spot, so an unforeseen event or hostile action, an unexpected event that could cause irreversible harm to Toronto and Canadian society. That's your job.

And finally, just like five years ago today, or five years ago, I am going to tell you the following. It is time to close Pickering. First, it's unneeded. Pickering's political purpose is to pork-barrel for votes in Durham Region, but ultimately I think you have a responsibility under the Act to close the station given its location. Commissioners have said this week that the status quo is operation until 2020. I agree and it should remain that.

To start, Pickering is going to shut down. Ontario announced the station would close in 2010 when it acknowledged the station is too outdated to be rebuilt cost-effectively. Quebec made a similar decision about Gentilly in 2012 and this month South Korea announced that Ulsan 1, which had already been rebuilt, would also close. So 10 out of 31 CANDUs internationally are closed or are closing due to high cost. That's 9 out of 22 in Canada. The CANDU industry is in decline. This is relevant to the Commission because you will oversee the safe decline of the CANDU industry.

So today I ask two things: one, spur some

momentum, we know the station is going to close; and two, rule in favour of our request for an environmental assessment under the *Impact Assessment Act*. This assessment would consider both OPG's approach to decommissioning as well as contingency plans in the event that Pickering becomes a de facto radioactive waste site beside Toronto.

Notably, Durham Region has asked for transition plans to mitigate the social and economic impacts of the station's closure. It has also asked for compensation in exchange for carrying the risk associated with indefinite waste storage. These types of social and economic effects are what would be considered under an IAA review as opposed to one under the *Nuclear Safety and Control Act*. Unlike the *Nuclear Safety and Control Act* review, an IAA review may also make recommendations on the adequacy of CNSC regulations. This is a good thing and a good planning tool. It would assist with both planning before OPG applies for a decommissioning licence in 2028, it would respond to local concerns, and I think it would strengthen trust in CNSC oversight over decommissioning in the long term.

So in the case before you, evidence puts in doubt the licensee's capacity to make adequate provision for the protection of the environment. In fact, I submit

it has a plan to reduce safety and it has a track record of mismanaging oversight of offsite emergency plans. Of course, when I say the licensee, I am referring to OPG and its shareholder, the Government of Ontario. The province is the de facto licensee. It gives OPG direction, it appoints its Board of Directors, and it approves its business plans such as the current proposal to continue operating Pickering. It also receives dividends from OPG and backstops its waste liability. OPG and the Government are the same.

And most importantly for the Commission, the province is responsible for the fifth level of defence in depth. This is protecting public from harm in the event of an accident. The province is responsible for two things that make up the fifth level of defence in depth: emergency preparedness and land use. The Ministry of Community Safety oversees emergency preparedness, the Ministry of Municipal Affairs oversees siting, and the Ministry of Energy oversees OPG. These three bodies are your licensee.

If OPG handled levels 1 to 4 of defence in depth as the province has, you would revoke their licence. The Ministry of Community Safety continues to show it is unable to adequately oversee nuclear emergency response. It lacks sufficient resources to oversee safety and it also

borrows staff from OPG to carry out its activities. This supports my point, you should consider OPG and the province as the licensee.

According to the IAEA there are three elements necessary to successfully implement every level of defence in depth: appropriate conservatism, quality assurance and safety culture. I am confident that CNSC staff will be able to point to how OPG ensures all of these are implemented for the other levels of defence in depth. I have no confidence that CNSC staff can show how the Ministries of Community Safety and Municipal Affairs implement these for level 5, protecting the public from an accident. Show me the plan, show me the verification criteria.

What's more, it is stated in the Licence Control Handbook: "Any change to the design or programs must have a neutral or positive impact on safety." This is in line with continuous improvement. I support it. If OPG were to take actions that not only reduce safety, CNSC staff would act. In contrast, the province has a policy of reducing safety around Pickering. It encourages population growth around the station and decreases the effectiveness of emergency measures. The province also knows that this is wrong and could invoke sanction from the Commission.

Through Freedrom of Information (FOI) I

obtained a Briefing Note that went to the Minister in 2010 recommending eventual closure. One of the reasons it listed to support closure was running Pickering in an area of mandated provincial growth could trigger regulatory sanction. So the province is knowingly implementing population growth policies that undermine public safety. It knows OPG could be sanctioned for this.

The province's intentional dereliction of duty to protect or improve public safety should have an impact on OPG's -- should impact your assessment of OPG's ability to carry out its responsibilities under the Act. In fact, I think it is reasonable to conclude that the licensee is unqualified for the licence renewal. The licensee's encouragement of growth around the Pickering nuclear station is decreasing safety margins in the fifth level of defence.

As population around the Pickering nuclear station has gradually increased over the past 40 years, so have the potential consequences of an accident. Like a frog in a pot of water brought slowly to boil, we have been unable or unwilling to acknowledge the increasing risk that accompanies the growing population around Pickering.

Commissioner Velshi, on Monday you asked about the implementation of the Joint Review Panel recommendation that the CNSC engage with the Government of

Ontario to develop land use planning around nuclear stations. Mr. Frappier responded that the Commission had engaged with the province and that they have updated their land use policy.

While it is true Ontario's 2014 growth plan now includes energy generation facilities, the details of the plan show it's meaningless. Downtown Pickering, where we are sitting, is named as an urban growth centre. The licensee's policy is still to encourage growth and reduce public safety. The policy Mr. Frappier mentioned isn't fit for purpose or intended to maintain safety. This requires Commission action.

And we see some data to this. Emergency time estimates are an indicator of safety decline, or emergency evacuation time estimates. We see a trend where ETEs have lengthened from 4 to 6 hours to evacuate on a good day the 10-kilometre zone to about 7 hours today. The worst case is 9. I have no numbers on evacuation for the new 20-kilometre contingency zone, but that should be available. All this is allowed to happen because the province and the CNSC have never set limits on population growth around Pickering. Other levels of defence in depth have a design limit, not Level 5. That's an oversight that must be corrected.

That said, the province's growth policy is

encouraging reductions in public safety. That is grounds to reject OPG's licence renewal.

I don't have time to discuss my final two points in depth, unfortunately, but in short, the Periodic Safety Review used to support OPG's application lacks sufficient transparency to support the continued operation of Pickering, in my mind. I started filing access to information requests related to the basis for the PSR about three years ago and the Commission has systematically denied information related to CNSC discussions on safety improvements that should be required to permit continued operation. Without such transparency, I don't think the Commission or the public can have the confidence that OPG is in fact making adequate or acceptable provisions to protect the environment. On this basis, I think you should reject the life extension.

And finally, I would ask you to rule in favour of the request for a ruling filed by Greenpeace and CELA asking for amendments to section 5.4 Of the Licence Control Handbook. It is poorly worded, when I read it over, and provides a loophole for Pickering to operate past 2024 without Commission approval.

In conclusion, I don't think you can have confidence that OPG and its shareholder will make adequate provision to protect the environment. You should deny

OPG's request to operate until 2024 and direct the company to immediately prepare transition plans for closure in 2020.

Thank you very much for listening.

THE PRESIDENT: Thank you.

Okay, let's go right into the question period. Who wants to start? Dr. Lacroix...?

MEMBER LACROIX: Thank you, Mr. Stensil, for this presentation. Incidentally, Groundhog Day is one of my all-time favourite movies.

--- Laughter / Rires

THE PRESIDENT: It does have a happy ending, doesn't it?

MEMBER LACROIX: Yes.

--- Laughter / Rires

THE PRESIDENT: For Bill Murray.

MR. STENSIL: When the station closes, yes.

THE PRESIDENT: For Bill Murray, yes, I meant for you.

MEMBER LACROIX: You are opposed to a 10-year licence, but you support a 5-year licence. From a purely safety point of view, can you justify this affirmation?

MR. STENSIL: Requesting a 5-year instead

of a 10-year licence?

MEMBER LACROIX: Yes.

MR. STENSIL: Thank you for the question and it's a very good one. I discussed this at the Bruce hearings as well.

In Greenpeace's view, the move towards 10-year licences in effect reduces a safety measure we have, a verification measure we have for checking in on CNSC staff and OPG as to both of their performances. It basically reduces the ability of the public to scrutinize operations of both CNSC staff and OPG. Why that is important is what we learned with Fukushima and other major disasters is that they are effectively caused by regulatory capture of some kind.

And how do you mitigate regulatory capture? The Commission will always be vulnerable to it because you deal with a very technical industry, like financial markets, and not a lot of people are trained in this area or have the patience to read all the documents. So you need these moments where the public can come in and be looking at these things from a different perspective and provide comment on, you know, looking where things haven't been implemented and also providing views from the Canadian public.

And, you know, I am a big believer that --

to give an anecdote, one of the reasons that I do environmental work is when I was a kid my mom worked at a factory and there was a period when I was a kid she would come home from work every night and have horrible headaches and writhe around on the bed, and it turned out she did some research and found out that the glue they were using for these car carpets had some sort of toxin that caused this. It in fact shouldn't have been used, but it was her research that figured that out. She had an environmental sensitivity and she figured it out. She went to her union and they didn't do anything, they didn't want to bother, and she eventually just went to -- called the Ministry of Energy -- or Labour, Freudian slip -- and they shut the plant down for several days.

And right there is an example of where we need to remember that Canadians are smart. They may not have the PhD's of people on both sides of me, but they can find things out, especially when it affects them and also see things from different perspectives because of how they are affected.

And I will list these again because I think it's really important. I mentioned these at the Bruce hearings. There's a whole line of regulatory improvements that have occurred because of public intervention at these hearings. And if you start delaying,

doing those every 10 years, you will not get the opportunity to do that, you are going to lose the capacity in the civil society sector. It takes a lot to read these documents and keep up on the file and that is something that CNSC staff have never talked to us about.

And to give some examples, in this hearing OPG has been talking about its new multi-unit risk assessment. That was me in the 2013 hearings where I raised an issue and it led to a request for ruling that now CNSC staff talk about. We are a world leader in this. They are a world leader because of public intervention in that. I suggested at the Bruce hearings that you also work that into your narrative as a Commission, because it is good for other regulators in the world to hear that.

Same thing in the last hearing. The main focus of my submission was that OPG has a policy that if it went over certain safety goals or limits it had to develop a risk reduction policy and either do upgrades, analytic, whatever, but they had just ignored it and so had CNSC staff. And I raised this in the hearings, that required a risk reduction policy that they have been doing for the past three years and that's a good thing. Those moments will not happen if you move to 10-year reactor extensions. I think this is very, very important.

THE PRESIDENT: Well, I really would

challenge that because not only whatever -- you are completely ignoring the annual report where you have again the ability to come and provide -- we do value the input, otherwise we wouldn't hold public hearings. So the input, I agree with you the input has been very, very useful, at least the 10 years I have been on this podium, and we have acted on many of them and in fact we enhanced the requirement with the annual ROR and some of the annual RORs will become a public hearing also in the communities. So I don't understand the reduction in public face.

MR. STENSIL: So this talking point comes up every time we talk about not moving to 10-year licences. You have the annual meeting and that is sufficient. To start off with, no one ever talked to anyone in the civil society community about whether that was an appropriate means of continuing to engage with intervenors and maintaining capacity. That has been the line out of the Commission and told to us.

The parallel I would make, with all respect to Monsieur Leblanc, is for this hearing it was originally scheduled in Courtice and on Day one Monsieur Leblanc said that it's unfortunate that it can't be in Pickering, but in our experience the Courtice facility meets all of our needs. What that didn't -- it meets all of the needs of the Commission, it doesn't meet the needs

of people living in the Pickering area. That site doesn't even have public transport. So it's a funny parallel, but it's being aware of the mindset that what you may think is sufficient is not.

The second issue is -- and Commissioner Velshi, I'm happy to work with this on you as you come into your presidency -- is these hearings have bad procedure compared to other tribunals. We don't have the right to cross-examine, even in an informal way, to gather information. And if you look at how decisions -- improvements to safety have come out through these hearings since Fukushima, it has been hearing to hearing. The Commission has heard themes about how probabilistic risk assessment was being ignored, about emergency management, and it wasn't in a specific meeting. But the reason that happened is because in one meeting we would often, with respect to staff, not be able to nail them down on the transcript about what we were actually trying to say and get them to confirm it. And in another tribunal when we could directly ask -- the example being the other night, President Binder, when you asked, so where is the plan -- this is a request for ruling -- where is the plan for distributing KI in the Toronto as a regulatory requirement? No one answered the question. Like that was just -- it wasn't answered. And that makes it very difficult to

intervene because you have talking points on both sides, that ends up being the transcript, unlike the OEB, where you can gather evidence, have some agreement on facts and then have a discussion about what that means for your deliberations. We can't do that here. It is very frustrating as an intervenor in these hearings.

So to your point, no. To be very clear, the August meetings are not acceptable as a replacement for these hearings. And beyond that, I think the Commission can go further to enhance its Rules of Procedure for both these hearings and the August meetings.

THE PRESIDENT: Thank you.

Questions. Ms Penney...?

MEMBER PENNEY: Thank you for the presentation. I want to talk about the strategic environmental assessment. So what I'm trying to understand is what you are requesting, because when I look at what was in your supplementary, it's a letter to the Minister commenting on the consultation package for the new IAA, and you request that decommissioning get put on the project list, but then in the body of your original submission, 62, you are asking for a strategic environmental assessment, and a strategic environmental assessment is usually on a point of policy. So what I am trying to understand is what you are really requesting. If you could elaborate for me,

please?

MR. STENSIL: Yes, a good question.

To start, and this is said in our request for ruling, we are in a bit of a regulatory vacuum on what triggers an EA, first of all. So that's why there is a bit of confusion. There is no compliance issue right now. If you guys decide to just ignore it, it can just kind of flow through.

So we are appealing to the Commissioners to say we should have an assessment outside of the *Nuclear Safety Control Act* assessments that are taking place under this new Act, because these assessments will look at effects that aren't considered by the Commission. And whether that is a strategic assessment or an IAA assessment -- there's two -- one of the reasons we are asking for it, because it's about policy, is with nuclear waste, with radioactive waste, one of the biggest issues or challenges is there's the technical assessments, and you guys have the guides to that effect. There's also a social and ethical element that comes up -- and economic -- of how these impact communities. That is not necessarily addressed in the CNSC policy for non-fuel radioactive wastes.

If you look to the *Nuclear Fuel Waste Act*, in its objectives it instructed the NWMO to, yes, look at

the technical case but also look at the ethical and social cases in conditions -- impacts of its assessments.

When you step back to the policy, the 1996 policy that predates -- I don't know if everyone is familiar with the long history of how this came out -- there is a general policy which is good that says it's the polluter pays principle. But beyond that, there is not a lot of instruction on how you develop social licence for these communities, what is a socially acceptable policy.

So under one of these environmental assessments we would be able to look at those issues. And I think for the Pickering site it's significant because I believe there is a risk that this station becomes, as I mentioned, a radioactive waste site beside Toronto, and that won't be viewed well, but it may just happen through creeping, creeping up over time. And such an assessment would also be an independent conduit to inform policy that staff could then implement over the lifecycle of decommissioning, because you -- in those assessments, recommendations can come out to influence CNSC regulations, so when you get to licensing.

An example is exactly what Ms Velshi, Commissioner Velshi, the question she asked about siting in the JRP, is they recommended changes to standards to address issues they had heard about social expectations for

safety within hearings. That is not really in the realm of this Commission, but, as I said in my opening remarks, I think urging the federal government to do that would in fact increase confidence in the CNSC's oversight when you get to the licensing stage, because some of these issues that are outside of the scope and expertise of CNSC staff will be better dealt with under that Act.

THE PRESIDENT: Thank you.

MEMBER VELSHI: I'm not sure you answered my question, but that --

MR. STENSIL: I'm not sure either.

THE PRESIDENT: Dr. Demeter.

MEMBER DEMETER: Thank you.

I wanted to clarify my understanding, based on your questions raised in slide 6 about operations beyond 2024. And just to confirm with staff, because they presented on their presentation here on their slide 28 of their CMD H6-C that Commission approval would be required to operate any unit beyond December 31st, 2024. My understanding of their presentation was that this was not a delegated task, this was a Commission task. Understanding that safe storage now is, as you understood it, part of the operations. But any operations from a power production beyond that, any change to the request would require approval at this level versus at staff level.

MR. FRAPPIER: Gerry Frappier, for the record.

That's correct. Actually, the quote that he has on his slide there, the underlined part is not in the LCH there right now. I think it might have been in an earlier version, and that was an error. So in the section 15.4, end of commercial operation, it is very clear. If you just strike out the part that's underlined, that's what's in there now. So it would read that the licensee -- well, I'll read it:

> "This licence condition also ensures that operation beyond December 31, 2024, would constitute a change in the licensing basis requiring approval by the Commission."

Period.

I think the other thing that's important, independent of that line, is we also have, as you know, putting restrictions on the effective full-power hours. So if they wanted to go beyond 295,000, then again that would be something that would have to come to the Commission, not to staff.

And then finally, in the integrated implementation plan that comes out of the PSR, there were also things that are very clear that they must stop

operation in 2024, otherwise there would be a whole bunch of activities they would have to do and that would have to be coordinated with the Commission.

MR. LOCKWOOD: Randy Lockwood --

MEMBER DEMETER: Thank you.

MR. LOCKWOOD: -- for the record.

I already did acknowledge earlier in the hearing that we would not be operating beyond 2024 -- we never had any intention to -- without Commission approval.

THE PRESIDENT: So sounds to me like there's a vibrant agreement with your recommendation on this one.

MR. STENSIL: Yes, that's good news. But again, note this is what is good about intervenors participating, as we flagged a line that was different from what was in public communications originally.

That said, I'd also like, on the licence control handbook, I'm not sure what version I'm working off of now. This is the one I think from April. When I said it was poorly worded, I would also like to flag for the Commission that the proposal that OPG's talking about is to run two reactors 'til 2022 and then the other four shut down in 2024. That I didn't -- in the version of the licence control handbook that I have in front of me, I haven't seen that reflected. And it was reflected in the

previous 2013 licence control handbook, these types of dates.

It's significant because there's timelines that are tied to I think submission of the SOP and SAPs that are based on when a unit closes. It's like three years before a unit closes, you have to do X. So if those dates are not acknowledged in the licence control handbook, you're going to have regulatory confusion. So --

THE PRESIDENT: Okay, that's a good clarification. OPG?

MR. LOCKWOOD: Randy Lockwood, for the record.

As I've already stated earlier in the hearing, and as we submitted a letter in June of 2016 -- June 28 of 2017, my mistake -- stating our intentions to operate Pickering, the end of commercial operations ceasing the end of 2024.

From a business perspective and a planning perspective, to test the economics and ensure everything makes sense, we did run a business case that considered operations of six units to 2022 and four units to 2024, strictly from a business case. And if the economics for that works out, which it did, then it makes good sense to carry forward. But simply that was a business case summary.

THE PRESIDENT: So it's not a regulatory requirement, staff?

MR. FRAPPIER: Gerry Frappier, for the record.

No, there's no regulatory requirement for them to close two of the units. That's not what this licence indicates. It indicates that it's up to them.

Having said that, there may be business reasons why they would want to do that as they have already done with two of the units at the station, but that is not, in our view, an end of commercial operations of the nuclear power plant, since even if they close two, they'd still have four that's operating, which is a pretty big plant.

THE PRESIDENT: Go ahead.

MR. STENSIL: This is an interesting discussion. As I mentioned in the 2013 licence control handbook, these types of dates were set out. And the reason we raised this issue is the original letter that went from OPG to the Commission in the appendix they mention these dates. These were also the dates that were used in the -- when they were at the OEB.

And the reason why they should look into this further, one, it's for compliance on the SOPs and SAPs. Because if you move back to 2022, I think some of them require submission next year. So if OPG already knows

that, they should know that.

Two, this is very important because I participated in these hearings with the assumption that this was their proposal. So I worry about a bait-and-switch at this point. It's gotten a little sketchy.

And the other issue is, again, if you're moving to shut down all six in 2024, we've seen requests from the region for transition plans to mitigate social environmental effects. Shutting down the whole plant in 2024 will be very different from shutting down two in a staged way, moving 500 workers to something else, and then doing the others in the next step.

So this has implications I think for other aspects of the licence renewal that you should look into.

THE PRESIDENT: I'd really like some clarity. If there's a business decision to stop some operations earlier, 2022, what is the regulatory implication of that?

MR. FRAPPIER: Gerry Frappier, for the record.

So under their current operating licence, they have the right to operate and generate power, and they also have the right to shut it down in an orderly, safe way.

The sustainable operation plan that we're saying they have to provide to us five years before the end of operations is the end of operations of all the units at the Pickering site, because that's the point where they start transitioning in a big way into being something quite different.

If today or next year or before 2022, they decided for business reasons they were going to stop operations of a unit, we would expect them to be telling us about that. And then they would have to have a plan for an orderly shutdown of that plant from a technical perspective, but it would not require them to have a sustainable operation plan and all that in place five years before they make that decision.

MR. JAMMAL: It's Ramzi Jammal, for the record.

Mr. President, if you'll allow me, here, with respect to the LCH, we definitely like to put clarity on the fact that in the LCH itself, page 140 of 176, Mr. Stensil talks about LCH for part 1, LCH for part 2.

In addition to what was said by our colleagues, and I will pass it on to Dr. Omar, with respect to the SOP as it pertains to the operation and the plans of OPG, in every regulatory requirement, it requires OPG to come to us. At minimum, whenever there is a change and

with the drop deadline being the December 2024.

So the LCH goes in detail with a shell statement by which that the licensee will have to notify the CNSC of their plans. The safety case is the bounding element. Anything they're going to do within the safety case, if they want to go shut down earlier, that is rendering the site safer.

I will pass it on to Dr. Omar to give you the detail associated with the SAR and all these are referenced in the LCH.

MR. OMAR: Al Omar, for the record.

I just wanted to clarify the point if OPG shut down a unit before 2024, what's the impact of the SOP, for instance, which is the sustainable operation plan. The current plan submission by OPG of the first SOP is December 2019. And in this one here, it will be built on previous submission of the SOP. So we expect that submission to be what we call "mature," addressing all concerns and challenges of approaching the end of commercial operation.

So if an early unit or two units shut down, the SOP will be submitted annually to the CNSC staff for view and inspection. And any impact of early shutdown of any unit would be reflected immediately in the annual submission. And then we'll take it from there.

The impact on safety or safe operation of

the entire station will not be impacted by that change, because all the provisions, including workforce management, the fitness for service of all components and structures, will be indicated in the first submission of the SOP.

MR. JAMMAL: It's Ramzi Jammal, for the record.

Sir, if you allow me to go to page 141 of 176 of the LCH, again, for clarity and for the record, what Dr. Omar has mentioned and it is clearly stated in the LCH under SOP specific requirements -- so this is specific requirement -- it is the shell statement is being implemented or being referred to.

> "The sustainable operation plan shall be developed and implemented at least five years preceding the permanent shutdown of the first unit of Pickering NGS. And for any subsequent Pickering units to be shut down, the SOP shall be updated using lessons learned from previous applications with a report due on the annual basis." (As read in)

So the shell statement does exist and the requirements from regulatory perspective do exist.

MR. STENSIL: This is my point.

THE PRESIDENT: Go ahead.

MR. STENSIL: So I hope I'm working off the same version. But when -- this is what triggered me to say that this seems sloppy, is saying that

> "the [SOP] shall be developed and implemented at least five years preceding the permanent shutdown of the first unit." (As read in)

So, yeah, that assumes 2024 if it's December 2029.

My assumption, intervening in these hearings, is that two units will be shut down in 2022, so this is a question of: what is the proposal in front of us that we're being consulted on? When I saw that, I'm like, that's not the usual kind of issue Greenpeace will worry about, but it's just kind of sloppy, because it just affects when things get reported.

Perhaps it should have something in there, if there was guidance on when Pickering A shuts down, like, "If OPG decides to operate Pickering A beyond this, they need to notify the Commission by --"

THE PRESIDENT: No. What I understand staff is saying is if they decide to close earlier there will be an earlier SOP or an earlier update. That's the way I understood --

MR. JAMMAL: Ramzi Jammal, for the record.

That's very true, sir.

To confirm to Mr. Stensil, the fact that, again, in the LCH, the licence condition ensures that operations beyond December 2024 would constitute a change in the licensing basis, requiring approval by the Commission. 2024 is the last date of the -- anything before, if they want to shut down, then, as I said, the bounding element of the safety case, it's a no-go beyond 2024 without your approval.

THE PRESIDENT: Okay.

Look, there's lots of other issues I'd like to talk about. I think we have heard enough, maybe the final word on this one. We have lots of other parties that I'd like to bring to the conversation.

MR. MANLEY: Robin Manley, for the record.

If the Commission would allow us to just put our perspective on that particular story briefly.

OPG completely understands the requirement, both in the previous Licence Conditions Handbook of our existing licence and in the Licence Conditions Handbook that is proposed in front of us today. We have been compliant with the existing Licence Conditions Handbook with the provision of sustainable operation plans from about 2011 through 2016. Then, in 2017, we submitted

a strategic plan aligned with what we submitted in our June 2017 letter that talked about end of commercial operations in 2024.

So, all the way along, we've been meeting the compliance requirements, we've been developing the plans, we've been communicating them with the CNSC, and it's clearly understood by us what the requirements are.

MR. LOCKWOOD: Randy Lockwood.

I just want to add one more point to make this entirely clear, and it speaks to the openness and transparency that we committed to.

As you know, and we've heard about during these hearings, we completed a PSR for 10 years with the idea that end of commercial operation is in 2024, very clear, for the station.

In addition, we were to supply the shutdown dates for Pickering, which we did, June 28 of 2017. As well, we intended to shut down the Pickering station at the end of 2024.

I will also add that you will find all of this information, the application and this letter, posted on our website.

In addition, I've communicated our plans to the public in the way of community information sessions. I've communicated those to staff, our community advisory

committee, and as well local community councils.

THE PRESIDENT: Okay.

Another question, please?

MEMBER VELSHI: I know, Mr. Stensil, you never need help in what you're asking for, but I just wanted to clarify that in your proposed amendment to the Licence Conditions Handbook, it's not only not delegating Commission authority but you want it reviewed by the public as well, and I just wanted to -- we hadn't discussed that, but that is in there.

MR. STENSIL: Thank you.

MEMBER VELSHI: My question is on your Slide No. 5 on the periodic safety review, and following OPG's comment around transparency, you now are claiming that it isn't sufficient, whether it's OPG or CNSC staff. Perhaps you can elaborate on specifically what you were looking for that you weren't able to get, and why that would be helpful for the Commission in its deliberations, please.

MR. STENSIL: Thank you for the question.

About three years ago, I started preparing for this hearing and trying to gather -- it's very difficult to get information, so it's time-consuming, and I started putting in access to information requests. What interests me most is what are the safety upgrades that are

being done and are not being done for this four-year application. This is very relevant to safety because, again back to the Groundhog Day issue, five years ago we had an application where OPG said, "We're going to run to 2020. We're not going to refurbish the plant and upgrade to a higher level of safety, closer to modern plans." There are cost-benefit decisions that happen when you decide how long you're going to operate the plant. Cost-benefit decisions, to my understanding, are they partly use the probabilistic risk assessments, but time is also a factor of what is the benefit or the cost, so when they applied in 2016, theoretically, if you run to 2020, you have a shorter amount of time, so there will be less benefit and more cost, theoretically.

Now we have a situation where they've come back again and said, "We want to run to 2024." It's Groundhog Day, and it's for a short period. I have no clarity on what their baseline was. Are they using just this four-year period or did they go back and re-establish a baseline from the original date? If they had applied in 2013, theoretically, I don't have access to this data, they would have looked at all that and said, "Okay. We're going to run for 10 more years." It may have affected those decisions.

What we've heard within the scope of this

hearing are the good things, the safety upgrades, the strengthening of programs. What we haven't heard is the discussion of what wasn't taken up in this analysis. What I was looking for was what was on the list and what wasn't on the list. That is a fair discussion.

At the Bruce hearings last month, the lawyer for the Saugeen made an interesting comment where they want to be involved when it comes to -- I think around fisheries decisions and cost-benefit decisions, because they want to make sure their values are reflected in those discussions. I have no access to any of that information, and for me that is key.

OPG is saying it's appropriately safe. I don't know what their measure is. The first request I asked for actually came from an OEB document. I know, Commissioner Velshi, you are now on the OEB. The OEB has a lot more transparency than the Commission in terms of filings, and OPG had submitted to the OEB its technical case for the continued operations to 2022 and 2024. There was a line in there that basically said the cost-effectiveness will also depend on agreement with the regulator on the time period under which these safety upgrades will be considered, so there was some sort of agreement between the two.

For the new commissioners, one of the

issues with the vulnerabilities of the Canadian Nuclear Safety Commission's framework is it's not prescriptive, that can also be a quality, but where it's vulnerable is it involves a lot of negotiation between staff and OPG because it's not prescriptive, there's not a clear rule to state compliance, so they have to decide on what is acceptable. It's that agreement that I am often interested in, because that's where the compromise on public safety may happen to the benefit of OPG's financial case. When I asked for that line in an access to information request to the Commission, "Can you provide me all documents on what the content of those discussions were", I got a letter back, and it was kind of unusual for an access to information request because it said, "These are all redacted, and we invite you to participate in the hearings two years from now to show your views", on an access to information letter. It was very odd.

To me, this just prevented -- I was thinking about this three years ago -- this has just basically prevented me from making any valuable comment to the Commission on these types of issues, and without that information, I can't have confidence that they are in fact going for the best.

So, not in short, but that's a summary of my concerns.

MEMBER VELSHI: Thank you.

I'll get staff to comment on what we've heard from the intervenor.

MR. FRAPPIER: Gerry Frappier, for the record.

I'll ask Al Omar to talk a bit about the PSR process, because I think that's really what is being asked about.

I would say that there was a PSR done by the licensee with a date of the 2020. That was done before and was important to our last hearing. When they decided they were going to go until 2024, then that was one of the requirements that was placed on them by the regulator, that they must update that PSR now that they're going to be going for an extra four years, so certainly at that point they had to take a look and see what is appropriate, given that they are going to continue operating a little bit longer.

With that, I'd ask Mr. Omar to talk about how we looked, at the various meetings, at the gap between modern standards and what they're proposing.

MR. OMAR: Al Omar, for the record.

When OPG hinted at least that they may go beyond 2020, we sent a formal letter requesting OPG to perform a PSR for going from 2020 to 2024. The PSR itself

is a systematic internationally-recognized process to confirm how close the station requirements are to current code standards and standards, whether the licensing basis will continue to be validated, and what kind of improvements can be added to enhance the safety, the station itself is safe, but just to enhance the safety to bring it, as practical as possible, to a new build. The last requirement or objective of the PSR is to ensure that programs, including processes, procedures, and so on, are in place to ensure the effective implementation of these safety enhancements.

The PSR includes four very specific steps. The first step is to establish what we call the basis document and this is more or less a contract between the regulator and the operator on how the PSR will be conducted, what kind of coverage of code and standard and what methodology will be used and what will be the output of that.

The second step is to perform a review of what we call 15 safety factors. Every safety factor addresses a specific aspect of operation or design, human performance, safety performance, radiation protection and so on and so forth. And these are the most extensive review, and part of that review will include all relevant new code and standard, as well as what we call task review

based on internationally recognized IAEA document.

The output of that, we call it gaps, meaning a finding of a potential requirement to satisfy the current code and standard that will be considered in the next steps that will lead ultimately to enhancement in safety to bring that station closer to a new built.

So, the next step is what we call global assessment, that you take all the output of the safety factor report review and have all consideration, including defence-in-depth, what do you have good practices and you assess the global assessment, global safety of operating beyond that to 2024 and have a determination whether -- related to continued validity of the safety case to operate to 2024.

Out of this it comes the implementation -- Integrated Implementation Plan and the current one include 72 actions --

THE PRESIDENT: I think the process is well known and well described.

MR. OMAR: Sure.

THE PRESIDENT: The question was, is any of this in the public domain?

MR. OMAR: Okay.

MR. JAMMAL: It's Ramzi Jammal, for the record. We published CMD in Part 1, and again this is for

clarity, I have no issues at all with the concerns raised by Mr. Stensil.

So, if you look at page 18, section 3.3 of Part 1 CMD, clearly list the references that were established by staff in exchange with OPG. Those references are publicly available.

With respect to the cost/benefit analysis, I will like to make a comment that no regulator in the world should pretend that they can do a proper cost/benefit analysis because we don't have the expertise, nor the knowledge that the operator does.

The USNRC and other regulators when they were audited on the cost/benefit analysis, they told them, don't do it because you do not know what you're doing.

So, what we do ourselves is, we look at the cost/benefit analysis with respect to safety enhancement. Is the safety enhancement adequate so that there is no compromise?

So, based on risk and from decision-making, there are safety enhancements the licensee must take without any cost/benefit analysis, and that is referred to in our CMD.

So, risk-significant upgrades are done, no debate about it. So, that's --

THE PRESIDENT: Were they all in the

public, that's what --

MR. JAMMAL: Yeah, they are all referenced --

THE PRESIDENT: That's what I think they need.

MR. JAMMAL: They are all referenced.

THE PRESIDENT: So, the intervenor said they asked for the documentation and didn't get the documentation.

MR. JAMMAL: Well, I heard he got the documentation...

THE PRESIDENT: Okay. OPG?

MR. GREGORIS: Steve Gregoris, Deputy Site Vice-President, Pickering, for the record.

As Mr. Omar discussed, Pickering completed an extensive PSR. Just for perspective, so aligned with regulatory requirements, international standards, it took a hundred people two and a half years to do this. That is the level of effort, okay.

When we completed this PSR, as Mr. Omar said, we identified improvement opportunities as part of the global assessment report. That global assessment report is published, it's on OPG.com, it's available.

The global assessment report identifies all safety improvement opportunities identified through the

PSR process. It also clearly explains how those safety improvement opportunities are grouped based on commonality, how they're ranked specifically to safety improvement significance, and then how they're chosen or not chosen. All laid out in the global assessment report, it's available to the public.

Based on safety alone and the safety improvement opportunities and the biggest safety improvements, actions were then chosen, again, shown in the report and those actions were then translated into the Integrated Implementation Plan and those actions and the Integrated Implementation Plan are available for the public.

So, what I'd like to say is, nuclear safety, transparency, two key fundamental commitments for us. This is a perfect example of dealing with safety, safety improvements, how we've made decisions and made it available to the public.

MEMBER VELSHI: So, Mr. Stensil, you're shaking your head. Have you seen this global assessment report and all the references to it?

MR. STENSIL: Yes, I've seen the global assessment report. What we did not hear in this back and forth was why all Access to Information requests I have filed asking for staff's comments on proposals of upgrades

have been withheld. I assume they're not references in that document.

` My fear for the Commission is, you're being handed a huge document and it can be very impressive, in the same way that an emergency plan can seem impressive, we've handled everything, but it's drilling down into those details to actually see how those decisions are made that I have not had access to.

And I did not hear a response why the Commission -- why I got this friendly letter saying, we encourage you to participate in three years, and no, you can't have that information. Something -- in French it's c'est louche, something doesn't make sense.

And until I have access to that type of information, I can't have confidence and I don't think you should going forward.

THE PRESIDENT: If you're talking about the deliberation and operation of staff, you're talking about the ATIP and this is not the place for us to discuss the ATIP legislation, this is a whole different process.

MR. STENSIL: It is not a whole different thing.

THE PRESIDENT: Okay. Look --

MR. STENSIL: I'm not done my comments to Commissioner Velshi's statement.

If you look closely at my submission, one of the reasons why I was worried about this, is I reference a briefing note that went to the Minister when Pickering was originally closed -- thank you... -- and one of the comments that it made was when they had done their original periodic safety review, PSR 1 that's referred to now, what they found is cost/ benefit analysis showed that little safety improvement would have been derived as a result of investing $100-million, would result in very little safety improvement.

So, notes like this were being given to the Minister of Energy, that even if they invest a lot of money they're not going to get -- in refurbishment, they're not going to get a lot of safety improvement.

But what we hear here is, we've done this wonderful PSR and we're approaching, you know, safety of a new reactor. This does not add up to me and ATI is, in fact, part of this process, respectfully, Mr. Binder, so a lot of my submissions have been influenced by it or informed by it.

I'm not finished.

THE PRESIDENT: What --

MR. STENSIL: And when you look at -- I'm not finished, excuse me.

Commissioner Velshi again, at the Ontario

Energy Board what you'll often see, OPG will file documents saying, we would like this included in our rates for "x" safety improvement and they will give you three scenarios; medium, high and low for benefit.

They release that to the Ontario Energy Board. We have no equivalent at the Canadian Nuclear Safety Commission for these types of decisions.

And I would encourage you, I can't see it being done in time for this project, but for other PSRs for the Bruce, they're doing them every 10 years, I think improvements can be made on how those discussions take place publicly and we haven't had them this time, and that's why I'm saying this PSR, it's a wonderful large document, but I can't verify it.

MEMBER VELSHI: Thank you. And staff, last word on this.

MR. FRAPPIER: Gerry Frappier, for the record. So, as mentioned the IIP is available in the public, it's attached to our submission. The global assessment report is available to the public. And the safety factor reviews that are what we undertake, if you like, so each one of the -- I forget the number of safety factor reports there are, has been reviewed by staff and that's available upon request.

MR. JAMMAL: It's Ramzi Jammal, for the --

THE PRESIDENT: No, I want to move on to emergency management. We have a lot of people in here and are willing to talk about this. I think we've heard enough about the previous topic, and we have opportunity to re-raise it a bit later on.

But right now I'd like to start with the Office of the Fire Marshal. The intervenor made a lot of comments on that.

We also have, I understand, Dr. Kyle from Durham Regional Health Department available. We have Environment Canada and Climate Change and Health Canada.

So, all of these are available to discuss this topic which is very prominently discussed in this intervenor's submission.

So, Office of the Fire Marshal, over to you, please.

MR. MORTON: For the record, I'm Mike Morton, Director of Emergency Management with the Office of the Fire Marshal and Emergency Management.

As the legislated off-site lead for emergency management and emergency preparedness for nuclear emergencies in Ontario, we very much appreciate the opportunity to participate in this public hearing.

As we discussed during the hearing on Tuesday, as well as at previous meetings of the Commission,

and we have heard Ontario has strong emergency plans in place for nuclear and radiological incidents, including very specific plans for the Pickering Nuclear Generating Station.

These plans are consistent not only with the Canadian Standards Association N1600 standard for nuclear emergency management in Canada, but are also consistent with international guidance such as IAEA, GSR-7 and GSR-2.

These plans, as well as the scenarios that they're based on, have been developed in close consultation not only with CNSC and Health Canada staff, but they have been put out for public review through a 75-day review period and we received, as I reported on Tuesday, 1,600 comments in response to that.

All of those comments were reviewed by an international advisory group that has provided us a validation of those scenarios, as well as recommendations on how we can even further enhance our programs. Many of those recommendations have been addressed in the 2017 PNERP which was released in November and are further reflected in the site-specific plan, released in March of 2018.

As reported yesterday in the hearing, we are also seeking global review of these programs. We are confident that our programs meet national and international

standards, and we are working closely with Health Canada to support the visit of an EPREV mission to Canada that will assess these programs through peer review, experts from around the world to look at all of the aspects of our emergency management programming.

While we have gone on the record over the last days on a number of aspects of emergency preparedness, including the contents of the plans; some of the upgrades to the plans; we spoke a lot on Tuesday about evacuation; we have referenced public alerting; we did want to go on record to provide some further clarity around arrangements related to distribution of KI and particularly when KI would be used as one of the protective actions that is available to us, along with our primary protective actions of evacuation and sheltering.

So with the Commission's permission, I would just like to turn it over to our chief scientist, Lori Whitcombe, who is sitting to my left. Lori can provide some background as to a little bit further in-depth as to the scenarios and planning, understanding this is an area that the intervenor has expressed interest in.

Lori?

MS WHITCOMBE: Lori Whitcombe, OFMEM, for the record.

As Mike just stated, the PNERP, we have

spoken over the course of the last few days how the PNERP outlines the provisions that are already in place for KI distribution in the automatic action zone, the detailed planning zone, and the contingency planning zone. We have also outlined over the last few days how the PNERP revision that was undertaken in 2017, incorporates the principles of optimization of strategy and has always incorporated the fundamental principle of reducing or avoiding entirely any radiation exposure.

The detailed modeling that underlies the planning basis in the current PNERP indicates a deposition beyond the automatic action zone and the detailed planning zone is not anticipated in most accident scenarios. In the highly unlikely and low probability scenario that deposition is anticipated to for beyond the detailed planning zone, the consumption of KI in specific sectors of the contingency planning zone and the ingestion planning zone would be implemented.

To be clear, in a severe accident, KI consumption in the automatic action zone is a default protective action. KI consumption in the detailed planning zone for those who are not able to evacuate prior to the start of the release would be implemented under the authority of the Chief Medical Officer of Health of Ontario.

If KI is necessary beyond the DPZ, in the CPZ or the IPZ, a key strategy would be employed. That is, for populations in sectors that align with the direction of the plume, KI would be recommended as a protective action for those sectors that cannot be evacuated.

As we have mentioned previously, we are also undertaking a technical study at the current time. That technical study will be used to inform any decisions that are necessary with regard to the revision of our zones, and KI distribution.

I would also like to reiterate that residents of the CPZ and the IPZ that are concerned about radioiodine exposure can visit the PreparedtobeSafe website at any time to order KI for themselves and their families.

THE PRESIDENT: Before -- I'm sure that you just raised many, many questions, but before we do this, I'd like Health Canada, if you want to make a statement right here and now.

Health Canada?

MR. AHIER: Can you hear us?

THE PRESIDENT: Yeah, go ahead, please.

MR. AHIER: Yes, this is Brian Ahier, Director of Radiation Protection Bureau at Health Canada, for the record.

I just want to start by saying that we

appreciate the opportunity to participate in the hearing and from the federal perspective, we believe that our federal arrangements, as specified in the Federal Emergency Response Plan and the Federal Nuclear Emergency Plan are sound, well-aligned with IAEA, relevant IAEA safety standards and we have validated that through many exercises with the Province of Ontario in other situations.

With respect to some of the specific comments from Mr. Stensil, we also believe that the current version of the Ontario Provincial Nuclear Emergency Plan is an adequate plan. We can provide a bit more information on our view on this, and I would like to hand the microphone over to Mr. Kevin Buchanan, who was the lead on undertaking the technical hazard assessment that we did in support of the PNERP revision.

MR. BUCHANAN: Kevin Buchanan, for the record.

So as Brian had said, so Health Canada does believe that the current version of the PNERP is adequate. Just to restate that, that the current version of the PNERP is adequate. Health Canada contributed a technical study to inform the current version of the PNERP as we previously heard.

So the modeling in the report used two source terms that represented different INS-level seven

events in terms of the iodine content. This has come up before and I need to reinforce this, that the modeling that was done did represent an INS-level seven event, in terms of the iodine content. So we can put that debate to rest.

The source terms were provided by the CNSC, and Health Canada respects and relies on their expertise and guidance regarding its applicability to emergency planning.

The modeling that was done previously by Health Canada indicated that some intervention levels might exceed the operational intervention levels in the previous PNERP. So stated in a different manner, the plume exposure zone could extend -- could extend beyond the previously defined primary zone in the 2009 PNERP. So if you're not familiar with the designated plume exposure planning zone, this is a zone that's defined within REGDOC-2.10.1

So at the conclusion of this work, Health Canada recommended that the Province of Ontario increase its zone sizes to adequately protect the public, which they did. We understand that this led to the inclusion of a contingency planning zone and we are very happy to see the results adopted into the current version of the 2017 PNERP.

So to clarify this improvement for everybody, in terms of international standards, the 2017 PNERP addition of a 20-kilometre planning zone, beyond the

10-kilometre detailed planning zone, addresses the same response issue covered in IAEA's recommendations for urgent protective action planning zones, which is, if it hasn't come up before, between 15 to 30 kilometres. So it falls within the ranges recommended by the IAEA.

Okay. So now from the 2017 PNERP, the improvements are described as follows: The contingency planning zone is an area beyond the 10-kilometre detailed planning zone where contingency planning and arrangements are made in advance so that during a nuclear emergency protective actions can be extended beyond the detailed planning zone, as required to reduce the potential for exposure.

So we had heard the response from OPG, and Health Canada accepts Lori Whitcombe's explanation of how that would be interpreted within the contingency planning zone. So, Health Canada believes that the current version of the PNERP, if executed as intended, represents a substantial improvement from the 2009 version.

I'll make the following statement. It does tie in with Lori's comments. So because the intent of the statement in the 2017 PNERP and the definition of the designated plume exposure planning zone, Health Canada recommends and would expect that all arrangements in the contingency planning zone be reviewed to ensure that they

are consistent with the hazards assessment and implementable and executable.

We had heard from Lori that this is in fact the case.

THE PRESIDENT: The only missing piece --

MR. AHIER: So Brian Ahier, for the record, just to close.

To reiterate, we believe that the PNERP is adequate and, certainly at the federal level we remain ready to implement our federal arrangements to support the province, if required. And just to close this comment, we would also just want to reiterate that, as was previously mentioned earlier during the hearing, we are working with our federal, provincial and industry partners to plan for an IAEA peer review of our arrangements against the relevant IAEA safety standards and that planning -- the planning for that peer review is in process. The review will be conducted within the coming year.

THE PRESIDENT: Thank you for that.

So the only missing piece is on the execution, and we have Dr. Kyle here, who I assume is going to be the trigger to make this thing in case of an emergency. So maybe you can shed some light as to how this is working or will work in case of an unlikely --

DR. KYLE: Robert Kyle, Commissioner and

Medical Officer of Health, Durham Region Health Department.

To my right is Mary-Anne Pietrusiak, who is an epidemiologist who can answer any questions the Commission may have either now or later with respect to cancer and that sort of thing.

So what I would say is this. I am an implementer. The PNERP, the site-specific plans and the Durham Region emergency master plan, although we may have input into the latter, we are more implementers and I really don't have any comments as to the adequacy of either the PNERP or the site-specific response.

Currently, as a department, we are responsible under our master plan for the pre-distribution of KI pills within 10 kilometres to vulnerable groups, namely schools, child care centres, long term care homes and certain emergency personnel.

Our current focus this year is on replacing the current stock of KI pills whose shelf life is expiring.

So the other thing that we do in addition to pre-distribution is we work with OPG when it was directed to pre-distribute to all residents and businesses within the 10-km zone. Our role was more on the communication side of things, and I'm going to say health information side of things.

We have up to five pharmacies within the 10-km zone that are stocked with KI pills and three times a year, through press releases primarily, we advertise the availability of local stocks and we also direct interested members of the public to the Prepare to be Safe website should they want to access KI pills.

So if pre-distribution was to expand beyond 10 km, there would certainly be some capacity challenges. Depending on how far, you'd get into multi-jurisdictional, I guess, coordinated requirements. So to our west is the City of Toronto, to the east, depending on how far you go out, are more rural health units, Haliburton, Kawartha, Pine Ridge and Peterborough.

So there'd need to be a lot of coordination to make that happen. But we would do our part to work with OPG or whoever's directed to lead pre-distribution.

I don't really have an opinion on how far pre-distribution should go. Should it be 20 km, should it be 50 km. But what I would say is the farther you go the more complicated it is, the more multi-jurisdictional it will be and, quite frankly, we would need assistance from the province.

As you've heard from the Office of the Fire Marshal and Emergency Preparedness, I would not direct

the public to ingest, it would be the Chief Medical Officer of Health.

I think those are my preliminary comments. I'm happy to answer any questions. But the further out you go, the more problematic it is.

Finally, what I would say is the voluntary approach does not work if people are stuck in their cars or otherwise unable to evacuate if they happened to be exposed to a radioactive plume. So I do think if that is a serious consideration, you do need to think about a pre-distribution strategy.

Whether it's the entire population, whether it's particularly vulnerable population, say children and youth who you're most concerned about with respect to thyroid cancer. The depth and breadth, all those options have pros and cons, and you'd need to give some thought to that.

Finally, there's the issue of payment. So any instrument you could use to require OPG to pay for it I think would be appreciated by multiple stakeholders.

Thanks.

MR. LOCKWOOD: Randy Lockwood, for the record. If I may, President Binder, we've looked at various pieces through the hearing here, and are disjointed in my opinion.

I believe what I would have liked to -- because I'm actually concerned about members of the public listening to this because we're talking about it in kind of disjointed manner. It's paramount that they understand in the unfortunate event we had that happen today, right now, that we're prepared to go, and that we have tested that and exercised unified control in December 2017.

So I would like to ask the Commission permission to turn this over to Scott and let's start back from the beginning and tell the story how this would unfold. If you would allow us that permission?

THE PRESIDENT: By all means. There's lots of other questions that we'd like to know. So really focus -- what our concern over the last few days is we did not get clarity about what we -- I think we have clarity on what happened in the 10-km zone.

We're not sure about the 20, and we definitely don't know about the 50. We really would like to see the detailed plan, to answer your question, if it happened tomorrow morning, who does what and how, and where are they pre-distributed kind of thing.

So that's what's really missing. So if you can shed some light onto that aspect, it would be welcome.

MR. LOCKWOOD: Randy Lockwood, for the

record. So I will turn it over to Scott Burns. But I do think that it's important that we start from the beginning to make sure we understand how things would unfold.

MEMBER VELSHI: I just want to reiterate what President Binder has said. I don't think we need to worry about the primary zone now. I think the focus should be on the other two.

MR. LOCKWOOD: Randy Lockwood, for the record. I understand, but it's important that we put the items in order in terms of the various emergency operation centres spinning up and how they spin up, because that factors into the back end which we're trying to talk about.

MR. BURNS: Scott Burns, for the record. Thank you for the opportunity to clarify. As Mr. Lockwood mentioned, we have heard lots of concerns raised about emergency preparedness, and I want to make some comments to give the Commission and the public a sense of confidence on this.

So to introduce my comments, I would say we'll assume that an emergency has happened today. So OPG would go through a process of identifying and activating the emergency procedures and notifying the Province and the CNSC as per those guidelines.

OPG, CNSC, the Province, the City of Toronto, and the Region of Durham would all activate their

emergency operations centre.

I'm not sure why this is happening right now, but... that was not part of the planning.

--- Laughter/Rires

MR. BURNS: So all of these organizations, Health Canada, as well we've heard from them, they would activate their emergency operations centre. People would start arriving -- trained experts, professionals, would start arriving to each of those emergency operations centres and take up their roles and responsibilities within those.

They would have procedures to follow with respect to their specific role, and they would begin to work on those things. Within the Province, we've heard health would be there, transportation would be there, we'd have scientists looking at the plant emergency data, which gets automatically transferred to the Province and to the CNSC from OPG.

We would be, if we're thinking about what's happening later, reception centres would be activated, emergency worker centres would be activated. If we use the example of the Durham Region, school boards, hospitals, long-term care facilities, childcare facilities, they'd all be notified. The region knows their list of folks. Public alerting would begin. We have the whole

system for that.

Inside the region, and I'm speaking a little bit for the region, but inside their specific role, so you've asked for details, the roles inside the emergency operations centres for the region would include: health, Dr. Kyle's group; social services; police; fire; EMS would have representation in there; works department; transit, and under those specific roles there's a whole army of people that would be responding to this.

This would be everyone's priority on this day. All of these centres, all of these people, would have two focuses; we'd have off-site, and we'd have on-site focus.

The two priorities for off-site would be protective action levels and communicating with the public. This whole army of people would be focused on those details. If it got to the point -- so we've heard from the Province about this ingestion planning zone, the contingency plan zone, they're divided into sectors and the ingestion planning zone is divided into subzones. The purposes of that is to assist the decision makers in making decisions around protective actions.

So if we got to a place where we were looking at a hot spot, so to speak -- we've heard the Province reference that earlier on in the week -- it would

be a smaller defined area that they would be focused on to deliver KI pills in the ingestion planning zone.

I'd also mention at the same time there's other things happening. This would be happening and transpiring over time. There'd be consideration for a venting strategy, as that would be over time, many hours, before we got to the decision where the Province gave direction to the Region of Durham in that emergency operations centre, and that army of people underneath there, that it's time to distribute KI.

Our KI strategy is stockpiling, which is found to meet the requirements under the PNERP and the Regulatory Document. That strategy was discussed at our Nuclear Emergency Management Coordinating Committee, all the partners were there. It fits for our demographics.

In the reception centres that we have we have 250,000 (a quarter of a million) pills in those reception centres ready to be distributed to the public.

THE PRESIDENT: So, really --

MR. BURNS: So the detailed planning would be the sole responsibility on that day of the emergency operations centre within the Durham Region and would be deployed through all of those functional responsibilities within that emergency operations centre and executed, implemented, by the people that support that emergency

operations centre.

So we heard from the Province earlier. Their focus is not just on nuclear, but emergency management. They deal with large-scale emergency and deliver of goods in a lot of different scenarios. They know how to execute this work. The emergency service personnel and organizations on the ground know how to execute this work.

The plans closer to the source of the event that I'm talking about, the hypothetical event that I'm talking about, they require more detail because the urgency and the risk involved is greater closer to the source. This assumes that the emergency mitigating equipment and all the safety systems we heard about earlier in the week, they haven't worked. They haven't worked, so --

THE PRESIDENT: Okay. Look, you keep repeating things that we already know --

MR. BURNS: I know you know it.

THE PRESIDENT: -- and we understand this. We asked a very specific question, I want to follow the pills. I'm not interested in anything else.

MR. BURNS: Okay.

THE PRESIDENT: I want to know where the pills -- you mentioned 25 reception areas. Where are they,

where are the locations, what is in each reception area?

MR. BURNS: The reception --

THE PRESIDENT: Why can't we get a straight answer?

MR. BURNS: That's my point.

THE PRESIDENT: So please get to it.

MR. BURNS: The reception centres contain 250,000 pills.

THE PRESIDENT: Where are they? Are they all -- do they cover the whole 50-kilometre zone?

MR. BURNS: They are in the contingency planning zone.

THE PRESIDENT: What about the 50K zone?

MR. BURNS: So in terms of the 50-kilometre zone, we don't currently -- we have a host community that is outside of -- a host reception centre, a host community that is outside of that. There are not reception centres currently located. As I mentioned, the contingency planning zone is -- the name of it states that there will be contingency plans in place, that is part of the Provincial Nuclear Emergency Response Plan, and organizations responsible for these plans are looking at and starting to implement these --

THE PRESIDENT: There is something called 50-kilometre ingestion zone.

MR. BURNS: Correct.

THE PRESIDENT: There are two regulatory provisions that make it clear that you have to have distribution of that, some plan for distribution. We have not yet seen that plan.

MR. BURNS: So what --

THE PRESIDENT: Excuse me, okay. I would like to turn to staff now, and again, let's go through those two requirements. They are not guidance, they are requirements, and I want to understand what is the plan for fulfilling those two requirements. And Dr. Sandor, you can jump right in there. I know this is something dear to your heart.

MEMBER DEMETER: Just for background, because I like the here and now analogy, the Nuclear Emergency Preparedness and Response REGDOC was put out in Version 1 in 2014, that is four years ago, Version 2 in 2016, but there was no change to the language that for the ingestion planning zone there should be pre-stocking and efficient distribution and particular concern to sensitive populations such as children and pregnant women. So if we are talking about the here and now, if we had to distribute KI pills in the ingestion planning zone, I just need to know how. Who is accountable, who is responsible and how will it be distributed in an efficient manner? That's all

I want. I really understand the detailed planning zone, I really understand the contingency, the scalable, but there has been a significant lack -- I just need the details to understand how it will be distributed and who is accountable so that I can feel comfortable that it is there and it can be distributed efficiently, especially to the vulnerable populations.

THE PRESIDENT: I don't want to put -- I understand there is a transition of government, I understand bureaucracy issues, I understand tariffs, I understand all those things. Just please share with us what it is that you can share with us now and what you can share with us later if it doesn't exist.

MR. MORTON: Mike Morton, for the record, Office of the Fire Marshal and Emergency Management.

I am going to turn to Kathy Bleyer, who is our Senior Nuclear Emergency Preparedness Officer. She will speak just a little bit more about the zones, and apologies if a little bit of that is on the record previously, but I think it is really important to understand the scenarios in which KI would be considered.

This is not about simultaneous distribution to everybody within a 50-kilometre zone. These scenarios have been carefully modelled by Health Canada, who could speak further to some of the specific

credible scenarios that again have been peer-reviewed. Kathy will just talk a little bit about this under the severe accident, which really is the only time where we would have indication of KI ingestion, and again, KI ingestion having a very specific purpose during a situation where radioactive iodine could be inhaled as a plume passes over. We are always going to prefer to evacuate people to have them not exposed to radiation and that is why the automatic actions are in place that Lorie outlined in the 3-kilometre zone, as well as very specific and detailed preparations and actions in the detailed planning zone. So Kathy will take us a little bit into the overall scenario, how that relates to the CPZ.

Again, Health Canada may want to emphasize some of the specifics of that scenario.

And then Jonathan Stone, who is our Manager of the Planned Exercise Unit, he is ready to speak to the specifics that have been asked about the REGDOC and how it's --

MEMBER DEMETER: Yes. I think just for timing, the precision I want is today, the Chief Medical Officer says yes, there is a plume, distribute the KI. I want to know who and how and the accountability. There's a lot of scenarios, but today you have a zone, you have a certain sector of people you can't evacuate, you have to

distribute it, who and how? Who is the accountability, who are the players?

MR. MORTON: Mike Morton, for the record.

I think we can provide further detail on that through the scenario itself, which is the only scenario in which case we would be considering this outside of the 10, which is the severe accident scenario. So I will just leave it to Kathy or Jonathan to decide who is best to go first on this, but provide us with that context.

MS BLEYER: I don't want to be repetitive, so I will try and narrow the focus down as far as possible.

So when we did the planning basis review, we looked at the severe accident scenario. So based on that severe accident scenario and specifically in terms of the need to ingest KI pills, the modelling indicated that the dose -- the intervention level for KI pill ingestion would be reached out to 7 kilometres and that that 7 kilometres was looking at sort of the mean dose.

So we looked at two doses -- or Health Canada actually looked at two doses: mean dose and maximum dose.

So the mean dose was the average dose, and in terms of the mean dose, the mean dose defines a zone where exceeding the generic criteria or intervention level is highly probable and to that distance in a range of

directions. So basically given that dose being reached, we are looking at the entire radius potentially having to ingest KI pills.

In terms of a maximum dose, a maximum dose defines the area where the risk is in a very specific direction and range best defined by environmental monitoring.

So basically you have the mean dose which we found would go out to a 7-kilometre area where KI ingestion might be needed. The maximum dose was 33 kilometres, so that of course takes us into the ingestion planning zone, but that would be in a very specific direction under the plume.

So basically, again, our first protective measure of choice is evacuation. Under even the most severe accident scenario there is the element of time where we could call for an evacuation. For the event where there might be some kind of severe weather situation where people can't evacuate or where there are some people left in the area who can't evacuate, we could do a focused distribution of KI pills to that area.

So in terms of the way we see the accident progressing, to do pre-distribution out to a whole 50-kilometre area just doesn't make a whole lot of sense, given that in this highly unlikely scenario, and on top of

that the highly unlikely weather event that would prevent people from leaving the area before the plume, we could undertake a focused distribution. It is the kind of thing we do under different kinds of emergency situations. We would involve emergency responders to take the pills out to the area as needed. So that's basically how we foresee the situation going.

THE PRESIDENT: So even in your scenario, who distributes the pills to the 33 kilometres? Where do they get the pills from and who actually distributes it?

MR. STONE: Jonathan Stone, OFMEM, for the record.

So as noted, at present there are 6 million doses of potassium iodide that are pre-stocked, available and stored at the provincial government pharmacy in the GTA. This constitutes --

THE PRESIDENT: Is it one -- sorry, I'm going to interrupt you. Is it one place?

MR. STONE: Yes. So the 6 million doses for the IPZ are stored at the provincial government pharmacy in the GTA. Now, this constitutes a credible location as required in section 2.3.4 of REGDOC-2.10.1. These pills have been procured by OPG as required and stored under the control of the Ministry of Health and Long-Term Care. These doses do account for sufficient

numbers of pills to cover populations of children under 18, pregnant women and breastfeeding women. That is also consistent with the requirement of REGDOC-2.10.1. So that constitutes your sensitive populations.

These pills are located in a place so that they could be readily accessed and efficiently and promptly provided to members of the public as required based on the scenario that has just been discussed. The location of these pills was selected by the provincial KI Working Group following the publication of REGDOC-2.10.1. The Working Group included our office, the Ministry of Health and Long-Term Care, the licensee as required by the licence. So everyone who needed to be involved in the discussion pursuant to the REGDOC was involved with selecting the location, and the justification for that really relates to the requirement within the PNERP Master Plan.

So at Annex I of the Master Plan there is a requirement for the Ministry of Health and Long-Term Care and OFMEM to develop and maintain a strategy for the distribution of pills within the IPZ as necessary during an emergency. So the distribution strategy would rely on the mechanisms that we have in place.

As noted by OPG, the PEOC is regularly called on to undertake complex emergency response and emergency logistics operations throughout Ontario, notably

to coordinate the evacuation of communities threatened by floods and forest fires. So we frequently move large numbers of people from remote northern communities into host communities far away. So we are not moving pills safely, we are moving people safely. We do that every year on a regular basis. We just completed an evacuation and repatriation of James Bay Coast communities this spring. We also did it last year. So the experience gained through these operational activities would be used to coordinate the emergency distribution of KI in the IPZ. These aren't exercises, these are the results of real operations that we do on an annual basis.

So the strategy for the distribution of KI pills within the IPZ as necessary to the specific locations would be as follows. Should the need arise to coordinate the distribution, the PEOC would coordinate that delivery as part of the overall response strategy. We wouldn't be able to know obviously in advance where the pills would need to go because that would be based on modelling. So the PEOC scientific section would use modelling to determine exactly where within the IPZ these pills would need to go and where that specific distribution would be. And again, keeping in mind the key holding strategy, these would in large part be sent to places for people who could not be evacuated.

MEMBER DEMETER: I understand that.

MR. STONE: Okay. So --

MEMBER DEMETER: Just stop for a second, please.

MR. STONE: Yes. Right.

MEMBER DEMETER: So let's say you have a plume, you have to distribute, all I want to know is who has the accountability to go to the central radiopharmacy, pick up the drugs and transfer them to the sites that are within that plume, within that modelling? Is the Office of the Fire Marshal accountable for the physical delivery or is it another -- I know this is multijurisdictional but I still -- I need a mechanical answer to who is accountable for distributing if the decision to distribute is made.

THE PRESIDENT: Just to make it even more complicated, we are dealing -- there's a clock going. Those KI pills, if you are going to be two days later, forget about it. So there is a clock. You want to do it on time to be as most effective as possible. That is why we are so preoccupied with distribution, because if it comes from one centre and you have to distribute to 300,000 people, let's assume the plume is right through all those schools, I have no idea how you are going to do it.

MR. MORTON: Mike Morton, for the record. Building on what Kathy Bleyer said about

this scenario and understanding this is a limited geographic scope specifically of people that could not be evacuated, and from what we heard on Tuesday from Ministry of Transportation as well as the statistics and timings that they have provided at past hearings even beyond the 10 kilometres in terms of evacuation and based on the scenario that Kathy outlined, it is very possible to evacuate people from the zones, and particularly in an area of geographic focus based on modelling before and up to release. So if these pills had to be distributed, again, it is on a limited basis.

To specifically answer the question about distribution, all of these decisions are through the Provincial Emergency Operations Centre in terms of leading the emergency response. We are the legislated lead of that. The ingestion of the pills, as we heard, is ordered by the Chief Medical Officer of Health. We have at our disposal in such an emergency all of the emergency response resources of the Province of Ontario and, if necessary, of the federal government and neighbouring jurisdictions. The legislation is clear that we can direct those resources. So every municipal emergency responder, provincial emergency responder, federal responder could be utilized to carry out these actions, to take pills to the targeted populations that could not evacuate or the choice was made

not to if we felt more harm would be done through such an evacuation, to provide them with those pills.

And to be really clear, not only are pills at the government pharmacy, that's where the 6 million doses targeted to the IPZ are, but, as OPG has indicated, they are staged at locations throughout the entire radius of the 10-kilometre zone as well and those locations are specifically in the plan. So it's not just that if there was an issue with the provincial pharmacy, they could be drawn from those other sites which are very geographically dispersed.

MEMBER DEMETER: So that really helps that we got there. So just for the record and to make sure I'm understanding, the accountability and the responsibility for the delivery of KI pills if need be is with the Office of the Fire Marshal?

MR. MORTON: Mike Morton, for the record. That is correct. We take our lead from our Cabinet, of course, who has the ultimate responsibility, the Cabinet Committee on Emergency Management, for all emergencies in Ontario and who approves the PNERP, and the Provincial Emergency Operations Centre is the mechanism through which the government coordinates and actions its command and coordination activities.

THE PRESIDENT: Again, I would argue that

staff, as a regulatory, if you like, compliance, you would want to make sure that you understand the process in great detail. If you waited -- normally those accidents happen at two o'clock in the morning, there is no Cabinet, and by the time you wait for a Cabinet decision it could be all over in terms of effectiveness. So you want to make sure that you have the authority a priori delegated to you guys to -- in case of an emergency to be able to ring the bell and things to happen.

MR. MORTON: Mike Morton, for the record. And apologies if any sort of delay was implied by my comment. We have a strong system of delegated authorities. Our Provincial Emergency Operations Centre operates 24 hours a day, seven days a week, 365 days a year. It is staffed at all times. This is not an on-call system. We have officers in place in our Operations Centre and we have delegated decision-making processes 24 hours a day. We are actually required to set offsite response levels within 15 minutes of OPG notifying us of any circumstance. So even from the most minor reportable events up to a general emergency, we have 15 minutes to provide direction to all of our emergency response partners, including the designated municipalities and ministries of the government, on the predetermined automatic and procedural actions that they would take under

any scenario that develops from the facility. That authority comes from Cabinet and that's why we have a Cabinet level plan that allows us to take those actions, to make those decisions without delay.

So there is absolute vigilance on this and a very well practised system that has multiple drills per week within the Ontario government and on a regular basis on more minor reportable events, regulatory events and so on, has proven over and over for decades that we can do that within a 15-minute timeline.

THE PRESIDENT: Mr. Stensil...?

MR. STENSIL: First of all, that's a lot to respond to and I will try to make it concise.

The top line that I heard in all of that back and forth is that the new PNERP is adequate and we are waiting for a study to confirm it. So in this way we are very similar to 2013 when we were in these hearings, we heard the same messaging, that the PNERP is adequate. And for the new Commissioners -- Commissioner Velshi, you may be a bit bored of this -- but what has driven a lot of the debate that we just heard was due to after Fukushima intervenors in Greenpeace asking for evidence to demonstrate the adequacy of offsite emergency management. What people said was we need studies modelling what an accident would look like offsite so that we can see whether

this -- we don't want just assurances. And the fact that we are still waiting for a study to definitively confirm these things eight years later shows you that intervenors have been patient and persistent.

We are getting the better decisions, but we still have a ways to go. And what is behind that originally is I think the Commission staff and the Canadian industry have had a blind spot to offsite -- the impacts of offsite emergency. They are almost scared of their own shadow. They seem to think if you model a big accident like this from a credible Health Canada that it would be the end of their company. I think that has been shown not to be the case, so I would encourage them to be more forthright moving forward.

But we have a lot -- we are still yet to be on par with European regulators that did similar studies within three years after Fukushima. So all that said, Commissioner Velshi, in your presidency this will be an ongoing thing, but I think we can get up to those levels over time. So that's a first background.

For KI, in regard to KI -- in my comments I am going to quickly try to summarize where I think there is evidence on the record for you to act based on what you know already and have heard and what you have not been told, and also where you need to continue asking questions

for more evidence and to provoke improvements to offsite emergency management.

And to start with KI, the story that was not said is the biggest improvement to the 2017 PNERP was caused by the Commission's implementation of the REGDOC on emergency management in 2014. That came in response to the 2013 Pickering hearings and what you heard from Commissioners about the -- not from Commissioners, from intervenors related to the inaccuracy of offsite emergency response and complacency within the provincial government and within OPG. So that is to your credit. You have moved this file forward.

That complacency, however, still exists and I think we have heard it in these hearings in that five years after that guide, I think Commissioner Demeter you mentioned this, we still don't have clarity on how it's being implemented. And even when the PNERP was under review last year, in spite of the fact that the Commission had put out this REGDOC, the discussion paper put out by the province said we will not be including KI within the planning basis. It was really weird. Luckily, Greenpeace was in agreement with CNSC staff and municipalities that said, No, we want this. This is something that the public wants.

So now the question comes to

implementation. And I think for your decision-making, your guide should still be your REGDOC and not the PNERP. I actually see it as stronger than the wording that came out in the 2007 [sic] PNERP. And you have the licensing authority to drive improvements to provincial offsite emergency management, and I encourage you to continue doing that.

The issue related to KI, I think the tangible thing that you can act on in these hearings is related to vulnerable communities and whether what we just heard is adequate and believable. And I don't think it is. We've already heard that Bruce Power made a decision to stockpile KI where the most vulnerable are. This makes sense, no matter which way the plume will go. They made that decision.

But we don't really have clarity on why there was a decision to not stockpile it around OPG's facilities. That's very unclear to me. Going back to cost-benefit analysis, I worry it may have had something to do with that. No one's just putting that forward.

And ironically, President Binder, after 10 years, at your last Commission meeting, by the line of your questions, I think we agree on this one. Took 10 years.

THE PRESIDENT: [indiscernible - distance from mic]

MR. STENSIL: It's just like *Groundhog Day*.

And I think you have clearly -- you have a rule that needs to be applied. And I would recommend that you apply it consistently by adopting the Bruce Power model

You have a public expectation for this. You heard from the TDSB, but also all the municipalities, including Durham Region and Toronto, have asked for KI pre-distribution to be expanded. So this is something that will be welcomed.

And while we keep hearing from the line "we're waiting for a technical study to confirm whether this is adequate," you already have the evidence base to direct stockpiling in schools. It is from your own staff. It's in my supplementary submission. CNSC staff, in their submission to the PNERP review, basically effectively said -- I can't find the citation -- both the SARP study and the Health Canada study show that vulnerable communities will need ready access, may need ready access to this.

Based on those two studies that I think are inadequate, we don't need to wait for this other study. You have a basis already to move forward on that. And that came from your staff. So I'm in agreement with them. It was not adopted explicitly in the PNERP, but I think that

may be for a lot of reasons that are out of scope here.

So for KI, I'd encourage you to move forward on that.

The second issue that came up over and over around the zones. We're waiting for them to be confirmed. What we've learned, I think, by starting to model larger accidents, is that the zones in which we've traditionally or historically planned for detailed or flexible measures are probably too small. And we haven't -- there was this contingency zone that has been superimposed that no one really knows what it does. It doesn't have any additional requirements, and we're told that it's for severe accidents.

I did some looking for the source of it. It's based in the CSA guide from 2014. When I went back to look at where the source from the CSA guide was, it was an IAEA guide that based it on the IAEA has recommended something called the "extended planning distance," that you deal with hot spots, this type of contingency planning.

In other countries, that extended planning distance is about 100 kilometres. And when staff were talking about the benchmarking with Switzerland the other day, they did not mention the extended planning zone. It's 100 kilometres in Switzerland.

So I expect in the future -- I don't think

it'll be at this hearing -- we'll see an expansion of the ingestion planning zone. And the contingency planning zone is a half-measure, as I stated.

So I think that's an area where you need to continue asking questions that I don't think were sufficiently covered.

An aside, also, something in front of you is about public awareness and advertising. Dr. Kyle just spoke. And one of the ways that we can create more conservatism in emergency management is by having more people aware to order the pills. It's fewer people to distribute to over time.

There are ads in GO stations within Durham Region. About a year ago I noticed that those ads said, "If you are within the 10 kilometres, you can order KI pills." And I was like, well, actually, if you're within the 50 kilometres you can order those KI pills.

And I sent a note to Dr. Kyle as the chief medical officer of health for Durham Region, and I said, "This doesn't make sense. The REGDOC actually says 50 kilometres. Your own council has said we would like expanded KI delivery."

I didn't hear back from him. He's a busy man. But I have noticed that the messaging in the advertising has changed to 50 kilometres. I don't see that

yet in Toronto.

But what this indicates to me is that the mindset is still do the bare minimum for availability.

THE PRESIDENT: We have a biological challenge here. It's been two hours.

--- Laughter / Rires

THE PRESIDENT: We need a break. So the question is do we have lots more to discuss.

So you'll have to stick around. We're going to take a 15-minute break. Come at quarter to 10 -- is it 10? To 11. I can't read this. Quarter to 11. Thank you.

--- Upon recessing at 10:30 a.m. /
Suspension à 10 h 30
--- Upon resuming at 10:49 a.m. /
Reprise à 10 h 49

THE PRESIDENT: Okay, we are back and continuing with our questioning session.

Who wants to -- Madame Velshi.

MEMBER VELSHI: Thank you, Mr. President.

I have a question for the Ontario Fire Marshal's office and Emergency Management.

We've had, as you know, a number of

intervenors express concerns about lack of awareness about the nuclear facility and emergency management, particularly folks from the GTA. And the City of Toronto, in their submission, have also asked the Province and the CNSC to undertake some action to address this need.

So my question to you is do you have any plans to address this need, and what are they.

MR. MORTON: Mike Morton, for the record, Office of the Fire Marshal and Emergency Management.

On Tuesday we did provide some background as to the current requirements, and particularly with respect to the committees that are developed for each of the areas around the nuclear facilities. And we did hear from OPG about the extensive education efforts that have taken place in the detailed planning zone, 130,000 kits distributed, and so on. So we do feel that measures in that area have been quite substantial, and based on the information we have, have been effective in getting across their message.

We also spoke to the Canada-wide education program that we've been very involved with around public alerting, the Alert Ready program -- because public alerting is such an important element of any emergency, and particularly of a nuclear emergency -- to ensure that Ontarians know how they will be alerted and what to do if

they are alerted.

That said, our committee that looks at the area around the Pickering Nuclear Generating Station -- and again, many of the stakeholders are on this, including OPG -- are indeed looking at ways that they can further increase awareness. This is actually going to be a topic of their next meeting.

We heard about some of those efforts before the break with respect to advertising about how people can get pills within not just the 10K zone but the 50K zone. The group recognizes that there are further opportunities, despite having really good mechanisms and systems online where people can go on and very quickly learn about pills, order pills, have them shipped if they're anywhere in the 50K zone.

We do feel that we can do more in this area, and the group is exploring strategies to do that, understanding that every municipality is required to have an emergency management public education program, that our programs are risk-based, and there are a large number of topics that we, at the Office of the Fire Marshal and Emergency Management and our municipal emergency management counterparts, want to ensure that people are aware of. You know, various hazards from weather to technological. And balancing that is always an important consideration and

challenge.

But our group is looking at opportunities to go even further. And I'm not sure if this is something OPG as a member of the committee also --

MEMBER VELSHI: Well, let me ask you the specific question, because the City of Toronto has asked the Province and the CNSC to do this. And I think what I'm hearing you saying is that this is a municipality responsibility, and really the City itself should be doing it, maybe getting help and resources and support from the other parties, but it is their responsibility.

MR. MORTON: Mike Morton, for the record.

So there's two discrete things that are being discussed. There's the general requirement under the *Emergency Management and Civil Protection Act* for all of Ontario's 444 municipalities to have public education programs. And it is risk-specific. It states that those programs should reflect the identified risks through the mandatory risk assessment that each community carries out. And our communities across Ontario do have those programs.

This area is somewhat unique in that there are additional requirements for risk-specific public education for the nuclear facilities. And again, those requirements through the PNERP place additional requirements on those areas. So we would, through the

PNERP, see this very much as a shared responsibility. The Province works to coordinate those public education committees; the municipalities actively participate; and across the province, the operators do provide significant resources to support the implementations of those programs. They've invested heavily in those programs, and they've expressed an openness and interest in continuing to support those.

So when the group meets, Toronto is a part of those discussions; Durham's a part of those discussions. They are looking at strategies to -- you know, from the perspective of the risk assessments and what target audiences would need to know at what point, there is the opportunity to put forward those ideas, to propose strategies directly with the operators.

And in the past, where that has occurred, that's led to the campaigns that we have now. And again, the industry's put a lot of financial support toward those.

MEMBER VELSHI: Is the CNSC part of that group?

MR. MORTON: Mike Morton, for the record.

As far as I know, the CNSC does not directly participate in that, but those groups report to the Nuclear Emergency Management Coordinating Committee. They are actually subcommittees of that. And the CNSC is

on the overall coordinating committee.

THE PRESIDENT: So that raises an interesting regulatory question. In your REGDOC about that particular subject and about the distribution and make it available for the 50K, is there any communication requirement under that to make this program effective? So in other words, you know, we've been hearing all along that the KI pills are available if you ask for it, but somebody got to know what is that that I have to ask for. Somebody have to know that it's available. So the vast majority of people that don't know about it, they're not going to ask for it. So how do we overcome that challenge?

MR. FRAPPIER: Gerry Frappier, for the record.

I'd ask Richard Tennant to talk a bit about our compliance program associated with this REGDOC.

MR. TENNANT: Richard Tennant, for the record.

With respect for what compliance activities we implement to oversee the distribution of KI, the REGDOC applies to the licensee. So what we've done is we've kept in contact with the licensee, looked at records and management systems and kept track of the progress of how the distribution was implemented.

We also, through site staff, have been

able to inquire as to where they live within the GTA, for example, and ask whether or not they've received the product and pills.

So we've kept abreast. We've kept our finger on the pulse through communications with the licensees and where that has been distributed, also through participation with the mentioned EMCC, the Emergency Management Coordinating Committee with the Province. We're also in dialogue and aware of the progress through that avenue as well. So we're very well up to speed on how the KI has been disseminated, pre-distributed, and stockpiled since the REGDOC came into effect.

THE PRESIDENT: But, again, we do have an outreach program. CNSC has an outreach program. I don't understand why you wouldn't within the outreach program make it a requirement that, within the 50K, it's known -- it's known that those pills are available if you go to that site and ask for it.

MS GERRISH: It's Meghan Gerrish, for the record.

Within the CNSC's outreach program, there are many avenues where licensees as well as CNSC staff go out and make this known to the public.

Now, with OPG, there is a requirement to communicate with emergency responders as well as with us in

terms of how are they communicating with the public to let them know that this is available. So up to the 50 kilometres they have a plan in place, a proactive public relations program where they disseminate this information through various tools.

THE PRESIDENT: So if I hear, you are politely saying yes, we can become a little bit more, you know, requirements to make sure that there's a campaign to all residents within 50K?

MS GERRISH: Yes, I believe that that's something that we can achieve together.

THE PRESIDENT: Okay, thank you.

Ms Velshi?

Question? Dr. Demeter?

MEMBER DEMETER: Thank you.

This is a question for the epidemiologist with Durham Health. Sorry, I forgot your name.

So a number of intervenors have brought up issues of health status around nuclear power plants, around Pickering. Based on your sort of health status reports and health status indicators, can you comment if there's any unusual clusters or concerns relative to chronic diseases, specifically cancer, any health status issues relative to low birth weight or congenital abnormalities? Like is there anything that sticks out that makes people who live

around a nuclear power plant, this time Pickering, different than the provincial standards?

MS PIETRUSIAK: Mary-Anne Pietrusiak, for the record.

We have done a lot of work around health status in Durham Region and in Pickering municipalities, and also in the health neighbourhoods. And no, there's nothing that comes out in terms of particularly higher rates that would be linked to the nuclear plants.

For example, childhood cancers are not higher in Durham Region. In terms of cancer rates for Pickering, we do not typically have cancer data below Durham Region level. So except for special studies where we have done on radiation and health, typically, we look at Durham Region as a whole.

MEMBER DEMETER: And maternal-fetal health status indicators?

MS PIETRUSIAK: Mary-Anne Pietrusiak.

In terms of fetal-maternal health, Pickering actually does very well in terms of those kinds of indicators.

There are some higher rates for small for gestational age, and that is likely due to the ethnic population. We have a lot of immigrants in the Ajax-Pickering area, and when we're looking at small for

gestational age, we can't look at what the ethnic make-up is. We do know that we do have a fairly high population of Asian as well in those areas, so they typically have smaller babies, not necessarily that that is a higher risk to health.

So, generally, we have actually extremely positive indicators for Pickering and for Durham Region. There are some rates that are higher, depending on what you're looking at. A lot of this information is available at durham.ca/neighbourhoods or durham.ca/healthstats. We have cancer reports. We have detailed reports for health neighbourhoods, for our 50 health neighbourhoods in Durham Region.

MEMBER DEMETER: Thank you very much.

THE PRESIDENT: Just as a follow up, did you have a chance to read Dr. Fairlie's presentation and his recommendations that women and pregnant women should move out of Pickering?

MS PIETRUSIAK: Mary-Anne Pietrusiak.

I did look at Dr. Fairlie's report. In terms of the methodology of that report, from what I understand, basically they took the Fukushima plume and just adjusted it to Durham Region, which doesn't really apply, so in terms of a recommendation like that, I would say totally, no, that of course pregnant women and children

have a very healthy environment within Durham Region.

THE PRESIDENT: He had two studies, sorry, I should have said. He had a study that for all living near NPPs globally it's not healthy, it's not good for you.

MS PIETRUSIAK: Mary-Anne Pietrusiak.

I'm sorry, I can't really comment on that, in terms of all nuclear power plants, but in terms of Durham Region, I would say that we have a particularly healthy population. Typically, Durham Region is very similar to Ontario, which is similar to Canada, and Canada does well globally in terms of a lot of its comparators for health indicators. That's not to say that there aren't areas for improvement, there always are.

In terms of our areas of focus, we tend to look more at health equity. We have seven priority neighbourhoods in Durham Region that are linked to lower income, and those areas definitely do show poorer health status compared to other areas in health. None of those priority neighbourhoods are in Pickering, I might add. There is downtown Ajax, downtown Whitby, and then five neighbourhoods in Oshawa, so those are really, for us, more of a priority in terms of improving the health of the population.

THE PRESIDENT: Thank you. Questions?

I think it's over. The last word is for

you.

MR. STENSIL: First, I'll do a little bit of cleanup, because I didn't finish what I was going to say before the end of the break, if that's okay.

THE PRESIDENT: Okay.

MR. STENSIL: On the question of advertising within the 50 km area, Commissioner Velshi, you were asking questions about this, I would remind the Commission that even the programs that are in place now within the detailed planning zone were driven by your licensing authority, not by the province and the multijurisdictional committees that you've been hearing about. Those committees are very slow. You have the authority to, as I said at the top of my presentation, spur momentum in exercising in your ruling. I urge you to do that.

What we've heard about the awareness campaigns is there's already one in place across Durham Region, OPG is fine with that, but we haven't seen it over into Toronto, so there's a blind spot there.

As I mentioned off the top again, what we've learned about the recent studies that we've had since Fukushima is that the geographic risk footprint of the station is larger than we thought in the 1970s. That's why we need these types of campaigns based on the evidence.

One small suggestion that maybe staff could undertake, I've been told by my colleague in Belgium that for KI distribution in their extended planning zone, which is 100 kilometres -- I don't have confirmation of this from actually reading their document but what has been conveyed to me -- is that, under the new Belgium system, doctors are actually instructed to prompt parents and pregnant women when they visit a doctor's office to ask them if they have ordered their KI pills. That could be a very simple thing that could be implemented within the GTA to start addressing that specific regulatory requirement, so just a suggestion to throw out there.

The other piece that I wanted to talk about, and it goes back to momentum, you've heard a lot at these hearings from all sides on the multijurisdictional committees that make decisions on emergency management. They're all great people, but these committees are actually part of the problem that we've been seeing. They're the bottleneck. I think we heard the other night, in the first round of questions on stocking KI in schools, OPG said something along the lines of, "We would never make a unilateral decision to change the stocking plan without the consent of the rest of these committees." Bruce Power did. Right there I think is part of the problem, where you can help address that.

The Nuclear Emergency Management Coordination Committee, which you've heard about a lot, operates by consensus. As an intervenor that intervenes in the public interest, what I worry about is OPG and Bruce Power are on this committee. If it operates by consensus, and if there is a proposal to go beyond, to seek the best, that may be against their financial interests, and based on the process, it will be a disincentive to doing that. A clear example is that those committees made a decision against KI pre-distribution after Fukushima. This Commission, though, came to the opposite conclusion. That's why there needs to be very close monitoring of these committees, and the Commission could also mandate, if it works by consensus, that staff can also have a role in making sure that consensus pushes forward and is not brought to the bottom.

You'll find, in my submission, a complaint, what's called an "integrity complaint", that I've sent to the Deputy Minister of Community Safety. That is related to my concern that the ministry has been borrowing staff from Ontario Power Generation to fulfill its role. For a public service intervenor, if this were pipelines, this would be like asking Kinder Morgan to come up with the emergency plan. It hurts the credibility and the trustworthiness of what you hear. What I documented in

my submission is that an OPG staffer was actually involved in the PNERP review, behind the scenes, so this is what I was intervening in, and others have been demanding for years. It wasn't the government that we seek to defend the public interest, there was a role of OPG in that process, and it's unclear to me what steps were taken to avoid conflict of interest, so when I hear the 2017 PNERP is adequate, and yet the only major upgrades to that plan were the KI requirements that this Commission triggered in 2014, I'm not satisfied that this plan is in fact adequate, and we have a lot more to do.

I wanted to bring that up because I think CNSC staff could have a very good role in making that committee more transparent. They also deny freedom to information requests constantly, which raises more issues. So, as you can see, there is a problem in the operations and governance of this issue, and it goes back to the main point of my submission, which is that you're not only licensing OPG, you are licensing the province, they're sharing staff, and in that you should feel a large mandate to exercise your licensing authority to drive continuous improvement of the PNERP. You have done it before. You should do it again.

Commissioner Velshi, in your presidency we may end up having a review of the *Nuclear Safety Control*

Act. In the United States, there are elements of the legislation that allow the NRC to review municipal and state-level emergency plans. We're effectively doing that in an informal way here. That might be an improvement we could bring to the *Act* that I'm happy to work with you on.

All that is to say I don't have trust in the 2017 PNERP. We know continuous improvement will be coming, but I urge you to continue asking questions. In your decision, you've been given a few very tangible things where you can take action where there is sufficient evidence on KI pre-stocking in Toronto and on awareness campaigns, and perhaps setting some timelines for implementation. I encourage you to do that.

In conclusion, because I can see you're getting antsy, President, one issue that we didn't in fact talk about at all was the siting issue, which was the focus of my presentation. The focus of my presentation was on the fifth level of defence in depth. This discussion has effectively been on emergency management, which is an aspect of that. I mentioned in my presentation that, according to the IAEA, you need three elements for defence in depth. The safety culture, I think I've just pointed out there's some issues with safety culture in the way that these bodies interact. They're all great people, but I think, as operations, there's something not working

in the public interest, conservatism.

When we're hearing these comments about being able to distribute KI to one -- from one point in the City of Toronto at 2:00 a.m. in the morning, as you said Mr. President. I don't see any data to show, is that adequate?

I made a recommendation in my submission actually for, parallel to evacuation time estimates, if this is the way we're going to do, maybe there should be a requirement for KI distribution time estimates for the City of Toronto, because I don't think this is believable, and there's no evidence to substantiate it.

And so, in terms of the IAEA requirement, I don't think they meet that.

And the final one is quality assurance. And, as we've seen over the past seven years, I don't think they're there. I bring this up because I think there's a role CNSC staff could have in trying to implement these elements to the fifth level of defence-in-depth, a lot of this is over my head, but I don't see it in the way it's rolling out right now.

But back to siting, the other element of the fifth level of defence-in-depth is controlling land use. And, as has been brought up with other intervenors in these hearings, is there are no limits to population growth

around the Pickering Station. This doesn't pass the common sense test for most people, that you can just operate an old nuclear reactor in an urban area. There's just -- this is not an issue of whether OPG complies with the CNSC regulation, it's a question of whether the CNSC has adequate regulations on this factor.

And Greenpeace and CELA have tried to constructively intervene in this process over the past 10 years, commenting on the siting guides, for example, and we're told it's a provincial issue. We filed a request for review by the Environmental -- with the Environmental Commissioner for the Ministry of Municipal Affairs to actually set standards. They brushed us off and said, we just updated in 2014. Those rules are inadequate.

So, again, this comes back to you and your licensing authority. You have the ability under the *Canadian Nuclear Safety Control Act* to ensure that there's adequate provision for the protection of the public.

On siting, we don't have any rules, we don't have any limits, we don't have any conservatisms. That had been discussed in these hearings.

So, I think there's latitude for you to act and this is where it comes back to Groundhog Day. There is a provision in the Licence Control Handbook that could by December 31st, 2022 to apply to operate the

reactor longer. So, this would be coming back to Groundhog Day again.

And I think we're at the point where you should be able to say, enough is enough. And if you're going to come back again and your government, your shareholder is knowingly increasing population around the Pickering Nuclear Station, you have a responsibility to do something about it.

So, in the same way that this Commission has intervened and forced action from the Ministry of Community Safety, I think in the event that there's a re-application in 2022, you have a responsibility to intervene so that the Ministry of Municipal Affairs shows how that it will, at a minimum, maintain safety margins for off-site management.

So, for this reason, Greenpeace respectfully makes the following request for ruling under Rule 23 of the CNSC's Rules of Procedure. I will provide it to Marc by email after this presentation.

Greenpeace requests that the Commission include an additional requirement related to land use planning in section 15.4 of the Licence Control Handbook.

The Licence Control Handbook currently lists a series of analyses and reports, OPG must provide the Commission, by December 31st, 2022, if it applies to

operate any Pickering unit beyond 2024.

Greenpeace requests this list be amended to include documentation to show OPG will ensure that it can control the use and occupation of land within 20 kilometres of the Pickering site to maintain safety margins for the fifth level of defence-in-depth by preventing the intensification and development of residential dwellings. This could include the Province's growth plan for the Golden Horseshoe which is scheduled to be updated in the middle of 2022.

I think I've summarized my reasons for this. I think it is a very reasonable request, and I think it's incumbent on the Commission for this site, of any site with your mandate under the *Nuclear Safety Control Act* to cause irreplaceable harm to Canadian society, you must ensure that there are rules in place to maintain safety at the fifth level of defence-in-depth.

We have not seen it. OPG has already taken us through this once in 2013, we're here again, and if they come back they should expect sanction from the Commission because the Ministry of Energy was aware of it when they approved the life extension originally in 2010, they knowingly increased -- have policies that undermine public safety.

With that I'll conclude. President

Binder, I wish you well in retirement, it's been a great ride, and Commissioner Velshi, I look forward to working with you in the future.

THE PRESIDENT: Thank you. I'm really going to miss those interventions.

So, thank you for those, too.

--- Laughter / Rires

THE PRESIDENT: And we are now going to move on to the next presentation by the Toronto Regional Board of Trade as outlined in CMD 18-H6.27.

I understand Mr. Parker will make this presentation.

CMD 18-H6.27

Oral presentation by the

Toronto Regional Board of Trade

MR. PARKER: All right. Well, thank you, Dr. Binder and congratulations on wrapping up your term as President of the CNSC and, obviously, congratulations to Ms Velshi for taking ownership of this important institution.

And, of course, quick thanks to Louise and all the CNSC administrative staff who provide such a valuable service and allow these hearings to actually take place. I know they sometimes get forgotten behind the

scenes, but I always think it's important to recognize it.

So, thank you again for allowing the Toronto Regional Board of Trade to appear before you today in support of Pickering Nuclear's licence renewal and extension.

As an aside, I told my young three and a half-year-old son today that I was going to be appearing before the Canadian Nuclear Safety Commission and his eyes lit up and said, are they football players? And I told him that one day when the CNSC is in the Grey Cup, they will have a fan in Ajax cheering for them. So, it's maybe a broader mandate in your future, Mr. President.

So, what I want to talk about today is a bit of a shift in focus from what we've heard for the past three hours. I wanted to bring it back up to a broader context because that's what I believe that's what these hearings need to hear.

You hear a lot from experts in the field, safety experts, environmental experts, nuclear technicians, but sometimes I think we need to get beyond the particular details which are crucial, but also remember, what is the broader context in which you're making these decisions?

And on that note, I want to talk about three things in particular. One, the need for a continued source of reliable low-cost power; a laudable safety record

that we see at Pickering and through our entire nuclear fleet in Ontario; and finally, ensuring a sustainable environment and how important that is.

And throughout that I want to focus specifically on how the extension of Pickering Nuclear's licence supports the goals and priorities not only of the CNSC to protect safety, to protect the environment, but also -- and this is, again, one of those neglected parts of the mandate that don't get discussed here enough -- it supports our responsibilities under international nuclear agreements and international nuclear treaties, and I think that's something that we don't lose sight of.

So, briefly about us. The Toronto Regional Board of Trade has been around for more than 170 years. We have a diverse membership of actually now more than 13,500 business professionals and influencers, unfortunately that number just got updated after the -- or before the slides had to go in and we count Ontario Power Generation as one of our valued members, as well as many other members in the business communities throughout this region.

Our energy work, which is growing and extensive, is founded on trying to achieve the balance between three main things: affordability, reliability and sustainability. And one of the reasons we're so passionate

about nuclear power at the Board of Trade is that we believe that nuclear is the rare technology that actually achieves these objectives, that can actually manage to get to all three without having to sacrifice one for the other.

And as anyone who has followed energy policy globally or within the province, you're usually making trade-offs. Nuclear is an area where, when it's properly managed, properly regulated as it is in Ontario, as it is in Pickering, we can actually achieve all three of these goals and we think that's very valuable and part of why we support the licence renewal.

Very briefly on the issue of cost because I know that's -- it's an important issue to us and our members, but obviously not necessarily the focus of all we're doing at the hearing. Pickering has been the basis of low-cost baseload electricity to the grid in Ontario, and specifically serving our membership throughout the Greater Toronto Area.

We feel that the continued value for money we get out of Pickering, even as the aged nuclear plant, is still evident, it's still outperforming other sources of power that are more expensive.

And when we're talking about Pickering's role within the broader system, within this broader context, we're talking once again about if not Pickering,

then what, then gas power, then intermittent wind or running more nuclear power, hydropower where there's some flexibility in our other resources.

So, we believe that having Pickering as a stable part of that not only makes electricity cheaper and more reliable, but that has broader benefits for our community that we think are important.

But to focus specifically on the issue of safety, it's really important to remember that nuclear is still the safest way to make reliable electricity. It doesn't produce almost any emissions, it doesn't produce the broader air pollution and greenhouse gas emissions that we see from fossil fuels, and even compared to something like hydroelectricity, which I know we don't see here because we couldn't find a perfectly comparable stat, it's still safer in terms of the amount of land lost to damming and to reservoirs, as well as the deaths that have been caused through hydroelectric construction around the world.

It's a high energy source that produces very few safety concerns and we need to, again, remember in context, that if not nuclear, if not Pickering, then what else? And those other sources come with actually a worse safety record received than our nuclear fleet.

And if you don't believe me, consider your own staff and your own work before that Pickering, along

with the rest of our nuclear fleet in Ontario, has been given a fully satisfactory or satisfactory ratings on safety, on reliability, on worker safety, and on the management of the waste products.

So we believe that the CNSC does a very good job of continuing to monitor our nuclear resources to continue monitoring their safe operation and we would urge you simply to listen to your own advice and the best practices of your skilled staff.

Beyond that, of course, Pickering in particular has made a special effort to increase worker safety and achieving only 0.06 injuries for 200,000 hours worked, which in almost any injury is a remarkable safety achievement. In fact, I even wonder if the Office of the Board of Trade have quite -- so a laudable safety record for something as large and sophisticated as a nuclear plant.

But the broader environmental context is also something that we really need to be concerned about here. I think it's very important, particularly in the context of where we're going with the nuclear refurbishment plans that we're seeing at Darlington and we're seeing at Bruce.

In particular, this is why the 2024 extension is so important. 2023 is sort of the magic year

for nuclear refurbishment in Ontario. We are going to have two units down at Bruce and two units down at Darlington at the same time. That's going to pull more than 3,000 megawatts out of our total electricity supply, 3,000 megawatts of clean energy.

If we take Pickering out of the equation as well and the four units that are expected to be servicing the grid in 2023, that's pulling another 2,000 units of clean energy off the grid as well. We think that's very troubling if we're truly committed to our international commitments on emissions, on climate change, that we're already going to have to increase our immediate sources of electricity to manage these situations. It makes very little sense to us at the Board of Trade that we would handicap ourselves further, assuming Pickering could be safely run, to further take clean energy off the grid by not extending that licence through that critical period of refurbishment.

Of course, if you're curious about whether or not we could substitute with other sources of power, well, the Intergovernmental Panel on Climate Change has already done the math on where the stronger emitting sources are, in terms of CO2 per kilowatt hour and nuclear again comes out best when we start comparing even things like solar.

Once again, of course, very quickly we would remind you of the fact that we were only able to close coal in this province because we were running more from our nuclear fleet. Again, that's very germane to the fact that as we are going through refurbishment and some of that nuclear fleet is offline, we need to make sure that there is clean energy to replace it.

But finally, I want to talk a little bit our international commitments and why this extension is important. As you may recall, back when we were here at the Bruce hearings, I talked about the need to support a strong, robust Canadian nuclear industry to help with things like non-proliferation because CANDUs are much more difficult technology to gain offensive nuclear materials out of, and a strong industry in Canada, a peaceful leader in technology, allows us to be a strong leader internationally for the peaceful and safe deployment of nuclear technology.

But specifically how we wind down Pickering and the next steps and the service extension to 2024, give us this additional period to show best practices to the world about how you complete operations and eventually wind down operations on existing and legacy nuclear technology. We know that there are nuclear reactors in the United States, in South Korea, in Europe

that are reaching their end of life as well, and we have an opportunity here through the stage shutdown and the final operations to show how best practices can be on aging but still useful and still safe nuclear reactors, so that we can show the world how the best way to run a peaceful and safe nuclear industry is. I think that's very important. I think that's something that merits consideration for how we leave the world in terms of nuclear power.

So on that I simply close by saying that the CNSC has a very successful track record in licensing continued operations, in licensing refurbishments, in licensing shutdowns. You have an excellent staff here and obviously intervenors who are going to come and give you the best perspective possible.

I simply urge you. You've got good staff. You've got good policy. You've got a good legislation. Stick to it, and I think you'll find that we'll have an extension to Pickering and a robust nuclear industry for many years to come.

Thank you.

THE PRESIDENT: Thank you.

Questions? Ms Velshi...?

MEMBER VELSHI: A comment that the intervenor made, I just want to ask OPG and then staff.

So where do you look for best practices on

how to safely, effectively shut down the plant and get it ready for decommissioning? Who do you look to for examples on who has done that really well?

And then staff can answer from a regulatory perspective.

MR. MANLEY: So Robin Manley, for the record. I am the Vice President of Nuclear Regulatory Affairs and Stakeholder Relations.

First off, we have some internal experience of our own, right. We have safe stored a couple of units. In addition, we have experience, as we have done before, of retubing units. So it's not like we have no internal capacity or experience of our own.

We have participated by sending staff and participating in refurbishments of other CANDU units, right? So we've got that experience as well. In addition, we participate in external conferences and benchmarking and go to sites that are involved in decommissioning processes, so we learn from others.

MEMBER VELSHI: I can't remember which intervenor mentioned -- it may have been the PWR Diablo Canyon as a place that it wasn't just shutting down because I know you have, but I meant the overall station shut down and getting ready for decommissioning. Where do you get best practices for that?

MR. LOCKWOOD: Randy Lockwood, for the record.

I'll ask Art Rob to speak to your specific question. We'll point out that as part of the OSART we did ask for someone to look at long term operation and how we were going to blend operations now, so to speak, into the shutdown stage and beyond.

Art, if you could elaborate a little bit on what we're looking at and other plans we're looking at for best practices.

MR. ROB: Good morning. It's Art Rob, VP of Decommissioning for the record.

So much like Robin Manley indicated, OPG does an extensive amount of benchmarking. We're actually linked to groups in the IAEA and we look at best practices internationally for decommissioning. We actually participate in several groups that study benchmarking opportunities and we actually do field visits to some of the actual sites in the States and take OPEX directly from some of the decommissioning projects that are underway right now.

MR. FRAPPIER: Gerry Frappier, for the record.

From the staff's perspective, certainly as far as shutting down and putting into safe storage, we have

lots of experience on that, G2, Pickering as has been mentioned a couple times, has a couple units that are there. But we also have on the previous generation of Douglas Point NPD. From our perspective, we also look at the research reactors so NRX and NRU, Whiteshell.

So as far as safe shutdown into sort of a long term stage, I think we certainly have the regulatory framework for it, and we have the experience with respect to what we need to be looking at.

I think the interesting part of your question is the decommissioning part, if you like, the actual disassembling of nuclear power plants. For that we certainly participate in international groups with the International Atomic Energy Agency and the Nuclear Energy Agency out of OECD. Right now, we are very much involved in looking at that with respect to NRU, Whiteshell NPD.

Perhaps I'd ask Ms Karine Glenn in Ottawa to give you some more details.

MEMBER VELSHI: No, my question wasn't around decommissioning. It was looking at the SOP or the continuous operating plan, what are best practices around that and who do we look to from a regulatory best practice in those?

So really, yeah, I'll leave the decommissioning for later, but it's the get ready for end

of commercial life.

MR. FRAPPIER: Sorry, my misunderstanding. Gerry Frappier, again.

So certainly in those areas we have a lot of experience but also, again, internationally there's been lots of working groups that we have participated on to look at both long term operation and end of commercial operations.

MR. GREGORIS: Steve Gregoris, for the record.

Just I'll add there, Commissioner Velshi. From an OPG point of view, we have shut down our coal plants. We have gone through that transition. We have experience with that. We have shutdown Units 2 and 3 at Pickering. We have gone through that experience, and again that's helped inform us.

We are part of the WANO AC Centre in Atlantis there, and we have communications with that group.

We have spoke to individuals in plants such as Diablo Canyon. I have personally to understand their approach. We certainly take those approaches into consideration when we plan ours.

THE PRESIDENT: Thank you.

Ms Penney...?

MEMBER PENNEY: Thanks for the

presentation. I'm not sure if you're aware or if you've looked at any of the other submissions we had but we had from the Toronto District School Board and the Toronto District Catholic School -- what they brought in front of us is two motions that were endorsed by the Toronto city council, one in November and one in April. The first one is about KI pills and we have dealt with that extensively. The second has to do with public information broadly, that sort of thing.

Just wondered what your organization -- in any way do you have communication plans or policy? And you know, how is nuclear or the nuclear industry and your nuclear members who may be providing services, is there any role for you in terms of communication, gratuitous communication?

MR. PARKER: That is a great question. Jeff Parker.

The communication that we do is mostly at the level of policy recommendations, as well as communication to our members about key items, if there was ever a situation where the government thought there was a need for our communication channels to help spread information or awareness. Obviously, we partner with government all the time on disseminating information and their own different campaigns for awareness, marketing, et

cetera. So there would be a role to play for that.

But our ongoing focus is generally at the level of -- both to policy makers in terms of advocating successful energy policies, as well as to our own membership to update on what our positions are. So I would say that I think there is a potential role that we can play, depending on the need of the organizations involved, including the municipalities, the Fire Marshal's office, but we don't, at this point, have an active role in that field.

THE PRESIDENT: Thank you. Anything else? Okay, thank you for your presentation.

MS COLE: Thanks for your time.

THE PRESIDENT: The next presentation is by Ms Cole, as outlined in CMD 18-H6.75.

Ms Cole, the floor is yours.

CMD 18-H6.75

Oral presentation by Belinda Cole

MS COLE: Thank you. Thank you for the opportunity to present this morning. I'd like to address the Commissioners, and I would urge you to deny OPG's application to extend Pickering's operation.

Here are the facts, as I understand them.

First of all, I understand that Pickering is not up to modern international safety standards.

Secondly, as I understand it, the Pickering reactors don't meet the International Atomic Energy Agency's safety guidelines. Fukushima had a far superior safety system in place, they're in the middle of a catastrophe now. As I understand it, they're a rural area, they're not in the middle of a huge thriving population.

I also understand that Pickering is, on top of all of these, it's past its design life. That OPG came in 2013 and said, would you please extend our licence to 2020? That was granted. Why are they coming again? This is the third time, as I understand it.

My interest here, I'm a citizen of Toronto, I'm a mother of four, and I'm really really worried about the water that sustains us. Here's my problem. If I were to say to my kids, okay, if there's an accident at Pickering, what happens? My number one question is we're talking about all the species that rely on Lake Ontario to survive. We're talking about water for millions of people. As I understand it, half of Ontario gets its water from the Great Lakes.

So what water am I going to be able to give my kids? If there's an accident at Pickering, we know it's past its design life, we know human error is always a

factor. What do I tell my kids? This is a reasonable risk? You know, I might not be able to give you water you can drink because a decision was made that somehow...

We know what happened at Fukushima. We don't even have the safety standards in place there. It's a catastrophe. It doesn't seem -- like, we're not talking about unreasonable. For me, if I was talking to my kids, I'd say, this is madness.

Emergency procedures, I'd like to tell you a story. I don't -- quite frankly, I don't believe anything on paper, and I'll tell you why. I live in Toronto near what used to be called the GE Hitachi plant. A few years ago I asked for the emergency response, what we do in the case of an emergency.

I took it and I called the numbers. This was 7:00 in the morning, I called the first number. I got a voicemail saying, you need to call this number. I called that number, and they said, "Oh, well, we don't know what you're talking about. You need to call this next number." I called the third number and I got a voicemail. That's the emergency planning for my neighbourhood. Everything looks good on paper.

Has there ever been a drill? In World War II, World War I there were drills, because people knew there was a big risk. So where are the drills?

I don't believe, even if there's an emergency plan, let's see it work. I'll believe it when we've had a drill and we can say we can get everybody in the vicinity out of there.

I'm a resident of Toronto, I haven't heard anything about KI pills. I haven't heard anything about what would happen. I go back to this, what water are we going to drink? What is going to be left of this area if this plant goes down? We're not talking about, you know... It's the heart of this area, it's what sustains us all.

All so, as I understand it, we don't need the power. Right now, this power is going to the United States. We don't need it. Why would we take this risk? It's just crazy, in my view.

I would like to add to that just a few points. Yeah, we need that awareness campaign for all of Toronto. I need to know and my neighbours need to know, and everybody here in Pickering and beyond, we need to know what happens. I have no faith that -- an emergency plan basically is going to be of no use. It's going to be finished. It's going to be finished.

So, I mean, it's a little bit crazy to even be talking about this, because it seems crazy to me. Nonetheless, we need closer plans that are subject to an environmental assessment. I have heard since I've arrived,

which is quite recently, that people are talking about, yes, we're on committees, we sit on committees and we're talking about this, practices...

No, I'm not hearing any -- I'm not hearing, here it is, here's the plan. If I don't see a plan and I can't talk to people about whether it looks trustworthy, I'd be crazy to rely on it.

You know, I've talked to some people, we sit on sub-committees and we've got -- you know, we're talking about this. Hang on a minute. This licence was renewed in 2013. It was supposed to close in 2020. Why are people asking -- why's OPG asking for yet another extension, a third?

As I understand it, I would also request that the Commission remove the wording from OPG's licence that allows CNSC Staff the power to allow Pickering to operate past 2024. That's a last-ditch question for me. Because, as you know, please -- like, please...

You know, the plant goes down, like how do we protect ourselves? How do we protect our families? How do we protect our communities? I mean, it's just like -- yeah, this is surprising. I'm sorry, but I...

THE PRESIDENT: Thank you. Have you been here for the last three or four days? That's precisely all the kind of issues we are trying to deal with. So I don't

know if you had a chance to actually listen. But we've been trying for the last four days to try to deal with some of those issues.

So anybody? Any particular questions? Okay, thank you. Thank you for your presentation.

MS COLE: Thank you very much.

THE PRESIDENT: The next presentation is by the Regional Municipality of Durham, as outlined in CMD 18-H6.67 and 18-H6.67A.

I understand Mr. Cubitt will make the presentation. Over to you.

CMD 18-H6.67/18-H6.67A
Oral presentation by the
Regional Municipality of Durham

MR. CUBITT: Good morning. For the record, my name is Garry Cubitt, I am the Chief Administrative Officer of the Regional Municipality of Durham.

Welcome to Durham Region and thank you for the opportunity today to highlight key points from our written submission.

Durham is a unique region in Canada, it is the only municipality with two nuclear plants operating in

an urban area and, for this reason, OPG has been one of the Region's largest employers for decades, and it also means that 51 per cent of Ontario's nuclear fuel is stored in interim facilities in our communities.

Most of Durham falls within 50 kilometres of the Pickering Nuclear Generating Station and as such our community involves all of the zones outlined in the Provincial Nuclear Emergency Response Plan and many regional departments play key roles in implementing that provincial plan.

Over the years Durham Region and OPG have developed successful partnerships that support community safety and awareness. OPG helps fund the work of the Durham Emergency Management Office and the Potassium Iodide Pill Distribution Program, which is delivered by the Durham Region Health Department. During the operational safety review of the Pickering plant, our KI program was identified as best practice for nuclear operations.

Thanks in part to the direction from the Commission, the Durham Regional Police Service worked closely with OPG to create a seamless emergency radio system. Regular communication with OPG occurs through channels such as the Durham Nuclear Health Committee and updates by OPG's staff to Regional Council.

The continued operation of the Pickering

Nuclear Generating Station will allow Ontario to refurbish the Darlington and Bruce nuclear stations without using gas-fired generation to supplement electricity supplies. Having clean, reliable nuclear power available will allow Ontario to pursue its greenhouse gas reduction targets by electrifying our transportation and heating systems.

Durham Region welcomes the sustained employment from continued operation of the Pickering Station. OPG's contributions to dozens of charitable and community organizations such as our hospitals and Chambers of Commerce are important as well. We value OPG's environmental stewardship and education programs that engage our young people. The region is confident that OPG will continue to operate the Pickering Station safely and therefore supports extending its operation until 2024.

This info graphic illustrates activities planned for the Pickering site over the next 50 years. The related impacts are complex. The graphic is drawn on information drawn from reports by OPG, the Nuclear Waste Management Organization and others. Our concerns for the future relate to the direct and indirect job losses over the next 10 years, the accumulating nuclear waste likely to be stored on site for the next half century and uncertainty about when it will be removed, the unknown impacts to property tax revenues and regional service demands. While

OPG's application is focused on the nuclear facility, we urge the Commission to also consider the communitywide impacts.

The Pickering Nuclear Generating Station began operating before the Region of Durham was formed in 1974. OPG has worked with the community to maintain the social licence for its operations. In the ongoing operations phase the region identified a few concerns which we believe can be mitigated.

Some elements of the new Provincial Nuclear Emergency Response Plan are still being finalized. However, based on preliminary review, my staff estimates that additional regional expenditures of at least $1.25 million annually will be required to implement it. This added cost is for expanded emergency planning in the new contingency planning zone from 10 to 20 kilometres. Regional Council is also concerned that OPG's application included no transition plan for the 1500 high-skilled, high-paid workers affected by the closure of the plant in 2024. This is a potential major impact to our local economy.

Our submission also describes how the province's unfair property tax treatment of nuclear generating facilities shifts more financial burden to Durham taxpayers each year. This is not OPG's doing. The

province regulates property taxes, but their practices should not be allowed to penalize the host community.

Further, as Council directed, the region seeks compensation for storage of used fuel waste. Our concern is about the indefinite interim storage of used nuclear fuel in Durham. While OPG contends that their property taxes compensate the region for nuclear waste storage, clearly the two are not related.

To help mitigate impacts on the community and ensure ongoing host community support to the Pickering plant during the continued operations phase, the region asks the CNSC to require provincial or OPG funding for the region to implement the Revised Provincial Nuclear Emergency Response Plan and that OPG prepare and share with the region their transition plan for loss of jobs.

We also seek compensation for used nuclear fuel storage. Until the federal government approves a permanent waste disposal solution, Durham Region is a de facto host community for spent nuclear fuel. Other communities storing nuclear waste, or offering to do so, are being compensated. Durham Region should be as well.

In addition, we seek the CNSC's support for an end to unfair and inequitable property tax regulations.

OPG seeks approval with this licence to

begin the process of decommissioning in 2024. However, only a preliminary decommissioning plan accompanies their application. As a municipality, the region is mandated to plan for the future. Our land use, servicing and transportation plans are generally 10 to 20 years, asset management plans may extend to 50 years. For this reason, the limited detail in OPG's application about decommissioning impacts and mitigation is a significant gap. There is no transition plan for more than 1100 workers to be displaced in 2028 or the many community organizations that have benefited from OPG corporate contributions in the past. Beneficial reuse of the site is scarcely mentioned and mitigation of the stigma related to ongoing nuclear waste storage on a largely vacated site is not discussed.

Durham Region has been clear in Council resolutions in 2010 and 2015 that it is not a willing host for the used fuel waste. A new social licence will be needed for a closed plant sitting for 30 years with 780,000 bundles of spent fuel. Discussion with the community about a new social contract for the decommissioning phase must begin now. Plans need to be in place when the process begins and 2024 is not far off.

In addition to receiving data about the socioeconomic impacts of each decommissioning phase, the

region asks the Commission to recommend that OPG launch an economic development partnership immediately. This would help mitigate job loss and ensure the beneficial reuse of the Pickering site.

The region also requests information about the transportation system and emissions impacts of each phase of decommissioning for planning purposes. Due to the substantial risk that the deep geological repositories will not be available to accept used fuel and other radioactive wastes when planned, the region seeks compensation until the waste is removed from Durham. In addition, we ask that Nuclear Waste Management Organization formally engage the region in planning for the transportation of used fuel. Regardless of the repository location, the route will pass through Durham.

Due to the duration and impact of decommissioning, we ask that the region be engaged as a key stakeholder in the scoping, planning and execution of the decommissioning EA or impact assessment. We may need experts to assist us. At present the region does not qualify for the CNSC's intervenor funding. Nevertheless, our petition should be funded impartially and transparently so that an additional burden is not imposed on Durham taxpayers.

To summarize, the region has suggested

straightforward solutions to several of our short-term concerns. These include funding of additional emergency planning costs, data-sharing and regulatory changes to resolve the property tax issues. Our concerns about decommissioning impacts and waste storage must be resolved through early engagement in the EA or impact assessment process and through negotiated agreements.

The region appreciates the opportunity to comment. The effects of the activities proposed under this licence are long-lived in our community. As such, we must plan now for the future.

In closing, the region wants to extend great thanks to Dr. Binder for his leadership and his work with us over many years and extend our best wishes in his retirement and extend our commitment to welcome and work effectively with Ms Velshi as she takes over this important role.

Thank you for your attention and we look forward to your questions.

THE PRESIDENT: Thank you.

Questions? Who wants to start? Dr. Demeter...?

MEMBER DEMETER: Thank you very much for your presentation. I think it's important to achieve our nuclear emergency preparedness and response activities that

there are adequate resources to meet those, so help me understand, one, from a staff point of view, whether they have reviewed whether the resources are adequate for the host community and the local areas to carry out those activities and maybe help me understand, someone, the means of how money flows from the PNERP process to the communities affected. That might be a PNERP question, but -- the first one is, has staff looked into this relative to adequate resources to carry on the mandate for emergency preparedness for the local community?

MR. FRAPPIER: Gerry Frappier, for the record. So I will ask Mr. Ramzi Jammal to comment on that.

MR. TENNANT: Richard Tennant, for the record.

Just with respect to RD-2.10.1 and 2.3.4, the public preparedness requirements, the REGDOC clearly states the requirement that licensees shall provide the necessary resources and support to provincial and municipal authorities in implementing the provincial and municipal plans to do the following. And therefore it states the requirements of IPZ and communication, but I will pass the microphone to Ramzi Jammal.

MR. JAMMAL: It's Ramzi Jammal, for the record.

So we have to be careful with respect to a

business agreement between the municipality and -- or the flow of funds provincially. As was stated in our requirements, the licensee has a responsibility to be working with the community. From our mandate perspective, again, I want to reiterate the fact that there is a resources requirement that must be in place. The province has a role to play, the municipality has a role to play and so does the licensee. So I would prefer that the question be given to OPG with respect to the relationship with the municipality and how they are providing them with support.

From a regulatory perspective, we provide training to first responders, we provide assistance with respect to clarity, but we don't have the financial means in order to provide resources or what is being requested by Mr. Cubitt.

MEMBER DEMETER: OPG...?

MR. LOCKWOOD: Randy Lockwood, for the record.

First of all, I want to thank the Region of Durham for coming here today and making the intervention. I was pleased to hear them speak about our long relationship in the Region of Durham. We share priorities and interest in the community to make it a better place to live. As I mentioned on day one, our staff not only work here but live here as well. I was also

pleased to hear around the identification of the best practice from OSART. It is something that's admirable and I'm glad it was mentioned today in terms of distribution of KI.

And moving on now to your question, you know, the emergency practices. Several items were mentioned, the relationships with emergency services and the radios. It really speaks to our earlier discussion around the effectiveness of the emergency plan. Specifically I'm going to ask Mr. Scott Burns to talk about our relationship with the region in terms of that.

And in terms of implementing the new PNERP, that is a priority for us. Many items were mentioned, and I am certain we will work through each of them, but from my perspective the first and foremost priority here is the emergency response plan and to ensure that the public is safe in the unlikely event of an accident at Pickering.

Scott...?

MR. BURNS: Scott Burns, for the record. I will be quick.

As Mr. Cubitt mentioned, we have enjoyed a longstanding strong relationship with the Region of Durham on many fronts. We do have Memorandums of Understanding that we agree on and provide financial support to the

region for the EP programs and the distribution of KI. So we have two separate ones, one with the Emergency Management Office and one with the Health Office.

Just to expand a little bit on that in terms of the relationship, we also have Memorandums of Understanding with the Police Service of jurisdiction, the regional police service and the fire service as well for Pickering and provide support there.

The radio system was mentioned by Mr. Cubitt and Mr. Lockwood. That has been an excellent partnership and we have seen the benefits of that interoperability in communication.

THE PRESIDENT: Ms Penney...?

MEMBER PENNEY: Thank you for your presentation. You mentioned in a couple of places in your presentation that you want, the region wants to be recognized as a stakeholder and involved in the EA/impact assessment process for decommissioning. So my question to you on that is what does that look like for your full involvement and what kinds of issues would you want discussed?

MR. CUBITT: Through you, Dr. Binder, I will refer the question to one of our staff that are more specialized in the EA process.

MS DRIMMIE: My name is Christine Drimmie,

for the record.

In regard to the EA process, we participated in the EA that was done for the new nuclear development at Darlington and it was a very extensive process, it took a lot of staff effort, and the areas that are of interest to us extend from the kind of transportation infrastructure that's needed to support, you know, that large kind of ongoing process right through to the economic impacts, the social impacts on our community, and any emissions and health impacts that would be happening from the demolition of the plant, for example, emergency planning during the various kinds of movement of materials that would be happening, which speaks to sort of the NWMO transportation planning that we are interested in. So it is a very -- the region provides a very extensive number of services, as you will see in the back of our submission, and just about any area that is mentioned in one of those services we would have concerns about how that looks over the next 50 years.

THE PRESIDENT: Thank you.

Question? Ms Velshi...?

MEMBER VELSHI: So a question to OPG. Durham Region has said they need additional resources to implement PNERP and so you talked about your MOUs, but what is your response to their request?

MR. BURNS: Scott Burns, for the record.

The response to that is we have already started discussions on that, so we are in discussions with the Durham Emergency Management Office. Steve Lesiuta, who is with me here, is our Director of Emergency Preparedness and Emergency Management, and Warren Leonard, the head of their Durham Emergency Management Office, have a strong relationship and have already started those discussions.

MEMBER VELSHI: Thank you.

So, Durham Region, I am looking towards you to say, hey, things are moving and hopefully this will get resolved to mutual satisfaction.

MR. CUBITT: Based on my understanding that is the case, but I will have Warren Leonard, who is here with us today, be able to confirm that for you.

MR. LEONARD: Thank you. Warren Leonard, for the record, from the Region of Durham.

So we have to put the context on this, which is for decades we have been looking at 10 kilometres. A lot of decisions have been made on that line in the sand, so to speak, that surround our operation centres, our reception centres, those operational things on the ground. Last December when the new PNERP came out -- and there was input given to the planning basis discussion prior to that in the summer, but when the PNERP was actually released in

December, followed up by a May release of the implementing plan for Pickering, now we have a contingency planning zone. And while this has gone out 10 more kilometres in the radius, we all know from our basic trigonometry that that has quadrupled the area. Notwithstanding the water area, the land area is quite a bit.

So we have had discussions that have started about this, but it is very recent. The implementing plan has been out a matter of weeks. So we have some thoughts around this, but it is going to take a fair bit of effort to look beyond the 20-kilometre zone for locating some of these areas, or some of these operation centres, because it seems to us that it doesn't make sense to locate places where you are going to send anybody who is being evacuated into an area that could also be evacuated. So we are looking beyond that.

The thing to understand about Durham Region is that our lakeshore municipalities where we are right now is our urban area. Our northern municipalities are very rural. The number of resources as you move away from the lake in terms of arenas and community centres decreases sharply. So the work involved in identifying those, getting those centres up and operational, because they are not currently in play, we have located all of our response efforts in what is currently outside the

10-kilometre zone. That's where the funding expectation is at the planning side of this, getting people and resources in to do the frontline work.

We also think, however, that given the resources and the capacity that we have as a regional municipality, that in the unlikely event that we are going to need this there are other municipalities beyond our borders that need to be engaged. One of our recommendations was that more municipalities be designated under the PNERP. That didn't take place, but we have had every assurance from the province that in the event of an emergency if we need additional resources we can ask for them through them and we have already heard that they have capabilities through the authority in the legislation that they can tap into all the provincial resources and we have every expectation that we would be doing that.

THE PRESIDENT: So which -- how much of the 50 ingestion zone is part of Durham?

MR. LEONARD: If you take the 50-kilometre ingestion zone, there is a very, very small part at the very upper reaches around Bolsover and Sunderland that is not included. It's the entire -- it's our entire region.

THE PRESIDENT: Okay. Because you mentioned the contingency, you didn't mention the 50K zone. So I'm trying to understand -- this is what we have been

struggling with. I don't know if you have been listening now to this --

MR. LEONARD: Yes.

THE PRESIDENT: -- for the last three, four days, I can't keep count, about trying to get an understanding of what is the actual plan in place. So what I hear from you is it's still a work in progress.

MR. LEONARD: It's a work in progress based on two things: one, our sites have been set on the 10 kilometres for such a very long time; but, two, this plan is very recent, it's just out.

THE PRESIDENT: Okay. So what's your estimated time to come up with a detailed plan of action?

MR. LEONARD: Typically the province has -- it's not specified, but typically the province has allowed us a year after their plan comes out for us to get our plan up to speed. Now of course, being economical with our resources, we have one plan for both plants. The Darlington implementing plan has not yet been released, so our timeline is going to be one year from when that's out.

THE PRESIDENT: So for staff, what is a reasonable time horizon to expect all of this to be in place with gory details?

MR. FRAPPIER: Gerry Frappier, for the record. I would ask Mr. Richard Tennant to comment on what

we would be expecting with respect to PNERP implementation.

MR. TENNANT: Richard Tennant, for the record.

With the discussions that we have had at EMCC on the release of implementation plans, as Mr. Leonard said, the province gives one year for conformity and we feel that's reasonable. Mr. Ramzi Jammal said we can update the Commission.

THE PRESIDENT: So are you planning to update the Commission in every -- on an annual basis through the regulatory oversight?

MR. TENNANT: That is correct.

THE PRESIDENT: Okay. Thank you.

I interrupted somebody. Go ahead.

MEMBER VELSHI: When is the Darlington implementation plan expected to be released by the province?

MR. LEONARD: Warren Leonard, for the record.

You would have to ask the province that one.

MEMBER VELSHI: Does staff know?

THE PRESIDENT: Office of the Fire Marshal -- they are still with us here -- any idea as to when the Darlington plan is going to be out?

--- Pause

MR. MORTON: Mike Morton, for the record, with the Office of the Fire Marshal and Emergency Management.

Updates to the Darlington implementation plan are underway at this time. And that will be presented to the new government once it's formed.

THE PRESIDENT: It's required to go through the new government?

MR. MORTON: Mike Morton, for the record.

Yes, that's correct. Each of the implementing plans reviewed --

THE PRESIDENT: And you're still [indiscernible - speaking at the same time] --

MR. MORTON: -- by cabinet.

THE PRESIDENT: -- one here? That's a leading question.

MR. MORTON: Yeah. We will be submitting the plan for the government's consideration, once formed.

THE PRESIDENT: Go ahead.

MR. LEONARD: Warren Leonard, for the record.

And I'd like to point out that when we're talking about a one-year time frame for putting our plan together on what we're going to do, there is still down the

road work involved at a centre basis, let's say, where we're talking about, you know, I call it left-turn, right-turn planning. Where do the cars go? What are the lanes? Where do the people go? Which door? Where are the signs? All of that will still be yet to come.

THE PRESIDENT: Our observation of the last -- at least my observation over the last 10 years, debts that get measured, gets done. That's why we focusing about when is a good time for us to get engaged as to progress on those plans.

MR. LEONARD: Warren Leonard, for the record.

I agree. And now we're back full circle to the funding request.

THE PRESIDENT: Well, I know you attribute a lot of power for us over the Ontario government. So we'll have to take this under advisement. But we only deal with the OPG, as they're licensees. So there's limited amount that we can do. But I think we haven't exhausted everything on this.

So OPG, are you still comfortable within the year to have some really lots of progress made at least on Pickering?

MR. BURNS: Scott Burns, for the record.

We're comfortable with the timeline

internally for OPG's component. Our plan is to have our updates finalized by this time next year. I have to respect the region's timeline. We don't have any authority to influence or direct that. And we have a strong relationship with the province as well, and they're happy with that.

I should say that although we're talking about updates to the plan, we have a strong program in place and community can be assured that we can safely respond to any emergency.

THE PRESIDENT: Thank you.

Mr. Berube?

MR. BERUBE: First of all, thanks for your presentation. As President Binder has admitted, some of this is out of our scope and we can't help you with some of it.

But what I find interesting in this is that I'm sitting here with two groups of people. You have a 50-year plan. You have a 50-year plan. You're in their backyard, more or less. And for some reason or another, you're coming to us with a bunch of requests that really -- have you talked to them about it? Where's the communication between these two things? Because as far as I can see, you both have issues to address over the next 50 years. Could you explain that to me? I'm a little

perplexed, considering that really the issue is that you're supposed to cooperate to get things done like the PNERP to take care of the people within your region, that kind of thing.

MR. LEONARD: Warren Leonard, for the record.

I can speak to our emergency planning responsibility with OPG, because that's more immediate. The longer term 50-year plan is a little out of my scope, because I am, of course, concerned with something that could happen at any moment -- looking down the road, of course, but you know, the larger issues of planning and the transportation and the waste management, that's a little out of my scope.

THE PRESIDENT: Okay, so let me jump in. So you make explicit ask about being compensated for hosting the waste. I know this is not the first time I hear that thing. I know you made that suggestion to the Ontario government. So I don't know what we can do about that.

Staff, you have any idea? I'm not sure that anything we can do about that. Maybe OPG can help us on that score, whether if the Ontario government decides not to compensate you and deal with your property taxes, I'm not sure we can ask for that.

MR. FRAPPIER: Gerry Frappier, for the record.

So first I would point out that certainly a lot of the interactions between the OPG, the licensee, and the regional governments and that are a requirement on them as part of the licence as was pointed out by Mr. Tennant.

I think the other thing that we've talked a little bit about, but we're certainly going to be coming back more over the next year or two, is that we do have a requirement on OPG to explain to us some of the details through their -- the SOP that's going to be delivered, as we've talked about a little bit before, in December of next year.

And so from those perspectives, we're certainly going to have window into whether there is issues or not. We also interact with the provincial emergency management planning group, as we've also talked about. So we'll certainly have a good handle on the immediate sort of concerns.

I think with that, I think Mr. Jammal would like to also add something.

MR. JAMMAL: It's Ramzi Jammal, for the record.

I don't have much to add for Mr. Frappier,

but I want to clarify with respect to your question. Are you asking do we have anything to do as CNSC between the host community and WMO for waste?

THE PRESIDENT: They're asking to be compensated for being a host for the waste. Maybe it's a good time to ask some of our lawyers whether they have any view on -- there was a recommendation from the regional municipality --

MR. JAMMAL: As the chief regulatory operations officer, we have no authority on a business agreement between a host community and a proponent. Let me put it this way. We will engage with respect to the siting and the geographical suitability of the location, but what happens between the proponent and the host community, that is an agreement between both parties.

MR. LOCKWOOD: Randy Lockwood, for the record.

Several items here. I would like to speak to a few of them, and I would ask Lise Morton later to speak to the waste.

First and foremost, as I spoke through this hearing, to us, our social licence, the ability to operate in our community, I've said it many times, the trust, respect, and confidence is paramount to us.

Item one for me is the safety of the

public. So it goes without saying, I'll restate again, implementations, the differentials to move from the existing plan to the new PNERP is of paramount priority to me. And we'll work with the province to get that done as quick as possible.

Number of items, though. Decommissioning. Decommissioning, we've had discussions with the region and we'll continue to have discussions with the region. We made very clear our overall strategy for what to do with the site. I've stated that here a couple of times. We tend to have a 10-year licence, end commercial operations 2024, and then safely shut down the units, remove the fuel, and remove the water, and place the units in safe storage. That preliminary decommissioning plan has been outlined to several parties and several stakeholders, and we'll continue to do that. And it's posted on our OPG website.

The repurposing. We've started discussions a number of years ago. Repurposing of the site in the longer term. It's still, I accept, quite a ways off. We touched a little bit on that during these hearings. We started that work back in 2015. It'll have to resume and it'll have to continue, because I'm certain that it will evolve with time.

Also staff was mentioned. We've discussed that several times during this hearing. I fully understand

that, the impact on the community. First and foremost in my mind is the effect of closing -- ending commercial operations for Pickering, closing down the plant on our staff and their families. Of course we're going to continue dialogue with the region and so they ensure they understand our staffing plan and where we intend to go, and the associated timelines. But as we've heard this week, we do have -- my first priority here is I have to deal with staff and the associated collective agreements. All through that process, I need to keep the region up to speed on where we're going. That I understand. And we'll commit to continue to do that.

As well, I have to balance to the ratepayers of Ontario.

So there's several things to balance. First and foremost is staff and their families and abiding by the collective agreements. It's also with the region, understanding the impact of the end of commercial operations of the Pickering station on the region and working with them and making sure that they understand our timeline as we move forward. And also the impact on the ratepayers with the end of commercial operations of Pickering.

So I will commit. There's no doubt in our mind. We will commit to continued ongoing relations and

communications with the region to lessen the impact of the eventual closure of the Pickering station.

THE PRESIDENT: Okay, I --

MR. LOCKWOOD: I'm going to -- may I ask, though, the one last topic we did not talk about is waste. And I would like Lise Morton to reiterate where we are going with waste.

MS MORTON: Lise Morton, for the record.

So as Mr. Lockwood said, we do have a long-term plan for wastes, and I think we need to be very clear about that.

So I'll separate out the streams. And I know the region is aware of this and certainly meets with NWMO routinely.

So with respect to the fuel, of course, the long-term strategy is to move the fuel to the NWMO's APM DGR. NWMO has published their timeline on their websites with by 2023 site selection being complete, 2028 licensing applications being submitted, and in-service dates of 2040 to 2045.

So while I certainly don't want to presuppose approvals of EAs and I certainly don't want to speak on behalf of the NWMO, they do remain on track with those timelines, and so therefore we are certainly using that as our planning basis.

In terms of low and intermediate level waste, of course, I believe most know that we're -- that waste is destined for the DGR for low and intermediate level waste. And I think we simply need to respect that that federal EA is in progress.

Lastly, as I said, we certainly do take the relationship with the region very seriously. We do meet regularly with the Durham Nuclear Health Committee as well, and in particular have some presentations on waste. I believe the last one was a couple of months ago.

MR. LOCKWOOD: Randy Lockwood, for the record.

The last point, I overlooked it, President Binder, was taxation. As the Commission can appreciate, we pay taxes, we do not set taxes.

THE PRESIDENT: Okay.

I have a very specific legal question. I don't know the answer. I'd like somebody to give me the answer. There's now a PDP, an approved PDP. There's financial guarantees that are associated with the PDP. Are any of those financial funds available for early planning of decommissioning, things like that? I think that's what was on the table. Don't ad lib. Get me a legal opinion on this, please.

MR. FRAPPIER: Gerry Frappier, for the

record.

Perhaps first I'd see if somebody in Ottawa has got those details.

In particular, I'd ask Karine Glenn if she has some comments on that.

MS GLENN: Karine Glenn, for the record. Can you hear me?

THE PRESIDENT: Yes, we can. Go ahead, please.

MS GLENN: I'm the Director of the Waste and Decommissioning Division. I'll speak to the PDP and the financial guarantee.

As part of the PDP, OPG lays out the plan and a credible cost estimate that goes along with that, along with their timeline. The financial guarantee that is in place is completely separate from their operating funds and cannot be accessed for activities other than for their decommissionings. Once they begin decommissioning activities, they would need to request permission from the CNSC in order to be able to access those funds, and they can only be accessed for decommissioning activities, so as they engage down the actual decommissioning activities, they could then begin to access those funds, but only for those activities, and as I mentioned, they could not do so without the prior approval of the Commission.

THE PRESIDENT: Keeping on-site dry storage for the next 50 years, is that part of decommissioning?

MS GLENN: Karine Glenn, for the record.

That's actually part of their operations. Long-term waste management is considered as part of their overall cost estimates, so the entire cost, from the time that they are into storage with surveillance and all costs associated with that for the management of the fuel until it goes to disposal are incorporated in the overall financial guarantee.

THE PRESIDENT: Okay. I'll leave it at this for now.

Questions? Ms Penney.

MEMBER PENNEY: Hopefully, you will be able to pull this slide up, it's in your presentation, the "Planned Future of PNGS", so if we could get that pulled up, it's on page 7, a very good communication tool. I'm going to ask you a couple of questions about it, and I also want to fact-check it with OPG.

It lays out for us 50 years into the future, along different categories, the structures and whether they'll be operated or not, the jobs at Pickering, the used fuel bundles, and then the intermediate and low-level waste. I guess my question number one is, the

intermediate and low-level waste, is there any meaning to the number of trucks and the number of hammers there in terms of volumes? It's clearly going along the path that at some point there will be a DGR at Kincardine, and the NWMO solution will be available, but is there any meaning to the number of trucks? That's my first question.

Then there's a question for OPG around the number of jobs. Are these your numbers for the number of jobs?

I'll start with you.

MR. CUBITT: Garry Cubitt, for the record.

I'm going to defer a further answer to Christine Drimmie, who is with me today, but I just want to pick up on your question about trucks, just to give this a sense of context for you.

Let's assume that the Pickering Nuclear Generating Station closes with 781,000 spent bundles of fuel. The Nuclear Waste Management Organization transportation planning documents indicate that each truck that would transport storage packaging is designed to hold 192 used fuel bundles. That means there would be 4,067 transport containers to move away from the Pickering plant just in used fuel. Only one storage container can be transported per truck, so the Nuclear Waste Management Organization has told potential host communities that waste

would be transported to the new deep ground repository at a rate of one or two trucks per day. If 14 trucks per week were sent from the Pickering Nuclear Generating Station to the used fuel repository without any disruption every day of the week, they would complete the removal by 2049 in accordance with the plan. In other words, it would take 11.1 years of transport trucks every day just to move the bundles. I hope that gives you a sense of the trucks.

Now, I'll defer over to Christine.

MS DRIMMIE: The 11 years actually is if they only moved one truck per day.

Sorry. Christine Drimmie, for the record.

In terms of the meaning of the graphics, it is meant to be representational, it's not exact. However, we did look into the number of waste management buildings that are to be at Pickering in the next decade or so and tried to represent them there.

The job numbers are taken from OPG reports and press releases, and from the Ontario Chamber of Commerce report that was done for OPG in terms of the employment related to the continued operation of Pickering.

The used fuel bundles, again it's representational but it's based on the NWMO anticipation, the figures they provide, about what would be at the plant by the time 2024 rolled around if the lifetime is extended.

The trucks in the low and intermediate-level waste line are mostly symbolic. We have trucks now moving with low and intermediate-level waste regularly. In the 2050 to the 2060 timeframe, we're anticipating that there would be more trucks because there will be debris and rubble to remove, assuming that is being removed to another place.

One of the concerns for us, and why we show the Kincardine DGR expansion in 2060, is that from reading the documents related to Kincardine, our understanding is that the current proposition for a DGR in Kincardine is for 200,000 cubic metres, I believe, and that is to take waste that currently exists in the western waste management facility, that's my understanding, and that it isn't actually going to be taking waste that would be produced, low and intermediate-level waste that would be produced from the refurbishment at Darlington or from the demolition of this plant.

The additional expansion of that DGR at Kincardine will have to be determined sometime in the future. It seems to be in the 2036 to 2039 timeframe that they might actually get around to doing the expansion of that facility. I'm not certain how long building that additional expansion of the facility would require, then there's just the time to remove all the waste, so that's

why we have sort of nothing in the 2060 to 2066 timeframe. We're assuming that the waste will be there, but given the sorts of delays that occurred in getting the existing proposed facility approved, we feel that there's some risk in that date.

MEMBER PENNEY: A question around the property taxes. Again, it's outside our mandate, as the President has said, but you've got question marks beyond 2024. Presumably, there's still a facility there and it would be paying something, regardless of whether it's operating or not, or am I wrong in my assumption?

MS PINCOMBE: Nicole Pincombe, for the record.

Yes, there's some uncertainty as to the amount of property taxes that would be forthcoming to both the region and the local municipality of Pickering once decommissioning starts. There's very specific legislation that speaks to how property taxes are calculated for the various components of the property, and the generating station. Once decommissioning starts, we're not clear in terms of what that will mean in terms of the revenue stream for the region and for the City of Pickering.

MEMBER PENNEY: Thank you.

OPG, are the job numbers correct?

MR. LOCKWOOD: Randy Lockwood, for the

record.

Looking at the slide, and for the benefit of the Commission, I can confirm that the top line, moving across from left to right, is our plan, as we've outlined previously in the hearings, and as well, the job numbers. I think we can confirm the used fuel bundles as well. The first two lines definitely come from our PDP. It's totally available to the public.

MEMBER PENNEY: The only correction I would say is, at the top, at the very top, it says that continued operations go to 2024, and what you've actually asked for is a licence that takes you out to 2028, so that's one correction for your slide. What we understand from OPG is they're not asking for decommissioning as part of this licensing hearing, their safe storage is considered part of operations, so that's just a correction for your slide.

MR. LOCKWOOD: Randy Lockwood, for the record.

For the Commissioner's benefit, I think the region already acknowledged -- if you look above the dates, it clearly shows the requested operating licence period. We're looking for the continued operations ending in 2024 and then moving out to decommissioning.

MEMBER PENNEY: Right, but then it calls

2024 to 2028 decommissioning, where you've been very clear that you're not decommissioning until 2028.

MR. LOCKWOOD: Good point, point accepted.

THE PRESIDENT: Okay. Question?

Any more questions?

Okay. You have the final comments.

MR. CUBITT: It's Garry Cubitt, for the record. We would just like one more time to thank you for the opportunity for presenting the Region of Durham's perspective, concerns and point of view and extend to you, again, our appreciation, Dr. Binder for your leadership, your support of the Region over the years and the very best wishes as you go forward in your next stage of life.

THE PRESIDENT: Thank you. Thank you very much.

I'd like now to move to the next presentation which is by the Ajax-Pickering Board of Trade as outlined in CMD 18-H6.25 and H6.25A.

I understand that Ms Ashton will make the presentation. Any time you're ready.

CMD 18-H6.25/18-H6.25A

Oral presentation by the

Ajax-Pickering Board of Trade

MS ASHTON: Good afternoon, Mr. President. Thank you very much for allowing me to present before you today.

My name is Christine Ashton, for the record. I am the Volunteer President of the Ajax-Pickering Board of Trade and an almost 10-year resident of Pickering living within two kilometres of the nuclear site.

So, I'm going to be quite brief today. I understand we're a little bit pressed for time and getting close to lunch.

So, just to give you a bit of background. The Ajax-Pickering Board of Trade has over 700 members and we represent the business community in both Pickering and Ajax. Our members are from diverse sectors and are very incisive, but the majority of our members are small businesses within the Region.

We look to ensuring that we are doing things for business and creating a must join organization, and we do that through education, connection opportunities, networking events and advocacy.

We wanted to come here today to speak in

support of Pickering Nuclear. First of all, we have seen over the years their commitment to safety and we've seen that, for example, in February we recently attended sort of a walk-through and a tour of the facilities and part of that tour really allowed us to see the safety measures that they have in place to ensure not only the safety of their own workers, but also the community and the province as a whole.

So, from the checks and scans and everything that we had to go through, you really got a sense of how safe and secure the site really is.

We were also one of the agencies that participated in December's emergency preparedness exercise where they dealt with a pretend loss of coolant to see how the OPG would respond and how we as a community would respond. And part of that was dealing with the communication efforts that would incur in terms of ensuring that everyone got the message as to what needed to be done.

And part of that two-day event also allowed for focus groups where we discussed our feedback, questions and concerns so that OPG could take those into consideration in making sure that they had a great emergency preparedness plan.

We're also thrilled to have OPG be a very active member and volunteer with the Board of Trade and

that includes being recognized through our eco-business certification process. So, we have a three-level certification process and OPG has achieved the highest level which requires that not only are they aware of the environmental impact of their business, but they take positive steps to ensuring that they are reducing their environmental impact and supporting the environment.

We also are proud to have OPG in the community because of the fact that they are such an important player on the economic side. So, in Durham Region alone we know that they create 4,500 jobs and that's just for Durham Region. When you go beyond that, obviously, the number goes much higher.

And then, finally, I wanted to address our partnership directly with OPG. So, as I mentioned, OPG is a very active member and volunteer with the Board of Trade. That includes acting as an annual title sponsor. They allow us to use their facilities to host events at, and I can say that even those events reaffirm their concern for safety because they always begin with, first them explaining what would happen if something were to happen.

And then, they also act as a representative on our Council and our Government Relations Committee.

I also just wanted to take a brief moment

to mention on sort of a personal note, as a resident of Pickering who resides so closely to the Pickering power plant, I literally wake up every morning and go to sleep with it in my eyesight.

That I know that there's been concerns raised today about whether or not individuals are aware of what would occur in an emergency, whether or not we're receiving our KIs, if we're told about them. And I can tell you that I got the package in 2015, in 2017 I got that further emergency preparedness package which provided you a place to store your KIs and also informed you if you don't have your KIs, where you can go to get it.

Every school year my kids get the letter to take home which we have to sign off on confirming that we are okay with them being given their KIs. When I registered the kids for daycare, I also got that form as well.

We get newsletters, emailers, lots of communications, and not just in terms of emergency and safety, but also in terms of all the great things that OPG is doing for our community from, in the summer they do their Tuesdays on the trails and my kids love that stuff, March break they have the March Break Madness.

So, I can tell you as a resident that I really see the strong relationship that OPG has had with

the community, not only in terms of safety and emergency response, but also in terms of being a great advocate for environment, science, health and awareness.

Thank you very much.

THE PRESIDENT: Thank you. Well, you live in the zone and we all know that you're looked after, that's not the zone we're questioning about.

I have a real question for you. Why are you a volunteer, can't they afford to pay you?

--- Laughter / Rires

MS ASHTON: We do have paid staff, but we also are made up of a group of volunteers who believe that it is important to advocate and ensure business success in the community.

THE PRESIDENT: Thank you.

Question?

Thank you. Thank you for your presentation.

MS ASHTON: Thank you.

THE PRESIDENT: Okay. I guess -- I am told we are stopping here and we're coming back at 1:30. One thirty, that's right, 1:30.

--- Upon recessing at 12:44 p.m. /

Suspension à 12 h 44

--- Upon resuming at 1:32 p.m. /
Reprise à 13 h 32

THE PRESIDENT: Okay. We are ready to proceed. The next presentation is by the North American Young Generation in Nuclear (NAYGN) – Canada, as outlined in CMD 18-H6.32.

I understand that Mr. Mairinger will make the presentation.

Over to you.

CMD 18-H6.32
Oral presentation by the
North American Young Generation in Nuclear
(NAYGN) – Canada

MR. MAIRINGER: Matthew Mairinger, for the record.

I would like to start by thanking the Canadian Nuclear Safety Commission for providing an opportunity to speak about the Pickering Nuclear Generating Station's licence renewal.

I have five years of experience working at Ontario Power Generation at both the Pickering and Darlington sites. I have worked in Project Controls, Minor

Modifications, Reactor Safety and Performance Engineering, and now I work in Performance Improvement at Pickering as a senior advisor in Stakeholder Relations.

I am a board member on the CNA board directors and I am a Society of United Professionals delegate on the steering committee for the Society of United Professionals, Young Professionals Network.

I earned my Bachelor of Engineering degree in Nuclear Engineering from UOIT and am a professional engineer in the province of Ontario. I currently live in Ajax less than 10 kilometres from the Pickering site.

I am here representing North America Young Generation in Nuclear as the Durham chapter president and as part of the corps as the Canadian Affairs Chair.

NAYGN is an association of young professionals and students passionate about the nuclear industry and is focused on professional development, public relations, networking, and community outreach. There are over 120 chapters across North America, with 11 chapters right her in Canada.

NAYGN was just recently presented with a Top Industry Practice Award honouring the organization for its impact and leadership in the nuclear industry.

Through my experience in the nuclear industry I am amazed at how open, transparent and

collaborative the industry is. Through organizations such as WANO, INPO, and COG, information about issues throughout the nuclear industry and across the globe are shared in an open manner so that all stations and employees can learn, and take corrective action if necessary. Unlike other industries where issues and improvements are kept secret to maintain a competitive advantage, the nuclear industry operates as a global community and adamantly tries to ensure other stations operate as effectively as possible.

For young professionals in nuclear this open and collaborative approach works well, as our generation has been brought up in a globally-connected environment. This global connectedness was never clearer than after Fukushima Daiichi event. Even though this was a completely different reactor design and was operated on a different continent, and experienced a tsunami, which would be quite strange to see in Lake Ontario, I saw how OPG completely reanalyzed their safety analysis and implemented millions of dollars in upgrades and projects to protect the station from beyond design basis events.

I saw several post-Fukushima modifications installed onsite at OPG and I worked on an industry best practices guideline for external flooding protection with EPRI. This approach to openly share experiences and lessons learned has allowed the nuclear

industry to exponentially advance in terms of safety and human performance improvements and is one of the underlying factors of why I have so much faith in the future of nuclear.

It is unfortunate that every year there are almost 1,000 workplace deaths and almost 250,000 claims accepted for lost time due to work-related injuries or diseases in Canada. Young workers are a group particularly at risk due to a number of factors such as lack of experience, hesitation about refusing work, and generally having a higher risk tolerance.

Ontario Power Generation, however, has robust and comprehensive safety programs in place to protect young workers. This includes computer-based training, qualification requirements before work can be performed, and ensuring that we have a mentor at the company.

In the engineering new-grad program, these new workers participate in rotations at both sites in various departments and do one month shift rotation before they go to their home base location. These experiences allow for a greater breadth of experience and allow for a transition period from school to work. Beyond this, Ontario Power Generation has an excellent nuclear safety culture. This includes reviewing the nuclear safety trait

of the week before the start of meetings, having an environment open to raising concerns in which all employees can document deficiencies via station condition records, to focusing on safety at the lowest level by enforcing that all staff hold handrails while traversing stairs.

In addition to this, the company there is also the Society of United Professionals and the Power Workers unions which are part of the joint health and safety team and are another defender of protecting young workers from workplace injuries. With such comprehensive programs in place, and by safety being reiterated at all levels within the company, young workers have the privilege of working for a company in which safety is the top priority and young workers are not subjected to precarious work.

The extension of the Pickering plant is not just a local issue. It is essential to maintain Ontario as a world leader in clean energy generation. The continued operation of Pickering is important to young nuclear professionals across the province. As the chapter lead from the NAYGN Bruce chapter puts it:

> "The continued operation of Pickering will ensure baseload power is available to the province as Bruce and Darlington undergo refurbishment.

> By continuing the operation of Pickering, Ontarians will continue to have reliable, low-cost, low-emissions power." (As read)

With the refurbishment of Darlington and Bruce there needs to be a dependable, base load generator to ensure uninterrupted services such as hospitals and other essential services. Ontario has such a stable grid that brownouts and blackouts are unusual and as a result most of us are not prepared and not willing to tolerate of power interruptions.

As a millennial I realize how dependant I am on electricity when a power outage occurs. The Wi-Fi goes down and as soon as the phone battery dies and can't be recharged, I can't even think where to look to check for updates. Twitter, unfortunately, does not run on candlelight.

While wind and solar are beneficial additions to the grid, with capacity factors around 30 percent and having variable production based on external factors, this means that with the closure of nuclear, Ontario will be forced to utilize fossil fuels to fill in the baseload generation gap. This is apparent in Germany where nuclear is being phased out and they are investing heavily in renewables. Even with heavy economic investment

in renewables, Germany consumed 80 percent of fossil fuels and only 13 percent renewables in 2017, while the cost of electricity was the highest in
Europe.

The lifecycle greenhouse gas emissions from nuclear are far less than fossil fuel sources and comparable with wind and solar. Nuclear power is also the most efficient means of electricity in terms of land use, producing almost 30 times more power per square kilometer than
wind.

The NAYGN Chalk River chapter stated that they support the Pickering Licence Renewal because, "it will support the generation of affordable low-carbon electricity in Ontario and will deliver on national policy objectives and international commitment for non-fossil fuel electricity generation. The licence renewal will be a key driver of Ontario's future prosperity and economy."

Ontario has made great strides in terms of phasing out coal and it is essential to keep this trend going by extending Pickering and not having natural gas fill the void.

From the Pickering facility, the public dose resulting from operation has consistently been well below the regulatory limit. From 2013 to 2016 the maximum

effective dose to a member of the public occurred in 2016 and has a dose equivalent to eating 15 bananas. There is a widespread misunderstanding about radiation in the public, and more education and training is needed.

In the 2017 NAYGN Career Survey, in which members from across North America were surveyed, 36 percent of respondents stated that their peers and family impression of nuclear changed to more supportive since they started working in the nuclear industry and 60 percent were already consistently supportive. These high levels of support, and high increased levels of support, demonstrate the powerful alteration in outlook towards nuclear power once more is learned and discussed about the topic.

Frequently, when the word "radiation" is raised, it invokes fear in the public. This is a shame as radiation is used in smoke detectors to save lives; nuclear procedures and materials are used in the medical sector to diagnose, monitor and treat a wide variety of issues; carbon dating has helped us learn more about our past and electron beam radiation is used to remove toxic pollutants in industries such as coal-fired plants.

Radiation is a naturally occurring process all around us, from radionuclides in the soil to cosmic radiation from the sun. Besides Pickering utilizing this amazing energy source to produce electricity, OPG and Bruce

Power have been working with Nordion to supply more than 50 percent of the world's Cobalt-60, which is used to sterilize medical equipment and food products. Therefore, the Pickering plant is essential not just as an electricity generator, but also as a producer of life-saving medical isotopes.

Ontario Power Generation is a model company in terms of giving back to the community. Pickering Nuclear supports over 140 grassroots communities, including charitable and non-profit initiatives annually. I've been to many of these community events around Pickering in which OPG was listed as a sponsor and these events have made significant impacts on creating a positive impact in the region.

Without the Pickering station I strongly believe that the overall quality of life in Durham region would decrease, not only due to thousands of lost jobs but also due to the lack of community-funded events and non-profit initiatives.

In summary, I believe OPG represents an ideal opportunity for young professionals to have access to safe, dependable, rewarding careers. I believe OPG represents the ideal model of an outstanding corporate citizen. I believe the Pickering plant can continue to deliver low cost, clean, dependable energy across Ontario

safely.

On behalf of the North American Young Generation in Nuclear organization, I strongly support the continued operation of the Pickering Nuclear Generating Station and the renewal of their power reactor operating licence.

Thank you.

THE PRESIDENT: Thank you.

Questions? Go ahead, Ms Penney.

MEMBER PENNEY: Thank you for that. I have to ask you about the book. You didn't mention it.

MR. MAIRINGER: Yeah, I was hoping you would so I left this out.

So a couple of years ago, North American Young Generation in Nuclear, in partnership with Duke Energy, developed this children's book, specifically geared to grade one and two students. It brings Marie and her dog Einstein through an adventure to discover that nuclear power isn't as scary as it is.

So it's another way to reach out to the public, especially at the younger generation as well. It's actually available on Amazon and we're making the second revision right now. It's called "Marie's Electric Adventure".

MEMBER PENNEY: Fabulous, "Marie's

Electric Adventure" for anyone who has small children.

THE PRESIDENT: So do you go to school and distribute this and show them or take a Geiger with you and explain to them what the action is about?

MR. MAIRINGER: So we're working with the CNS right now, because I know you guys delivered 15 Geiger counters to them. So we're working in joint conjunction with the CNS.

In the States they are very open with their schools, so they get invited to speak about this. We would love to go to schools and right now we're working on an initiative to work with groups such as scientists and schools, and reaching out to local schools in the community to deliver this, but for right now what we do is we give some of these away at conferences. They're available for just the cost of producing them on Amazon right now, $5.75, I believe it is.

MEMBER PENNEY: I did have a real question.

What you said about young workers is absolutely true. So I wanted you to just elaborate a tiny bit about how OPG keeps the young workers, new workers onsite, safe, because it's fascinating.

MR. MAIRINGER: So I think it all starts with the safety culture. Right when you get into the

company they're not rushing you to do work. They treat training and safety as a top priority. So that's reiterated at the start of meetings. As I said, even the smallest things such as holding handrails, not talking on the phone while walking, these low level events prevent the higher hazards from happening.

It's an extensive program in the engineering new grad program where they'll take you through rotations. They'll assign you a mentor. We have groups such as NAYGN that is happy to provide mentorship opportunities.

I know to be authorized as a shift supervisor that's like a five-year program. So just the whole culture, the training program, all these barriers in place where they treat it -- unlike other industries where they might rush into the job or be in a rush to get some work out of you, OPG really wants to train you, make sure you're comfortable with the job, and that you feel safe before you take on any work.

MEMBER PENNEY: Do you wear a different coloured hard hat?

MR. MAIRINGER: I'll let OPG take this one, but they have a "New to Nuclear" sign that they actually stick on your hard hat, if they want to expand on that.

THE PRESIDENT: Okay, thank you. Thank you for your presentation.

The next presentation is by the Pickering Nuclear Generating Station Community Advisory Council, as outlined in CMDs 18-H6.22 and 18-H6.22A.

I understand that Mr. John Vincett will begin this presentation.

CMD 18-H6.22/18-H6.22A
Oral presentation by the
Pickering Nuclear Generating Station Community
Advisory Council

MR. VINCETT: Mr. Chairman and Members of the Commission, for the record my name is John Vincett.

I am the facilitator of the Community Advisory Council to the Pickering Nuclear Generating Station.

I am joined here today by five members of the council, or the CAC, as the group is often described: Mr. Ralph Sutton, a retired company director with experience in the energy sector who has lived in Pickering for 33 years; Mr. Zachary Moshonas, an environmental technologist employed in the private sector and a resident of Whitby; Ms Anna-Lisa Tersigni, a Durham college student

in the Department of Environmental Studies and a resident of Whitby; Mr. Bill Houston, a retired information technology management consultant living in Ajax, a geologist by training with a background also in physics, and Mr. Tim Kellar, a certified financial planner with a client base across the Durham region, serviced from an office in Pickering. Mr. Keller is a resident of Courtice.

At the end of this brief presentation, council members will be happy to answer any questions the Commission members may have.

MR. SUTTON: For the record, my name is Ralph Sutton. The CAC supports this application for renewal of the Pickering Nuclear Generating Station operating licence for a 10-year term, 2018 to 2028, which would cover extension of services to 2024 as well as the transition to the post-shutdown phase.

A core vehicle for the OPG dialogue with the community since 1999, the CAC assists the station in identifying and responding effectively to the concerns of the community. The group is made up of citizens, representatives of community organizations, members of local government staff and agencies who examine a wide range of issues associated with OPG in Durham Region and at the corporate level.

Most members report back to one or more

constituencies. The CAC meets eight to 10 times a year, interacting with senior management from the plant, for an annual total of about 30 hours per year. Meetings are open to the public and the media, minutes are posted on the OPG website and available through public library internet connections.

Over the years OPG managers have provided comprehensive details to the Council on the operations of Pickering Nuclear, including updates on the changes made to apply to lessons learned from the events of the Fukushima in 2011.

OPG operations have already meet very robust safety standards before 2011. The company undertook additional actions based on a review of these events.

A few of these actions of Pickering were a development of an action plan to improve nuclear emergency preparedness and emergency drills to respond to such an accident, and a placement of dykes around standby generators, fuel-forwarding pumps, and the installation of auxiliary back-up equipment on site available to be deployed within minutes.

MR. MOSHONAS: For the record, my name is Zachary Moshonas. With regards to fitness for service, in recent months we have heard all about the extensive testing of equipment as well as major investments in maintaining

and improving the plant to ensure fitness for service to 2024.

Key plant components, major reactor components, steam turbines, and main output generators now have lifecycle management plans. All other important plant components have also been assessed to make sure that maintenance plans are in place to ensure safe and reliable operation to 2024.

We have also been reassured to hear that the most recent periodic safety review of Pickering Nuclear conducted by OPG and accepted by CNSC Staff confirms that the plant conforms to new plant requirements to the extent practicable.

In late 2017 we learned that as the station continued its strong safety performance it also achieved its best operational performance over the last three years, putting it on par with the industry best.

Additional recent agenda items include: an OPG presentation on an operational safety inspection of Pickering Nuclear in 2016 under the auspices of the International Atomic Energy Agency, which found that the plant had strengthened safety in recent year; the results of environmental monitoring programs at the Pickering and Darlington stations; an overview of security at the Pickering site; nuclear waste management updates on the

Pickering Waste Management Facility; Provincial Nuclear Emergency Response Plan; and, the Pickering emergency response capability, as well as a tour of the reserve emergency back-up equipment to understand the scope of the equipment and its readiness to be mobilized.

MS TERSIGNI: For the record, my name is Anna-lisa Tersigni. Pickering Nuclear has also involved council members as participants and observers in annual stakeholder information sessions and in major emergency drills in 2014 and 2017.

With each of these topics we have been impressed with the level of detail undertaken in OPG staff analysis and the chain of logic that supports their decision making. OPG experts on plant safety and performance have always been ready to attend meetings and answer any and all questions from the CAC.

The material presented to us clearly shows the thoroughness in OPG's planning. It leaves us confident in the ability of OPG to manage the proposed life extension project for the Pickering power station and their ability during the proposed licence period to move successfully into a safe storage mode.

Why are we confident that Pickering Nuclear will maintain best performance to 2024? We realize that the amount of information placed before the Commission

during licence hearings is extensive and detailed.

At the same time, despite the voluminous number of studies conducted by OPG in reference to the CNSC to demonstrate the improving performance of the Pickering station we are aware that there is a view in the public domain that it is not credible for an older station to achieve the kind of success claimed by OPG.

We have created a graphic as our attempt to explain why this claim has been shown to us to be fully credible.

MR. HOUSTON: For the record, my name is Bill Houston. Five factors come together to explain how Pickering Nuclear today performs better than it ever has, and to ensure that that level of performance is maintained to the last day of operation in 2024.

Research, key factor; innovation; applied learning; operating experience, coordination and teamwork. Research and innovation have enabled renewal of plant performance. Research, innovation, operating experience and coordination and teamwork have led to improved design and the use of improved materials. Analysis of the applied learning and operating experience has led to improved performance.

Research and operating experience have contributed to an augmented knowledge base. Various

combinations drawn from the key factors have led to improved design, improved materials, and an enhanced internal review process.

There has been a productive interplay between international and industry information sharing and applied learning, operating experience, and coordination at Pickering Nuclear.

Various combinations drawn from the key factors have enabled refined technical systems and enriched management systems, and have led to upgraded maintenance effectiveness. Enhanced effectiveness of the regulatory process, greater clarity, precision, and transparency have also played a critical role in improving performance at Pickering Nuclear.

We have looked at how each of five factors; research, innovation, applied learning, operating experience, and coordination and teamwork, along with the improved effectiveness of the regulatory process have produced a comprehensive range of positive results at Pickering Nuclear. No one factor could do the job, but all working together they mutually reinforce each other to produce and maintain performance excellence.

MR. KELLAR: For the record, my name is Tim Kellar. The CAC is pleased to enclose with our submission our latest report to the community.

We believe we have an obligation to inform the public in the region about what we have learned regarding the Pickering Nuclear safety, performance, and plans for the future.

At our request, OPG enclosed our independent report with the spring issue of their newsletter, Neighbours, which was distributed in March to 100,000 homes in Durham Region and East Toronto. In our view, OPG has made a compelling case for the continuance of Pickering Nuclear service to 2024.

We hope that, given the station's excellent and improving record, the CNSC agrees. Ultimately, we rely on the CNSC to do a technical analysis of OPG's claims for the plant's fitness for service to 2024.

We hope that the Commission takes the transparency of the station in its relationship with the community into their consideration as it reviews OPG's application.

We'll be pleased to address any questions from the Commission Members. Thank you.

THE PRESIDENT: Thank you. Thank you for the presentation. Questions? Ms Velshi.

MEMBER VELSHI: Thank you for the presentation. Besides your report to the community, how do

you communicate with your constituents? If you can share the kinds of concerns and comments that they bring to your attention about Pickering?

MR. VINCETT: For the record, my name is John Vincett. There are a number of mechanisms through which our committee members go back to their respective constituencies. One, is that many of our members are actually members of other groups, and so they would report to various groups as part of their meeting process. We also have representation from bodies of government, like the Town of Ajax, City of Pickering, and the Region of Durham. So there were those kinds of mechanisms.

It was the view of the Council, this council, that we should do a better job of communicating with the public and, consequently, we put quite a bit of effort into creating a regular community newsletter.

We recognized, once that was created, that there were not that many being distributed, and so we petitioned OPG, why don't you put it into your Neighbours publication, because that meets a lot of other places. But 100,000 copies are distributed in Toronto and Durham Region.

But there's other means. For example, going out to council meetings. One of our members accompanied OPG to a council meeting. I'd ask Mr. Bill

Houston, if he'd comment on that please?

MR. HOUSTON: Yes. Bill Houston, for the record. I went to a presentation at the Town of Ajax on the licence renewal, OPG was requesting the support of the Town of Ajax for the licence renewal. They were well-received and it was a public forum in which that request took place.

MR. VINCETT: There have also been other interactions with the community, and I'd ask Mr. Moshonas if he would speak about the interaction with classrooms in the re-distribution?

MR. MOSHONAS: Zachary Moshonas, for the record. When I started with the CAC I was actually a student at Durham College. Our classroom, when we'd have topics regarding nuclear issues or regulatory process, I would always try and share my experience with the CAC, and topics that would come up during meetings and presentations from OPG staff or other members of the public or things like that.

So it really created a conversation in the classroom and it would allow me to dive deeper and learn a bit more from other people's questions as well.

MR. VINCETT: And I suppose just to finalize this question, the meeting is actually open if people would like to attend. We do get attendees and

sometimes that's a source of new members. People come and they are interested and they become new members. But there is also a series of minutes that are filed and they are online, so there are quite a few opportunities for people to learn about the Commission.

THE PRESIDENT: So at a typical meeting, how many people actually from the public show up? And I don't know if you have been listening for the last four days, there is a lot of expression of concern about emergency management. Did it come up and was there a lot of interest in giving you advice about what to say and what not to say? I am trying to understand the participation rate of the public.

MR. VINCETT: Well, just to start out, there are 20 members of the Council, the CAC, there are four alternate members. We have a couple of continuing visiting people that come in fairly regularly and we have occasional visitors external to that. Sometimes we have people from the media come and write something if it is a particularly interesting topic. The topic of public communication comes up very regularly, as you can imagine. Maybe I would ask Bill Houston if he would like to speak about the whole process of how we gave advice to OPG, who said we need to communicate with more people, what kinds of advice did we give.

MR. HOUSTON: Bill Houston, for the record.

OPG is well represented, as you can imagine, at the CAC and are constantly asking us for feedback on how they can communicate better and who -- other people we might talk to about what's going on. With specific reference to maintenance and the ongoing maintenance of the plant, we have received very detailed presentations by OPG on how they are managing that, how they are prioritizing the maintenance events, how they are coordinating that with the other work that has to be part of the ongoing operations of the plant. So we feel very comfortable that they are right on top of the maintenance management activities of the plant.

THE PRESIDENT: What I'm specifically interested in is emergency planning, did that come up as an issue?

MR. HOUSTON: Yes, it did very specifically come up and I think probably the reason that John asked me to comment -- Bill Houston again, for the record -- is that I volunteered to act as a participant in the drill that was held in December where we actually participated in a simulation of exercising the emergency plan and there were recommendations that came out of that in terms of communication coordination, trying to eliminate

some communication bottlenecks in terms of release of information, and that was taken up by OPG.

MR. VINCETT: Maybe I could just add to that. At a May meeting we had a presentation from the Ontario Fire Marshal's Office, along with some folks from OPG who are responsible for that area, and we had a very, I think, useful discussion, probably about an hour. The thought was expressed by the Council that it is fairly recently put together and it will be of interest to the Council as to what is going on with Durham Region and how they interpret it and how they plan to roll out. So that will certainly be an agenda item for the fall.

THE PRESIDENT: Thank you.

Dr. Lacroix...?

MEMBER LACROIX: Yes. I do have an observation. For someone who is not in the nuclear bubble, if I attend a meeting and you guys talk about emergency plan, that's good, but that's bad publicity. So how can you cope with the fact that you have to inform people with emergency planning on one hand, and on the other hand you sort of promote nuclear power?

MR. VINCETT: Well, perhaps -- John Vincett, for the record.

Our terms of reference basically place us in a position to advise OPG. We don't take responsibility

to communicate for OPG, but OPG comes to us and says: This is what we have to communicate. Do you have some suggestions as to how we can do that more effectively? An example would be, we recommended a couple of years ago that community meetings be held, an opportunity for people to come and speak to OPG management in much the way Council members do who spend, you know, 30 hours a year with OPG management, and OPG did put that process in place and has repeated it a few times. There have been discussions back from OPG, saying we think this worked, we think that worked, what do you think, and Council has given its thoughts on that. Council's specific concern is about how do we make sure that people in the community have an opportunity to understand what the Council is doing and that has led to the report to the community. We probably should do that more often.

THE PRESIDENT: Thank you.

Questions? Ms Penney...?

MEMBER PENNEY: Thanks. This is a question -- thank you very much, I am really pleased to see that there is a Council like yours. A question for OPG. In terms of the feedback that you get, we have gotten a little bit of an indication, but what is the formal process for taking on board what you hear from your Advisory Council and how is it processed internal? What is the

governance?

MR. LOCKWOOD: Randy Lockwood, for the record.

I very much value the input from the Community Advisory Committee, as they will attest. I will give you several examples.

We had visited as a group the emergency mitigating equipment as outlined and it was made very clear to me, I got very good feedback that as a company we should be promoting this more in the public, that -- and I don't want to put words in their mouth, but if the public was aware of the amount of preparation you have sitting in these storage areas that they would change their mind rather quickly around nuclear power. With that in mind, that was a key factor to us producing the defence in depth video that was attached to part of our CMD, and in fact that is one of the key reasons for driving that. It became really clear to me.

And in addition, I did play that. The first group that we played that for, albeit it was not that long ago, was for the Community Advisory Committee, because I wanted to know feedback from them, does this work or not, is this enough and does it give you the right type of information. That is a specific example.

I would also like to make mention that I

thought very much about the suggestion that President Binder provided me the other night and I would like to expand on that. In fact, I have thought a lot about it and would like to wait for this group and I will tell you why. Because I very much value what the Community Advisory Group, information they give me in terms of how will the public receive this, is this enough information, do they want more, et cetera, et cetera. So I have been thinking a lot about that because we post a lot of information on our website. The goal really was operational reports to give the -- and as well release data and doses. And the goal really was to give a person, a member of the general public an idea, are we safe doing what we say, confident that we are safely and reliably operating Pickering. And in addition to that, we posted, as I said during the hearing here, all kinds of additional information with the idea that we would be as open and transparent as we could and I think we have been industry-leading.

I am leading to the suggestion the other night that definitely we will release the groundwater data. I think that was your suggestion. But what I would ask of the Commission is, I would go back to the Community Advisory Committee and say, how best -- what format to put that in as opposed to reams of data that doesn't mean anything necessarily to the public. Because I would like

to make the Commission aware that I often get feedback from the public, that if you put all kinds of technical things on here I can't understand and you are just trying to put all kinds of technical information on and not making it in a form that I can understand. So I will commit to I definitely will do that, but I will go back to the Community Advisory Committee and have them give me guidance in terms of what should that format look like.

I hope I answered your question.

MEMBER PENNEY: Yes. Does anyone from OPG sit on the CAC? No? Yes, thank you.

MR. VINCETT: John Vincett, for the record.

I would say not intentionally. I say that in the sense that currently we do have a student from Durham College who is on an assignment, a summer job assignment at OPG. We have had in the past students from the university, the UOIT who have gone to do summer assignments or maybe, you know, lengthy work assignments with OPG. But no, there is nobody who is an OPG employee who is on the Council.

MEMBER PENNEY: The question is, is who do -- you report to OPG, you provide your minutes to them. Who in OPG do you report to or provide the minutes to?

MR. VINCETT: Okay. John Vincett, for the

record.

The Manager of Public Affairs is the manager of the process for us.

MR. LOCKWOOD: Randy Lockwood, for the record. I wouldn't miss a meeting.

THE PRESIDENT: Okay. Thank you. So thank you. Thank you very much. Any last comments? We always give the intervenor the last word.

MR. VINCETT: John Vincett, for the record.

We worked long and hard on our diagram and we were --

THE PRESIDENT: It's very nice.

MR. VINCETT: -- thinking that you folks would like to ask some questions about that. We're kind of relieved that you didn't --

--- Laughter / Rires

MR. VINCETT: -- but it did recognize -- what we did was distil about nine months of information from OPG which we thought was just an enormous vast quantity of information that wasn't manageable for us. So we worked through. So one of the key elements of that is the source of our diagram.

THE PRESIDENT: I think you should animate it and put it on your website.

--- Laughter / Rires

THE PRESIDENT: Okay. Thank you.

I would like to move on to the next presentation by Mr. Bertrand, as outlined in CMDs 18-H6.72 and 6.72A.

Monsieur Bertrand, vous avez la parole.

--- Pause

CMD 18-H6.72/18-H6.72A

Oral presentation by Louis Bertrand

MR. BERTRAND: Mr. Chairman, Members of the Commission, staff and participants, good afternoon.

Before I begin, I acknowledge that we are in the traditional lands of the Mississaugas of Scugog Island and I hope that these proceedings are being held in the spirit of sharing our knowledge and values.

Monsieur le Président, Membres de la Commission, fonctionnaires et participants, bonjour. Je fais la présentation orale en anglais, mais je répondrai, dans la mesure du possible, les questions qui me seront posées en français.

I am a professional engineer and my background is in electrical engineering with a focus on microcontrollers and firmware development. I have designed

analog and digital circuits and written software in C and Assembler on various microcontroller architectures. I also spent part of my career in information technology, in turn as a system administrator, disaster recovery planner, security consultant and applications developer. I currently teach firmware development in the Electronics Engineering Technology and Biomedical Engineering Technology programs at Durham College.

The focus of my intervention is on the aging digital control computer equipment at the Pickering Nuclear Generating Station.

Computers and software cannot be treated as just another component. The failure modes are radically different. I do not believe that the conventional probabilistic risk assessment methodology can reliably account for computer-related failures.

At the outset my main request to the Commission is to take concrete steps to ensure that new software, as well as maintenance of existing software, is developed following a well-defined and sound process.

First, let me situate my talk.

In past presentations to this Commission, as well as CEAA/CNSC joint panels, I have spoken about cybersecurity. However, today's presentation is different. Today I am speaking about software safety. Safety is not

the same as security. They are related but distinct properties of a system.

As the financial prospectus says, past performance is no guarantee of future result. The fact that the software system has operated correctly so far does not automatically imply that it will continue to do so. In my written submission I refer to the concept of software rot, as if the software bits are decaying, well, bit by bit, even though the program is intact. What in fact is happening is that the environment in which that program operates changes while the program itself does not.

That the operating environment changes seems inevitable to me as the Pickering reactors and the instrumentation and control systems around them age beyond their best before date. The replacement instruments behave the same way as the original. Is the calibration the same? Are there different conversion factors, different nonlinearities?

So how is risk assessed? Now I turn to the area of probabilistic risk assessment as a context to discuss software safety. You will note that my slides mention probabilistic safety assessment, but it really is an assessment of risk. I will continue mentioning PRA, not PSA, in my talk.

To my understanding, a full PRA tries to

address every chain of events potentially resulting in an accident and produces enough three-ring binders to fill a bookshelf or enough PDF files to fill a stack of DVDs. The main value of the PRA, again to my understanding, is evaluating the relative probability of an accidental event chain in order to assign a priority to mitigation measures, in other words, to decide which measures will give the best safety improvements.

My misgivings about the use of PRA is informed by critiques of the analysis that cast doubt on the ability for humans to fully understand the workings of complex technological systems. Perrault makes the deceptively simple yet profound -- and here quoting Downer -- that "since large-scale accidents in commercial aviation or nuclear reactors occur on a regular basis, they must be accepted as normal." In other words, the billions of interactions in a complex system offer the nonzero probability of that billion-to-one accident occurring.

It's the old joke. Here is our man Jeff looking for a coin. Where did you lose it? Over there. Why are you looking over here? Because the light is better.

--- Laughter / Rires

MR. BERTRAND: The ability of PRA hinges on the ability to foresee all circumstances or operating

states of a very complex system and correctly identify the initiating events and their consequences. PRA necessarily makes assumptions that accident chains are causal, linear and occur individually. In other words, if we can put a number to this risk, we derive some comfort and confidence. But where does that number come from? Can we be sure that all of the effects have been accounted for? Are the estimates of the individual event probabilities correct? And more relevant to my intervention, how can we determine the probability of a failure of the instrumentation and control software?

The attractiveness of software is its ability to build a specific-purpose machine on general-purpose hardware. But please keep in mind that software is abstract, completely determined by the mind of its creators. Also, computer-based controls are fragile. I refer you to the incident on June 22nd that was discussed Monday in the regular meeting of this Commission where an operator pressed the wrong button on the process control computer and caused operations to come to a halt.

The idea of a random failure of software, the same way that a valve or a pipe can fail randomly, is simply not realistic. Bits don't wear out.

I have noticed that there is generally a blind spot in Ontario professional engineering about the

risks associated with transferring functionality from electromechanical devices to computer-based systems. I recall a feature article in the November/December 2016 issue of the PEO magazine, "Engineering Dimensions". It was on safety, but it was all about mines, chemical plants, carnival rides, not software.

The source of software failure can be traced to the work of its designers, either in the requirements, specifications, implementation, testing, verification and validation. In other words, a software failure should be thought of as one or more errors in its development.

Here I would like to illustrate the mechanism for a case where the software will fail to execute. Sorry. So where was the failure in here? You will notice that the bolt is correctly installed and that the hole is drilled to line up exactly with the bolt and that the user is operating both the bold and the door according to the instructions.

Here we need to look at system theory. System theory models the interactions between components, first at the lowest levels, then progressively higher levels of abstraction. In other words, parts fit together into subassemblies, which in turn work as assemblies and subsystems that eventually form the entire system.

System theory tells us that systems in which disturbances in one part of the system have direct consequences on other parts of the system are defined as tightly coupled and that tightly coupled systems are more vulnerable to disturbances, cascading events or feedback loops. These nonlinear interactions are difficult to model with PRA.

Here I would like to illustrate the mechanism for a case where the software will fail to execute correctly. It's a very simple example. The flow of control is the path taken by the execution of the code on the left side, if I may, with the --

--- Pause

MR. BERTRAND: I guess the pointer isn't working for me.

THE PRESIDENT: A software issue.

MR. BERTRAND: Always.

Okay. So here I believe you can see. So the code on the left is represented by the flowchart diagram on the right. The invaluable X is input, we make a decision based on the value of X and if the question is answered as true we execute A, otherwise we would execute B, but not both procedures at once. So that's the simple example. The code is in pseudocode, it's not in any specific programming language. The next time through a new

value of X may cause a different path through that code.

Now I'm going to double the complexity here. There are two -- there are four pads for a control flow and it depends on X and Y. So after making a decision on X, the software has to make a decision on Y in both branches, and we could execute A, B, C or D depending on the values of X and Y.

So here's the scenario. Suppose procedure C has an error and then furthermore, suppose that in all previous executions of this code fragment only procedures A, B and D were executed. As conditions change, for whatever reason, aging, new procedures, replaced component, it's possible that a new value of Y will cause procedure C to be executed. At this point the error manifests itself as an incorrect computation evidenced by incorrect outputs which potentially can result in unsafe operation.

You can think of software as a series of paths through a minefield. If the system is carefully designed, the mines are sparsely distributed and most paths through the minefield are perfectly safe. However, there are paths that will inevitably lead to a landmine.

I am running short of time, otherwise I would give an example of a software-triggered accident at Bruce No. 4 in January 1990. This is for the record, Ontario Hydro SER 90-003. I can come back to it in the

questions, if you like.

I ask the indulgence of the Chair, I have a couple of more pages, if that's okay? Thank you.

So how do we ensure correct software? There are several CNSC and CSA guidance documents and development process activities, but they are very short on details. In an IAEA technical report, that's TRS-384, Verification and Validation of Software Related to Nuclear Power Plant Instrumentation and Control, 1999, Appendix 3 summarizes work in several countries participating in a survey of best practices. The Canadian section describes in high-level terms the efforts for Pickering, Darlington and Wolseong in South Korea.

Just to give an idea to the Commission of what I mean by software development process, I am using an illustration from TRS-384 of the so-called V-Model. It is widely used in the software industry, but it is only one of many approaches.

If you look at the top-to-bottom access, and hopefully the mouse will do it for me, there we go, we go from the highest level to the most detail at the bottom, and the progression of the development goes from left to right in order of time.

As we go down one branch with the V, we go from requirements to specifications to coding at the very

bottom, and then at each stage there are two work products, one is the further refined work product, the other one is a test to see that when we come back up the right branch of the V we test at each stage at higher and higher levels of integration. This is a well-known model.

In parallel with this there are also activities to identify hazards and mitigation measures, as well as defect tracking and disposition. Embedded within that we have peer reviews and unit testing in the process.

There are many points in this next slide, but the summary is that the digital instrumentation and control systems are aging even though there have been many modernization initiatives. My concerns are that the software in use may eventually meet a sequence of input conditions that will trigger an accident or that newly-developed software has not been vetted to the same standards as when there was a keen interest in proving the correctness of the entirely computer-based Darlington shutdown systems SDS1 and SDS2.

In support of my concerns about software engineering expertise, I reference Slide 4 of the presentation by Paul Sedran, in CMD 18-H6.20, describing the fragmentation of fuel channel assessors. If the expertise on something as fundamental to CANDU operation as fuel channels was fragmented, what could we say about the

expertise in software engineering?

Finally, I would like to suggest that the Commission ask OPG Pickering to document its software modifications, in particular to review its software development process. According to *CSA Standard N290.14*, vendors of safety-critical digital hardware and software to the nuclear industry must be qualified by inspecting the software development process of those vendors. If OPG requires transparency from its vendors, I think that it's only fair that the Commission, and we members of the public, require the same of OPG. My recommendation is that the Commission require the applicant, as a condition of licensing, to submit the third-party technical review of their development process, sharing the findings with the public by this time next year, and to itemize and publish on a yearly basis the modifications made to the digital control software, along with evidence of the software engineering process that went into the development, verification and validation process steps followed.

Finally, I would like to support the calls by other intervenors to shut down the Pickering Nuclear Generating Station at the earliest opportunity, and to deny the request for a 10-year extension of the operating licence.

I'm also supporting a request for a ruling

by CELA, Greenpeace, Northwatch, and Durham Nuclear Awareness to improve the emergency planning and awareness in the 50-kilometre ingestion planning zone.

Thank you for the opportunity to address this Commission. I welcome your questions.

THE PRESIDENT: Thank you.

I'd like to start with maybe OPG telling us about the way you deal with software, and then from staff, what is the regulatory requirement.

MR. GREGORIS: Steve Gregoris, for the record.

As part of our commitment, fitness for service was one of our clear commitments, ensuring fitness for service of our system structures and components today and out to 2024.

One of the things I'd like to point out and we haven't had a chance to mention is this diagram here. It's in Addendum 1 of our CMD. It outlines the comprehensive equipment reliability process that we have in place. It talks about a lot of the different programs and processes that go into ensuring our equipment is reliable, it's in good condition, it's upgraded when appropriate, and design changes are done and they're done in a systematic fashion.

With that, I'm going to ask Jason Wight to

lead the conversation specific to our computer systems.

MR. WIGHT: Jason Wight, Director of Engineering for Pickering Nuclear.

I've got four points to make, and then I'll pass it off to Mike Benjamin, who will talk a bit about our software management program.

With regard to the periodic safety review, there's been a lot of discussion on how much work has been done with the periodic safety review: 500,000 components, 1,000 component condition assessments, over two years of work. In that assessment, it's both looking at the current standards and codes for Pickering, applying the new standards and codes, as well as electronics and software. That is encompassed as part of the periodic safety review, and that's important to note.

Another piece of information that's also very important to note, documentation aside, Pickering Nuclear, in 2017, performed 13,608 safety system tests. Zero missed. That's 13,608 safety system tests. These tests include software and electronics, which helps with the justification and confirm reliability and availability of our safety systems. That's very important to note as well.

There was a comment made with regard to the engineering change control process for the modification

of software. Our modification process is very large. It's about 800 pages. It's very extensive, with third-party reviews. It's also audited. It's evaluated by INPO and WANO. We have frequent audits from the CNSC, and internal audits as well, and it's benchmarked among the industry. Although the specifics about design of software is of course we're operating a nuclear power station so that's ours, the process itself is very robust.

We have something else as well that hasn't really been talked about, and that's the monitoring and diagnostic centre. We have the ability to perform advanced pattern recognition, so looking at electronics as they slowly degrade in age and be able to proactively replace these electronics in a fashion so it doesn't actually impact the operation of the power station, and that's very important to note as well. This is something about innovation. This is using technology for Pickering that we really haven't talked about but that's very important to note, and we are leading the industry in this fashion.

I'll pass this off to Mike to talk a bit about our software programs.

MR. BENJAMIN: Mike Benjamin, Senior Manager, Cyber Security, for the record.

OPG has extensive experience and expertise managing its cyber-assets securely, safely, and reliably as

part of plant operations.

The development process for software is fully compliant with *CSA N290.14*. We are subject to CNSC Type II inspections. We recently had an audit from our OPG's nuclear oversight organization. That audit did include staff from another nuclear utility, knowledgeable staff. The results of that audit was our controls are effective.

All changes to the digital control software are considered whenever we make changes to instrumentation, to plant equipment, sensors and detectors, as well as computer hardware, so when a change is evaluated it falls under engineering change control. Engineering change control has all the gates to look at security, it looks at reliability, it looks at maintainability, and we make those changes under a full ECC process, which is fully compliant with *CSA N286*, a continuous improvement process.

The nuclear aging management program itself has been updated. The procedure has been updated to align with the requirements of CNSC REGDOC-2.6.3 on aging management. We produce regular condition assessment reports with recommended actions, and they are tracked as part of health reporting, so system engineers, as part of the performance monitoring procedures, produce health reports. Those health reports and condition assessment

reports are updated on a regular basis, and they contain the actions required to make sure that the component health maintains its health as the plant ages.

THE PRESIDENT: Staff?

MR. FRAPPIER: Gerry Frappier, for the record.

We do have programs and compliance programs to oversee computer software. I would point out that of course what we're mostly interested in is what could it do that would have a negative impact on safety, so whether there's production issues and operational issues, that's a broader question. The question particularly that we're looking at is, is the software qualified, and as was mentioned with the discussion on PSA and a deterministic safety analysis, what sort of things could go wrong if the software does go wrong?

I'd ask Mr. Eric Lemoine to explain our compliance program.

M. LEMOINE : Bon après-midi. Mon nom est Éric Lemoine, je suis le directeur du Système d'analyse des systèmes. Je comprends très bien le français, mais je vais continuer en anglais pour m'assurer que je ne fasse pas d'erreur technique, à cause qu'il y a beaucoup de mots techniques dans ma réponse.

The CNSC staff monitor the reliability of

process control computers through multiple ways. One way is through the review of REGDOC-3.1.1 event reports. We also look at system and component health reports, and annual reliability reports.

In addition, CNSC staff have reviewed and evaluated Pickering's DCC -- this is the digital control computers, the process control computers -- condition assessments in 2008 and 2016, keep in mind that's looking at the hardware side, and we had no issues with OPG's approach.

CNSC, we performed software maintenance inspections in the past. There were no safety significant issues that were found from that inspection, and there's another software maintenance inspection planned for this fiscal year.

In that software maintenance inspection, the criteria that we look at are compliance to *CSA N286*, in particular, the engineering change control process. We also look at *CSA N290.14*. *CSA N290.14* is the qualification of digital hardware and software for use in instrumentation and control applications for nuclear power plants. We also look at RD/GD-210, which is the maintenance programs for nuclear power plants. That's the compliance verification criteria that we use.

There are other standards that we also

look at as well, such as IEEE 12207, which is a systems and software engineering software lifecycle process, plus other IEEEs, and also we look at what are called CANDU computer system engineering centre of excellence standards which are referenced in the CSA in 290.14.

These were standards that were developed in the 90s as part of the -- to support the STS-1, STS-2 Darlington work. And one thing that's interesting is that these standards as well are very robust, very thorough and they're available for free on the CSA's website.

THE PRESIDENT: So, I recall from my days in the telecommunication business, this is a known phenomenon. We have had nightmare about the software failure in particularly every industry from telecommunication to aviation, to you name it.

But my interest is, you know by now I always ask the same question. So, if there's a Doomsday scenario and the worst case scenario happen, software fail, will you be able to shut down the machine safely?

MR. FRAPPIER: Gerry Frappier, for the record. Certainly -- so, that's now in the realm perhaps more of the probabilistic safety assessments that were done and the deterministic safety assessments that were done, and we can certainly get into some of the details there.

But the short answer would be, the primary

safety systems are all failsafe, so if something does go wrong the unit will shut down as opposed to stay operating.

And so, we're very confident about the effect of software has been taken into account in the safety analyses. But if you want, I can get a little bit more details on how that's done.

THE PRESIDENT: That's fine with me.

Any...? Ms Velshi?

MEMBER VELSHI: Quick question to OPG and then to the intervenor.

So, when you did your periodic safety review, does the IIP address significant gaps that were identified in this area?

MR. WIGHT: Jason Wight, Director of Engineering. There were no significant gaps in the areas of software.

MEMBER VELSHI: Thank you. Mr. Bertrand, you mentioned an event that occurred at the Bruce in this area. Maybe you can give us a bit more detail, and then maybe staff can comment on, what kind of a trend is it on software issues resulting in maybe increased safety risk.

MR. BERTRAND: Thank you for the question, Ms Velshi.

Yes, this is an event at Bruce 4, January 23rd, 1990 around 3:00 in the morning and it's, for the

record, Ontario Hydro report SER-90.003. And I thank the Secretariat for digging up the old AECB documents on very short notice. Thank you very much.

A sudden displacement -- I'm going to quote directly:

> "A sudden displacement of the east fueling machine bridge with the machine locked onto channel C-08 caused a large heat transport leak which forced a unit to shut down and cool down using AIM procedures."
>
> (As read)

And I'm not sure what the acronym stands for.

Basically the east bridge dropped about 40 cm for no apparent reason and, of course, caused a leak from the channel and it was leaking 1.4, and the unit here is mega grams per hour, it's not tonnes, it's just a very weird unit.

Anyway, in the follow-up report from March 21st of the same year, 1990, what happened is that an error message was generated and that error message, because of an independent event, a motor overheated apparently, so this error message was generated by the sub routine; however, the main program, instead of calling the sub routine with a

jump to sub routine instruction, on a jump to sub routine instruction the idea -- you'll excuse the hand waving here -- but you have your main program coming along and it calls the sub routine it has to know where to come back to after finishing that sub routine, returning from that sub routine.

The call was made by an unconditional jump instruction which meant that that return address was not stored in the processor's register. So, what happened is that the program continued executing at a random place in memory which, for some reason, the unexpected effect of that was to release the motor and the platform started dropping and under its own weight caused a problem.

So, the idea here is that a very simple mistake, right, in the instruction is a jump instead of JSR in most micro controllers, caused a very unexpected event to happen, right.

And that's the whole idea of software is its unpredictability of the failures, the failure effects. And that's basically where I'm coming from is that once you hit one of those land mines you don't know what the effect is going to be.

And I do appreciate the failsafes, but please recognize that these systems are very fragile.

THE PRESIDENT: Yeah, but tell us the end

of the story. So, what happened? Did it shut down? Did some --

MR. BERTRAND: Oh yes. There was a shutdown. The operators noticed that there was a leak in the D2O reserves and apparently through the periscope were observing that there was a lot of steam coming out and executed an orderly shutdown.

THE PRESIDENT: So, from our perspective, you know, we have nightmares about things going wrong, but we want to make sure that no matter what goes wrong, there's a provision to make sure that it doesn't become a serious incident.

MR. BERTRAND: As far as I know there was no safety -- everything was contained, but from the operational point of view of Ontario Hydro at the time, that was a loss of revenue.

So, obviously, other than the fact that it's a spectacular failure if you have steam coming out of the reactor, also there's a loss of revenue. So, for these reasons it really needs to be addressed.

MR. FRAPPIER: Gerry Frappier, for the --

THE PRESIDENT: Mr. Berube?

MR. FRAPPIER: Sorry, because I want to make a point here that I think is really important is to understand how we deal, in general, with software.

So, the example being given here -- we can get into some more detail if you want -- but is a good example of how we do the analysis.

So, Mr. Bertrand is explaining the software cause of a certain problem. That would not be how we would have analyzed it. We would have looked at, this is, we're talking about the fueling machine being on the reactor face, what are the things that can go wrong, whether it's because of mechanical, pneumatic, operator error and you basically have, it can be locked on, it can be loose and therefore having steam and water leakage, it could be such that it's partially off and there's fuel in it, fuel out of it.

So, all of those are design-based situations that have to be analyzed in the deterministic safety analysis and in the probabilistic safety analysis to show, as you were saying, sir, what are the safety consequences of that. And if there is a significant safety consequence, then you must design in something that's going to solve that problem or at least make it so that it's not a safety concern.

Whether it's caused by software or whether it's caused by human error or mechanical failure, we don't really care, we just want to make sure that whatever it was you have it such that it's not of a safety concern.

THE PRESIDENT: Mr. Berube?

MEMBER BERUBE: This question is for OPG. Are you doing any, at this point in time, active development for DCS code call at this point? Are you actually changing your DCS coding at all, or are you just in maintenance mode?

MR. BENJAMIN: Mike Benjamin, for the record. There are routine changes, as we've said, to the control computers with changes in sensors and that, but it's mainly -- but we are mainly in a maintenance mode. So, it's ongoing maintenance. As upgrades happen to the plant, the control computers will be modified under ECC.

THE PRESIDENT: Okay.

Question? Dr. Demeter?

MEMBER DEMETER: This is a quick question. In my business we have a lot of equipment with software and because the equipment is Health Canada certified, changing the software is not trivial because the vendor has to go back and get everything re-certified. So, we end up with a lot of equipment that has aging software because we're waiting for updates from the vendor because of regulatory oversight and cost.

Is that the same in your industry that a lot of your equipment has software that is tied to a larger certification process so that it's more difficult to

update? Is there an aging issue with regards that way, or is it a different game with your industry?

MR. WIGHT: Jason Wight, Director of Engineering, for the record.

So, there is -- for special safety system software it's very robust, we've got checks and balances and it's timely.

In many other circumstances, we do like a failure mode spec analysis based on the software and the required updates for revision. We have quite a significant technical staff, software staff, DCC group that -- actually in-house expertise. So, we can make a lot of the modifications, for example, for DCC in-house which allows us the timely updates. But it's a varied situation.

MEMBER DEMETER: Okay. My example, when I moved to Winnipeg in 2002, we were running a machine on a 486 computer because that was the only computer available for that machine. It worked, but...

Thank you.

THE PRESIDENT: Okay. Thank you.

Any final thought?

MR. BERTRAND: Louis Bertrand, for the record. Once again, I ask the Commission to deny the 10-year licence and, instead, work to permanently shut down the Pickering reactors and transition to the

decommissioning phase.

Failing that, I ask that the Commission as a condition of licensing require an independent formal technical study of the software development process to modifications to the safety shutdown systems as well as the digital control software, with the results of the evaluation to be made public.

And the final, final word, President Binder, best wishes for a long and happy retirement, and Ms Velshi, congratulations on your appointment.

Thank you.

THE PRESIDENT: Thank you.

The next presentation is by the Ontario Chamber of Commerce as outlined in CMD 18-H6.30. I understand Mr. Rossi will make the presentation.

CMD 18-H6.30
Oral presentation by the
Ontario Chamber of Commerce

MR. ROSSI: Thank you, Mr. President and honoured Commissioners, ladies and gentlemen.

My name is Rocco Rossi and I am the President and CEO of the Ontario Chamber of Commerce.

On behalf of the OCC and our 135 chambers

and boards of trade and over 60,000 businesses, thank you for the opportunity to present our recommendations as part of our support of the Ontario Power Generation's 10-year licence application for the Pickering Nuclear Generating Station.

You will have heard from two of our members today, the Toronto Region Board of Trade, the Ajax-Pickering Board of Trade, and you also have two written submissions from Whitby and Oshawa. You will see unanimity on behalf of the Chamber movement in support of this renewal.

That said I want to thank the Canadian Nuclear Safety Commission for their diligence in conducting a comprehensive and robust review process. I think we always have to be upping our game, always holding people accountable. Particularly when it comes to nuclear industry, it's essential to ensure that there is never any compromise to safety or to the environment.

The OCC is committed to working with the CNSC and the federal government to ensure Canada remains a leader in nuclear expertise, innovation, and that the nuclear sector continues to be a key economic driver.

As Ontario's business advocate, the OCC is the independent, non-partisan voice of business. We are committed to working with the government

to promote economic growth and prosperity in the province of Ontario and across Canada.

The OCC has long recognized the importance of the nuclear industry to our province's economy, particularly the critical role that OPG and the Pickering station play as fundamental drivers in our economy.

Nuclear power represents a clean, reliable source of energy for Ontarians, while also being an integral part of that economy. We believe the continued investment in the nuclear industry not only supports direct and indirect job creation but also in building a dependable and cost-effective energy system. This is of critical importance to Ontario which has successfully eliminated coal from its energy mix.

Our recommendations draw from an extensive advocacy work from our 135 chambers and boards of trade across Ontario, along with original data and research from our 60,000 members. Our network has advocated for an affordable, reliable, clean and innovative energy system that supports Ontario businesses. That resolution process highlights the need to take advantage of Ontario's nuclear expertise to support both our economy and the global transition to a low carbon future. I'm here as the voice of those chambers supporting those calls with this submission.

The OCC has a strong, long-standing relationship and partnership with the OPG. We work together to support our shared vision of a prosperous Ontario. Our work together has boosted both business and public confidence in Ontario's nuclear industry. A leading example of this is our membership's broad support of the Pickering station. A recent report, "Pickering continued operations and impact analysis on Ontario's economy" supported by the Canadian Centre of Economic Analysis contains original quantitative analysis detailing the economic impact of continued operations of the Pickering station to 2024.

As you know, the nuclear industry is a major driver of Ontario's economy. It's made up of over 180 companies. It employs about 60,000 people per year. The nuclear industry plays an integral role in medicine and research and innovation and generates more than $6 billion annually on a GDP basis.

With that, I'd like to begin to highlight the economic benefits of the continued operations of the station. Currently, Pickering powers 1.5 million homes and provides 14 percent of Ontario's generation capacity. The continued operations of this plant will provide the province with much needed cost-effective electricity while Darlington and Bruce Powers units are refurbished between

2022 and 2024.

Reducing electricity prices is a top priority for our members. We know that the price of electricity directly influences the province's ability to attract and retain businesses, as well as foster economic growth. Lower electricity prices contribute to the province's competitive advantage. With the cost of doing business in the province on the rise, continued investment in nuclear power will help to alleviate some of the input cost concerns currently affecting Ontario businesses.

The nuclear industry further creates jobs across its high-tech supply chain, while contributing to local research and innovation initiatives. This includes supporting those afore-mentioned 180 companies within the nuclear supply chain, many of which are sources of high-tech jobs from a diverse range of large to smaller firms.

Our recent report found that the continued operations of Pickering will contribute over $12.3 billion to Ontario's GDP over the period. It will also support 7,590 full-time equivalent jobs per year, arising from direct employment at the Pickering plant, indirect employment at suppliers and induce spending from wages earned by all individuals across all industries. Supporting the nuclear industry is essential to creating

that prosperous province that we all want.

We are also lending our support to OPG due to their strong commitment to safety and the environment. We have heard some criticism of the design and the reliance on radiation containment systems, characterizing the plant as being unsafe or outdated. However, Pickering's impeccable safety track record speaks for itself. This is demonstrated in the CNSC awarding Pickering with its highest achievable rating standards in both 2015 and 2016.

The World Association of Nuclear Operators has also twice over recognized Pickering's exemplary safety performance. Pickering's all-injury rate was zero until September 2017 and they ended the year at a rate of .06 which is in line with the industry's best.

The station exceeded its generation target for the year as a result of completing two outages ahead of schedule, as well as exceeding its maintenance backlog targets. Two units also achieved record runs in between those scheduled outages. Pickering station is continually finding ways to improve their performance.

To identify opportunities to further enhance plant safety, Pickering most recently completed a Periodic Safety Review in accordance with CNSC's regulations and international standards. This review looked at plant operation today in comparison to the latest

codes and standards. The review concluded that Pickering is safe today and, with the proposed enhancements it will become even safer.

The safety and security of the Pickering station is overseen by multiple external oversight bodies, which continue to reinforce its strong safety rating.

Healthy communities help Ontario businesses thrive and a critical component of OPG's demonstrated commitment to safety extends beyond the walls of Pickering station and into the communities that surround the plant. Our local chambers across the Durham region attest to the open, transparent and regular communications by OPG providing the opportunity for two-way dialogue on plant operations.

The OCC is also aware of the environmental and climate change benefits attributable to the Pickering plant. Nuclear energy is one of the cleanest technologies available when we consider the entire power generation life cycle from construction to mining to operation and decommissioning.

Nuclear power also helped facilitate Ontario's transition to a low carbon energy mix with 60 percent of Ontario's electricity supply coming from carbon-free nuclear energy. With a global shift away from greenhouse gas emitting fuels, nuclear energy is an

integral part in meeting the energy and air quality needs of the province as well as providing for the province's larger low carbon future. It is estimated that the continued operation of Pickering station will reduce greenhouse gas emissions in Ontario by an estimated 17 million tonnes, which is the equivalent of taking around 3.4 million cars off the road each year.

In conclusion, the Chamber and its network of 135 chambers and boards of trades strongly recommends the 10-year licence continuance for the Pickering plant.

Pleased to take any questions you may have.

THE PRESIDENT: Thank you. Question? Ms Velshi...?

MEMBER VELSHI: Thank you for your submission. I was looking at your policy resolutions and under nuclear one of your recommendations -- and this is dated April 28, 2018 -- is "provide greater certainty and clarity to the nuclear regulatory review process". Can you elaborate on that and what were you getting at?

MR. ROSSI: Again, we don't believe anyone should ever get a blank cheque and that's why it is important to have these regular hearings in going through renewal processes. As I said, we are delighted and we congratulate the Commission for doing so, and ensuring that

these issues are aired and the latest standards are applied, going forward.

MEMBER VELSHI: Okay, because as I read it that's not quite how I read it, because it says "certainty and clarity to the nuclear regulatory review process".

MR. ROSSI: I was at the AGM and heard the debate and that was the context of that commentary.

THE PRESIDENT: Question? Question? That's very clear then. Thank you. Thank you for your presentation.

MR. ROSSI: If I may -- one final word if I may, Mr. President.

When I presented with respect to the Bruce hearings you asked the question, well, isn't there debate within the business community and within the Chamber with respect to nuclear energy? And just to be absolutely clear and to reiterate, there is no question we have members, individual companies and individuals within the network where this is debated. But through our resolution process we have the votes of 135 chambers, which 100 percent support this.

So on a vast majority basis within each individual chamber and then with unanimity across the entire chamber network you have a very strong voice from the business community speaking on this issue.

THE PRESIDENT: Thank you. Thank you for your presentation.

I'd like to move now to the next presentation, which is by Durham Nuclear Awareness, as outlined in CMD 18-H6.56 and 18-H6.56A.

I understand that Ms McNeill will make the presentation.

CMD 18-H6.56/18-H6.56A

Oral presentation by Durham Nuclear Awareness

MS McNEILL: Yes, and I'm not using the PowerPoint actually, I'm not using the slide presentation.

Good afternoon. I'm Janet McNeill, Coordinator of Durham Nuclear Awareness, and this is Dr. Paul Seccaspina, Oraclepoll Founder and President.

Firstly, I need to say that DNA is grateful to have received CNSC participant funding to do our polling, to solicit public opinion on nuclear emergency plans in a 20-km radius around Pickering.

Also, we endorse the request for rulings that have been submitted by DNA, CELA, Greenpeace and Northwatch.

I also draw attention to the disclaimer that we sent with our supplementary submission. Our

participation needs to be understood in the context of that disclaimer.

I've been a community activist for more than 30 years now. I've worked on quite a few issues and fell into nuke work more or less by accident, not by design. I guess you could say it was a beyond-design-basis accident.

I've been working on nuke since 2010, but a CNSC watcher since 2006. I've intervened at about 10 hearings now and watched or attended who knows how many after all these years, since 2006.

I live in Toronto now. I lived in Durham Region for many years, it's where I raised my kids, pretty oblivious to the existence of the two very large nuclear stations here. I have to say that there is much obliviousness among the populations both of Durham Region and Toronto.

It is not safe to assume that all the new and potential residents in coming years choose the region with full knowledge about the two large nuclear stations, as MP Erin O'Toole claimed in his remarks on Tuesday. Not everyone is even aware these stations are here.

DNA history, the Durham Nuclear Awareness group formed in 1986 post-Chernobyl accident, and has been calling for better nuclear emergency plans ever since.

I've been involved with the group since 2012.

I wanted to make a quick comment about this hearing. The fact that some people did not intervene either because they've kind of given up on taking part since they see that it may fall into that category of insanity; doing the same thing over and over, and expecting different results. So some people have fallen away. Also, the original location out in Courtice was very inconvenient for many people, so we're not going to know how many people chose not to intervene because of that.

I want to point out a few things of note that I've learned over the years. I've learned of the existence of the May 1959 International Atomic Energy Agency deal with the WHO, World Health Organization, in which the two organizations agreed to work closely. Quoting from that agreement:

> "Whenever either organization proposes to initiate a program or activity on a subject in which the other organization has or may have a substantial interest, the first party shall consult the other with a view to adjusting the matter by mutual agreement." (As read)

Kind of makes clear how public health

agencies don't study or say too much about the impacts of radioactivity on human health.

Knowing of this deal also helps make clear that cover-ups and collusion among various agencies in the nuclear industry has existed for 60 years now.

Another thing of note, the whistleblower letter from CNSC Staff in 2016 stating that, "CNSC Tribunal Members are not always provided with all the information they need in order to be able to render decisions." Scary.

The Officer of the Auditor General of Canada report in 2016 that cast a negative light on CNSC inspections of nuclear facilities, "likening the situation to planes taking off improperly inspected."

A CNSC staffer questioned about these two matters at a Durham Nuclear Health Committee in, I believe it was early 2017, was quite impolite in the remarks he made about the CNSC Tribunal. I think you'd be shocked at what he said. Everyone seems to be missing the important point that if you, the Tribunal Members, are not provided with all the facts you really cannot make informed decisions, can you?

The Ontario Auditor General's report in late 2017 as regard to provincial emergency management. I quoted some key points from this in the DNA submission about lack of staffing, retired nuclear personnel in the

office, and who emergency exercises are really for, et cetera.

Population; the population density around the Pickering station is already too high, yet intensification is being stepped up.

Hearings; licences are never turned down, kind of seems like the hearings are pure theatre, really.

Tritium; sometimes I think tritium is the real elephant in the room.

I'm frequently reminded of this quotation, "It is difficult to get a man to understand something when his salary depends upon his not understanding it," this was Upton Sinclair.

Regarding emergency planning, to repeat myself, DNA has been at this for a period of over 30 years now. The only change we've seen really is KI pills in the 10-km zone.

I sent in with my written submission the CNSC information letter that was sent out four days after the K announcement from CNSC, which was sent out at 4:00 p.m. on the Friday of Thanksgiving weekend 2014. That letter the four days after was about the benefits of a much wider distribution radius, 30 miles or 48 km, that was being described by some independent researchers. Yet, our pre-distribution here in Southern Ontario is 10 km. Ten

kilometres is 6 miles. The U.S. is also in a bad way vis à vis emergency planning zones, but at least there it's 10 miles, not 6. How did we ever get stuck on this 10 km business? I'm curious about that, but it seems rather arbitrary.

Our submission talks about learnings from the Three Mile Island accident, and the it can't happen here myth. Thirty-two years since Chernobyl, 39 since Three Mile Island. Seems like nothing but talk has transpired in all these decades. Lots and lots and lots of talk, but almost no action.

Could there be a serious accident here? Of course there could, everyone knows that. Though, a CNSC staffer said at the Pickering hold point hearing in May 2014, "As the Commission probably recalls, we had this discussion many times in the past," he was referring to risk of a serious accident. Resuming the quote, "So using the exactly same argument to the CANDU fleet, we can say the risk is zero because there was never a significant accident in the CANDU fleet."

That really didn't sound like very good science to me; we can never have an accident with the CANDU fleet, because we never had an accident yet?

I am a very untechnical person, and I'm the first one to admit that. I'm definitively not a rocket

scientist. But I do recognize unscientific remarks when I hear them. That remark from that CNSC staffer spoke to me not just about reliability or honesty, but about trust. How can we trust either OPG or CNSC when this kind of remark is made by an organization that claims to be scientific?

How can we trust the WHO or any United Nations agency when we know a deal was made way back in the late 1950s?

Moving to our recent polling results, we see that 93 per cent of those surveyed want plans for a Fukushima-scale accident, an INES-7 accident like the one in Japan in 2011 that caused the evacuation of 150,000 people, many of whom are still displaced seven years later. That has led to many cases of thyroid cancer among children, among a myriad of other impacts that possibly most people in this room have not heard about or maybe don't even want to hear about.

Long-range health impacts will be numerous, wide-ranging and multi-generational, as has been the case, as is the case with the Chernobyl disaster of 1986. You don't have to trust me on that, there's lots of data.

Regarding the recent polling results, it isn't just that 93 per cent want emergency plans for a

serious nuclear accident, they also overwhelmingly want details about such things as: sheltering in place; whom to contact in an emergency, they're talking about phone numbers; practical information; location of emergency reception centres; information about alerting systems; how to self-decontaminate; information about KI pills; maps with evacuation routes. Also, tellingly, 87 per cent support KI pill delivery beyond 10 km.

Paul Seccaspina from Oraclepoll will be happy to answer any of your questions about the polling results.

As stated in our written submission, Ontario Power Generation claimed at the Day 1 hearing that they had:

> "Worked hard to reach out and communicate with the public about emergency preparedness. Based on polling results, we are confident that the general public knows what to do in the extremely unlikely event of a nuclear emergency." (As read)

Clearly, this in direct contradiction to the results of our recent polling. I hope you have some questions to ask us about that.

Thank you.

THE PRESIDENT: Thank you. Questions? Ms Penney.

MEMBER PENNEY: Thank you for that. I'm assuming you brought your expert so that he could tell us a tiny bit, not 20 minutes, but a tiny bit about the poll. Yes, please.

MR. SECCASPINA: Sure. How detailed would you like me to get? I can go through the whole process. Could --

MEMBER PENNEY: Three minutes.

MR. SECCASPINA: -- go here for an hour. Three minutes? Okay, I can do that.

Thousand person sample, dual sample frame landline, cell phone. The sample frame was people within a 20-km radius of the station. Results were segregated within 3 km and within 20, demographic breakouts.

A lot of data there, there's a whole lot of data, everything from perceptions of a crisis, a problem, a disaster, right through to concerns. So low level of concern. Consequently, low level of preparedness and low level of willingness to take -- there's a high willingness to take action, but low level of concern. So low concern, low preparation.

We got into specifics on this as to what people do want. So they do want information, as Janet

mentioned, and we got into the specifics as to everything from shelter and KI pills. We focused on KI pills. We got into communication in here as well as, you know, awareness of initiatives, receipt of information in the mail. Interesting stuff there. I mean, you know, you are looking at 48 percent of people that said, yeah, I got something in the mail, but when they were asked to explain what it was, 55 percent couldn't. Either they couldn't, didn't read it, put it aside. Then the other responses are right across the board.

So there is an issue there with respect to, yes, low concern, low level of preparedness, and without having that main motivator to get into the information, people just aren't reading it. They want to get information, the delivery mechanism that they are getting points to the fact that there needs to be some improvement in that area.

MEMBER PENNEY: What would they --

MR. SECCASPINA: That's three minutes, I think.

MEMBER PENNEY: How would people prefer to be communicated with?

MR. SECCASPINA: When you are looking at this information -- we do a lot of municipal work, we do a lot of stuff around testing, you know, how messages can be

delivered. I mean when you look at this whole data set here there are variances geographically. Under 3 kilometres, 3 kilometres out, under 35 years old, higher income earners, there are variances. So younger respondents are saying, yes we are more concerned, yes we are going to be more prepared, higher income earners as well, people with families. When you are looking at the delivery mechanism, it's coming back down to digital, right. And it's not just an under 35 thing anymore. It's not 1997 when we started polling when we could say, yes, websites are definitely an under 50, under 40, under 30 thing. So it's across the board. The problem is that we can have this information on a website, but if there is no motivator to get people to go to the website, there is no motivator to get people to read through that document that's coming in the mail. We went through this in this last provincial election, upside down, I mean you know, you can get the information out there, are people going to get engaged, do they want to get into the specifics? So there is that gap right in there to get people to take that next leap of faith.

MEMBER PENNEY: Thank you.

THE PRESIDENT: Question? Ms Velshi...?

MEMBER VELSHI: So tell me the difference between the 3 kilometres and --

MR. SECCASPINA: Sure.

MEMBER VELSHI: -- from 3 to 20, about the level of awareness because, you know, for the 10-kilometre zone a lot of effort has been expended in that area.

MR. SECCASPINA: Right. So the awareness or the accident concern, I mean so the overall concern of an accident is 26 percent. So 3 kilometre radius, 45 percent concern level.

MEMBER VELSHI: What about awareness?

MR. SECCASPINA: And those farther away -- oh, awareness.

MEMBER VELSHI: I'm sorry, awareness and being ready to respond.

MR. SECCASPINA: Oh, okay, we can go into that one. Detailed emergency plan. So level of awareness 31 percent overall. This is gender split here throughout this as well. Under 3 kilometres 36 percent, farther away 29 percent. So we can go across all of these indicators and you are going to see either a 10-point spread, in some cases a 20-point spread, in some cases even farther. So it's across the board. So in that one, we are getting that divide just on that one.

THE PRESIDENT: But isn't it probably on any issue you get to the general public in terms of if there is no impetus to act --

MR. SECCASPINA: Of course.

THE PRESIDENT: -- you know, why would they care about it?

MR. SECCASPINA: That's it exactly.

THE PRESIDENT: So it's nothing kind of unusual.

MR. SECCASPINA: Not at all. Not at all.

THE PRESIDENT: Right.

MR. SECCASPINA: I think this is the third time I have been presenting and I mean the results are consistent. And I mean you can pick not only this issue, you can pick any issue across the board.

THE PRESIDENT: Yes.

MEMBER VELSHI: But the results are inconsistent with what OPG's polling data has shown, is it not? Maybe you can comment on that, particularly for the 3-kilometre zone results that we have heard.

MR. BURNS: Scott Burns, for the record.

There are some differences, we recognize that. As we have mentioned earlier on, we are committed to a better understanding. I think the information that we have seen here and what we have heard helps to inform OPG and opportunities for learning and improving on our strategy. The differences I think are probably variables in the way the polling was conducted. I wouldn't be able

to speak to the details or the background on that necessarily. I did note that in the intervenors that there was the note about 81 percent have the KI pills at their residence, so that was probably the most consistent piece with ours, and the supporting of receiving their message and information online through social media was very similar.

MR. GREGORIS: Steve Gregoris, for the record. Commissioner Velshi, if I can just add.

So, you know, we have seen polls that have different results. I think what's important is that we understand we don't have full public understanding, support or awareness. We are aware of that. We are also committed to continue to engage and be transparent, and with that we will continue to educate, we will continue to listen and we will continue to improve.

THE PRESIDENT: Dr. Demeter...?

MEMBER DEMETER: Thank you. Were you here earlier -- to the intervenor, sorry, thank you for your presentation. Were you here earlier when Durham Health presented with the Medical Officer of Health and Epidemiologist?

MS McNEILL: I actually inadvertently missed part of their presentation. I totally did not mean to. I was outside charging my computer and I was supposed

to come back in.

MEMBER DEMETER: Sure.

MS McNEILL: I do go to Durham Nuclear Health Committee meetings all the time, so I am in the habit of running into Dr. Kyle and hearing from -- and I attend a lot of regional Council meetings in Durham Region, too.

MEMBER DEMETER: That's good. On page 2 of your Intervention you said, we are concerned about -- and the first bullet is cancer rates in the Durham Region. And they clearly identified and discussed cancer rates, fetal/maternal issues. And your bullet further down is genetic damage to human beings and biota. Understanding that the published dose to the public is about 1/1000 or less of natural background, so one, I want to -- do you have other data regarding cancer rates that are not part of the Cancer Registry and Durham County Health Status reports?

MS McNEILL: You know what, I don't have a lot of health data at my fingertips because we don't focus on that. I would like to focus more on health, but we find that people -- it's hard to engage on health. It's hard to deal with the CNSC on health, too.

One of the things I have noticed with the nuclear industry, for one thing I don't have any -- I don't

feel that UNSCEAR is a credible agency. I have mentioned why that is. I don't trust the UN agencies because of that deal that happened in 1959 between the IAEA and the WHO. And I have read the critiques of some of the UNSCEAR data on Chernobyl for example from international -- I'm not sure if I'm going to get the words right on this, the acronym is IPPNW, International something or other Physicians Against Nuclear War.

I don't trust UNSCEAR data and I don't always trust studies that I read because one of the things that I find the nuclear industry will do when they are discussing data -- and I wish I had at hand a study from Durham Region where there was an elevated cancer rate among teenagers and then in the next breath it was, well we know it wasn't related to nuclear. And it's the same thing with the CICC. The CICC study is always being criticized. There were cancer clusters, but it wasn't anything to do with radiation. Well, how can you trust that? So --

MEMBER DEMETER: I guess I have to bring it back down to locally. Do you trust the Ontario Cancer Registry and your local health officials who are monitoring this all the time?

MS McNEILL: Not really.

MEMBER DEMETER: Okay. So we will leave that.

THE PRESIDENT: So Dr. Kyle is also part of this global conspiracy?

MS McNEILL: I'm not saying he's part of a global conspiracy, but --

THE PRESIDENT: So why wouldn't you trust him?

MS McNEILL: It's going to get a little personal if we go into that. I don't really need to do that.

MEMBER DEMETER: So the one piece of --

THE PRESIDENT: He's gone.

MEMBER DEMETER: The one piece of advice I have to a lot of intervenors who brought up the --

MS McNEILL: I can explain that actually. It's not a tremendously terrible thing. About 25 years ago when I -- I wasn't working on nuclear issues at that point, I was working on water issues and waste, and I went to visit Dr. Kyle with a fellow activist and he said that the biggest environmental issue as far as he was concerned was cigarette smoking and I just thought, we are not on the same page about the things that are, you know, problems. I mean of course cigarette smoking is a terrible problem, but I don't think of it as an environmental problem exactly.

MEMBER DEMETER: So I think one of the observations I'm making, a lot of intervenors have raised

issues of communication of KI to the 50-kilometre zone and after it was discussed about the order on the Toronto webpage, I found that within 30 seconds and did a test order, so it works. But I would ask intervenors who have real concerns about the 50 kilometres and access through the mail and ordering, perhaps let your community and your constituents know. Be part of the solution in communicating the issue of how to obtain KI pills to 50 kilometres if that's your concern, because --

MS McNEILL: I live in the Beaches area of Toronto. I am surrounded by millions of people. I don't have any means by which to run a PR campaign to let them know about this.

MEMBER DEMETER: This is a much broader discussion to all the intervenors who have that concern, because a lot of them have come before us. Not you personally necessarily, I don't know who your constituents are, but I think that's --

MS McNEILL: Well, I don't think it's our responsibility. I think it's the responsibility of the nuclear industry and/or the CNSC or the Health departments to be doing this. You can't -- this happened the last time we did a poll and we presented it at the Darlington hearing. It was kind of tossed in our laps: Well, are you going to go out and kind of walk your talk here? And I'm

like: I make 400 bucks a week doing this work. Like, you know, I'm at the bottom of whatever the food chain is on this. It's not my responsibility to communicate this.

MEMBER DEMETER: I'm not saying it is, I'm just saying it's an opportunity for -- especially Greenpeace for example, they have a lot of constituents, they have a newsletter, if their constituents --

MS McNEILL: Shouldn't it be up to the industry to take responsibility for this? Why should people in the public have to do this?

THE PRESIDENT: Can we please not get into a solution right now. We are just here to collect evidence. Thank you for your intervention here.

Any other particular -- Dr. Lacroix...?

MR. LOCKWOOD: Randy Lockwood, for the record. If I may, President Binder.

I too have heard a lot of information this week. I was quite pleased to hear the Commissioner say that he found the information within 30 seconds. It's one of the first things I did when I took this job, just punched in what to do in a Pickering nuclear emergency and you've got countless webpages.

That aside, I welcome the intervenor for coming forward, and all the previous ones, and I am still thinking about your suggestion of how best to raise

awareness. One of the things is we are definitely -- it has to come in many shapes and forms. That's why we produced the video to make sure people understand the risks from the plant and we have to work that out some way on our website and a number of other websites. And similarly, we have to raise awareness to even further connect the various webpages and enhance these webpages. So we plan and we will commit to improving that. And again, I thank the intervenor.

THE PRESIDENT: Thank you. Okay?

MEMBER LACROIX: Yes, I do have a question.

THE PRESIDENT: Go ahead.

MEMBER LACROIX: Thank you, Mrs. McNeill, for your presentation. On page 16 you list a number of reasons for shutting down Pickering and among these reasons you mention that discerning members of the public do not see the usefulness of staged emergency exercises. What do you suggest as an alternative?

MS McNEILL: I guess the public would be more engaged in the exercises if they were engaged in the exercises, but the exercises are really for all the agencies involved and the Auditor General makes a statement about that which I quoted in our submission as well. The exercises are done for the industry. They are a

requirement for the industry, so, you know, it's a bunch of the agencies talking to one another, I guess to help ensure that if there is an accident not too many things will fall between the cracks.

I personally think gobs of stuff will fall between the cracks if there is an accident and I think some of the discussion here today made that plain. When you talk about KI distribution, it seems as though nobody really knows who is in charge. And it was being said today by OPG, if I'm not mistaken, I was kind of gobsmacked really, but we are talking about delivering KI pills while an accident is taking place. Like that just seems completely absurd to me. And I am aware of what happened with KI pills after the Chernobyl accident and what happened in Japan and I know about the thyroid cancers that are happening in Japan. You have to do this ahead of time. You don't start distributing -- you don't run out to the drugstore to buy Band-Aids, you know what I mean, you keep the Band-Aids in your house. You know what I'm saying, you have to be prepared ahead of time. And I don't -- I think Dr. Binder has said this many times today, you know, you are not really sure what's going on with this whole thing. But I think it -- you know, it is pretty clear that the pills need to be pre-distributed ahead of time, not in the midst of an accident.

MEMBER LACROIX: In this case, would your organization be willing to participate in one of these emergency exercises?

THE PRESIDENT: Just for the record, I think, if memory serves -- staff remind me, and maybe OPG -- there were citizen groups monitoring the exercise. You are right, OPG is required to do this periodically as part of keeping track, but I think an organization of community people were invited to observe and participate. Staff...?

MR. FRAPPIER: Gerry Frappier, for the record.

So yes, OPG can provide some details. And also there were volunteers who participated as casualties and things of that nature. So there is certainly opportunity. But I do agree that what we are really testing is the organizations who do have responsibility for undertaking certain things in an emergency situation, that they can actually do what they say they are going to be doing.

MS McNEILL: Yes. The Auditor General commented that:

> "The focus on practice tests for nuclear emergencies is driven by the licensing requirements of the nuclear

> power companies. The tests are paid for and organized by these companies and generally focus on their concerns."

This is the Auditor General of Ontario that I'm referring to.

> "We noted that the tests mainly concentrate on events occurring inside the nuclear power facility -- the responsibility of these companies; they usually do not extensively test areas outside the nuclear power facility -- the Province's responsibility."

So that's all I'm saying. The tests benefit the industry, they don't particularly benefit the public. That's all I'm saying and, you know, that is backed up by the Auditor General's --

THE PRESIDENT: OPG, go ahead.

MR. BURNS: So a couple of comments there.

I would acknowledge that we did run a focus group in the last two major exercises, where we invite community members in to evaluate our communication with the public throughout the emergency. We learned a lot of valuable lessons through that process and our public

affairs people have taken note of that feedback and it has been incorporated into our after-action report.

I would say that there has been benefit to the public agencies that were involved in Exercise Unified Control and Exercise Unified Response, again, over 30 organizations. We recently published the after-action report for Exercise Unified Control and there was valuable lessons learned not only for OPG but the other organizations involved.

THE PRESIDENT: I see the Office of the Fire Marshal is still here and maybe you want to come in and comment about the kind of true test, if you like, that would cover not only the OPG requirement but the general public requirement?

MR. MORTON: For the record, Mike Morton, Office of the Fire Marshal and Emergency Management. I am joined by Emma Fuchs, who is our Exercise Program Officer. Emma is going to provide some background on our exercise program in general and talk about some of our recent exercises which have involved a wide variety of organizations and have indeed done fairly extensive assessment of offsite response capabilities, including for the severe accident scenario.

Emma...?

MS FUCHS: Hello. Emma Fuchs, for the

record.

So the Office of the Fire Marshal and Emergency Management and the Provincial Emergency Operations Centre in general participate in quite a lot of nuclear and radiological emergency exercises. In particular, we have actually done four full-scale multi-day, multijurisdictional exercises in the past six years, two of which have been with OPG. We also regularly run a lot of notification drills and exercises, about 3 to 4 per month, not just with the facilities here in Ontario but also with our contiguous states in New York and Michigan and Ohio.

We have a lot of good lessons learned from Exercise Unified Control, which has been mentioned and as indicated in that after-action report. For that exercise, again as has been mentioned, there are about 30 or so organizations. A number of different provincial ministries were involved as well as a lot of inoperability learned between the municipality and the different stakeholders there.

THE PRESIDENT: So how does the general public get involved in some of those exercises?

MS FUCHS: Usually the general public would be involved through -- as has been mentioned, through either as volunteers, as for example acting as a

contaminated casualty or as part of focus groups with the communications testing and so on.

THE PRESIDENT: Okay. Any final comments you want to share with us?

MS McNEILL: Yes, for sure. And I also want to quote something quickly from this book about the Fukushima accident that I highly recommend to everybody on the planet basically if you want to get a really good understanding. It is called, "Fukushima: The Story of a Nuclear Disaster" by David Lochbaum, Edwin Lyman, Susan Q. Stranahan and The Union of Concerned Scientists. Very detailed about the progression of the Fukushima accident. And it has a statement about the exercises and it says:

> "These exercises only provide an illusion of adequate preparation. As the Fukushima experience painfully demonstrated, rapidly moving people out of harm's way in the midst of a nuclear crisis is exceedingly difficult, yet critical."

So I think that's something people need to keep in mind.

Final remarks-wise, I have learned a lot about emergency preparedness in the last six years. Some of it is incredibly simple and down to earth. There has

been a lot just today indicating the degree to which the left hand is pretty confused about what the right hand is doing. It's sobering. And I remind you that DNA has been calling for better emergency plans for 30 years, since the late 80s, since the Chernobyl accident. We have been saying all this stuff for 30 years.

For sure you have heard a lot about the need for more public education in the 50-kilometre zone. I hope you will rule in favour of the requests from CELA, DNA, Greenpeace and Northwatch. And I hope everyone in this room will be mindful of this quote from the Official Report of the Fukushima Nuclear Accident Independent Investigation Commission:

> "The government, the regulators, Tepco management, and the Kantei lacked the preparation and the mindset to efficiently operate an emergency response to an accident of this scope. None [therefore] were effective in preventing or limiting the [consequential] damage."

Lots of great quotes on the DNA website, if you go to our website, about Fukushima and all things nuclear. And climate change and all kinds of other things, too.

THE PRESIDENT: And where to get KI pills, I assume.

MS McNEILL: Pardon me?

THE PRESIDENT: And where to get -- how to get KI pills, I assume.

MS McNEILL: Oh, yes.

THE PRESIDENT: Oh, that's okay. Thank you.

We are going to break now for 15 minutes, which takes us to 10 to 4:00. Thank you.

--- Upon recessing at 3:35 p.m. /
Suspension à 15 h 35
--- Upon resuming at 3:55 p.m. /
Reprise à 15 h 55

THE PRESIDENT: Okay, we are ready to continue with the next presentation.

Oh sorry, you may notice that our senior legal advisor has changed. So let me introduce M. Denis Saumure, who is sitting in for Lisa, who had to go, family obligation. Thank you.

So the next presentation is by the Society of Professional Engineers and Associates, as outlined in CMD 18-H6.109. And I understand that Dr. Ivanco will make

the presentation.

Over to you, sir.

DR. IVANCO: Okay, I have a PowerPoint presentation; I just don't see it here. Let me see if I can call it up. Oh, okay.

--- Pause

THE PRESIDENT: Somebody come in and do the magic.

DR. IVANCO: I don't see it on the hard drive.

THE PRESIDENT: What are you looking for?

MR. LEBLANC: We don't have it.

THE PRESIDENT: I have it.

MR. LEBLANC: Sorry, Dr. Ivanco, we don't have it loaded on the system. So do you have a key with you?

DR. IVANCO: I don't have a memory stick with me. I have it on my laptop, if I can borrow a memory stick.

MR. LEBLANC: I'm not sure --

On l'a ici sur un des écrans. Est-ce qu'on pourrait juste prendre un ordi d'un Membre, puis le brancher? Okay, we'll do that. Thank you.

--- Off record discussion / Discussion officieuse

THE PRESIDENT: I think from the two heads

behind you, I think magic will happen.

--- Off record discussion / Discussion officieuse

DR. IVANCO: Okay, I think I'm ready. Want me to start?

THE PRESIDENT: Yeah, please.

CMD 18-H6.109

Oral presentation by the

Society of Professional Engineers and Associates

DR. IVANCO: Okay. I'm here representing the Society of Professional Engineers and Associates, of which I am past president.

For those who don't know, we're a union that represents engineers, scientists, technicians, technologists, designers, and skilled trades who work for SNC Lavalin's Nuclear Division. We used to work for Atomic Energy of Canada Limited, and Atomic Energy of Canada was the designer of the Pickering A reactors and the designer of the CANDU 6 reactors around the world. Currently our members design reactors and provide engineering, technical, and procurement support for existing reactors around the world and in Canada, including those at Pickering NGS.

A bit of history. The Pickering units were the first multi-unit electricity-producing nuclear

reactors built in Ontario after Douglas Point and were commissioned between '71 and '73. The first unit to be commissioned, Pickering unit 1, is still in operation following refurbishment.

For many years, the Pickering A units were amongst the very best operating stations in the world. And through the '60s, '70s, and '80s, Ontario's economy was expanding quite rapidly and in need of abundant and cheap electricity. And with the easily available exploitable hydroelectric capacity already developed, this meant building coal or nuclear.

Ontario government at the time chose to build both types of generation, and the nuclear generation built at Pickering, then at Bruce, and later at Darlington replaced on a one-for-one basis generation that would otherwise have been produced by burning coal.

And just to refresh your memories, burning 1 kilogram of coal yields about 1 kilogram of carbon dioxide. And one kilowatt hour of electricity generates about 1 kilogram of carbon dioxide.

So the Pickering nuclear units have produced over 850 terawatt hours of electricity and thus have displaced more than 850 million tonnes of CO_2. Canada's annual emissions from all sources, by comparison, are about 700 million tonnes. Annually, the station

generates more than 20 terawatt hours of carbon-free electricity, which is enough to power about 1.6 million homes, and avoids 20 million tonnes of CO_2 emissions per year.

And in 2017, the Pickering station satisfied about 16 per cent of Ontario's electricity demand. It plays a key role in powering the homes and industries in and around Toronto, where its proximity is important. And in our opinion, when it shuts down, it will leave a gaping hole in Ontario's electricity infrastructure.

The Pickering station has played a key role in reducing Canada's GHG footprint over the years, and it's difficult to imagine a replacement for Pickering that does not also increase Ontario's GHG footprint, although that's not an issue relevant for licence extension.

But to provide 24/7 baseload power is possible in principle if you use a combination of wind power and solar generation, supplemented by natural gas. But this would be the most benign replacement form of generation. But replacing Pickering with, say, a combination of 25 per cent intermittent renewables, supplemented by natural gas -- 75 per cent natural gas, would increase the electricity generation sector's GHG footprint by about 7.5 million tonnes.

And I left this piece of paper over there at the other desk, but while I was sitting waiting for the other talks, I looked at the IESO generator reports. You can google them any time. And to give you an idea of how the system runs, Ontario takes as much electricity as it can get from nuclear, as much as it can get from water, from hydro, and as much as it can get from wind, and then uses natural gas to balance supply and demand.

And if you looked at the generator reports at noon today, nuclear capability was 10,667 megawatts and the generation was 10,663 megawatts, which is a 99.6 per cent capability factor. For hydro, it was producing about 4,200 megawatts of electricity, at about 60 per cent capability factor. Wind power is 4,313 megawatts of capacity, was producing 174 megawatts of electricity at noon today, which is about 4 per cent capacity factor. And the remaining 2,400 megawatts was gas.

So that's how our electricity system works. When there's a lot of wind, it's great. You don't have to burn as much gas. When there's not a lot of wind, like today, you have to burn a heck of a lot of gas.

I won't go into that, because I have a limited amount of time.

The person who gave the talk from the Ontario Chamber of Commerce talked a lot about the impact

of Pickering on the local economy, so I won't go into that.

And I won't go into that.

I'll talk a little bit about the robustness of the design, since we are designers, to give people an idea of what the differences are between our reactors and other ones. They're different from conventional reactors, which have a pressure vessel. Fuel is non-enriched and unused fuel can be handled by hand with no danger. And it has five physical barriers between the radioactive fuel and the environment. And I think people know fuel is in a stable UO_2 matrix. It's covered by a fuel sheath. It's put inside bundles. The bundles are contained inside pressured-containing tubes. The system is contained within an airtight reactor building with four-foot-thick walls. And here in Pickering you also have a big vacuum building should there be an accident.

I mentioned this part about multiplexing, because there is a mention before that CANDUs have had no accidents. The sort of reactors that all -- the accidents that all reactor vendors worry about are loss-of-coolant accidents. There have been some very famous ones. There was the Chernobyl one; there was the Three Mile Island one; there was the Fukushima one. Less well-known is the 1982 loss-of-coolant accident at Pickering, which was pressure tube G16 in unit 2, and it ruptured, resulting in a LOCA.

And most people don't know about it because nothing much happened. The ECC was not even triggered in that accident, and it's because of the nature of the core design. Our core design is multiplexed. Instead of a big pressure vessel, we have a spaghetti-like assortment of pressure tubes and feeder pipes. And in any sort of pressure vessel like that, the thing that tends to break is the weakest link in the chain. And the weakest link in the chain are the individual fuel channels. And that's what broke in 1982 in Pickering A.

But one of the points I would like to make is there are roughly 16,000 of these fuel channels in operation around the world. To my knowledge there's only one has ever failed in service, and that was Pickering 2, unit G16 in Pickering 2 in 1982. And it was using an alloy that hasn't been used in 30 years.

It's worth mentioning at this point -- I won't mention it -- I probably don't mention it in this part here -- the other kinds of accidents that people tend to worry about with pressurized water reactors and boiling water reactors are a main steam line break. If a main steam line breaks in one of those reactors, you got about one second to shut it down, basically, to close off the secondary system. In a CANDU reactor, the operator can go for coffee and come back and shut it down. Our reactors

just behave differently than conventional reactors.

Another big accident people worry about is control rod ejection. You can't get a control rod ejection in a CANDU reactor because the moderator's not pressurized.

So the point I'm trying to make is we have a robust design that certainly, in our opinion, is much safer than other reactors. And when you do have things that happen, transients that do happen, they behave much more slowly in a CANDU reactor because they're great big reactors. A nuclear physicist once described a CANDU reactor compared to other reactors as being like a pussy cat.

I won't -- this is mostly what I've said verbally.

I want to talk about response to Fukushima. And this is talked about in the submissions by both the OPG and the CNSC.

That accident resulted in complete station blackout, which you can't see happening in a CANDU reactor on the Great Lakes. But having said that, all of the CANDU reactors went through and addressed the lessons learned from Fukushima and addressed all of the action items. Even though we think that's over the top, they did it, and I think it's made their level of safety quite a bit greater than they would otherwise be.

Safety performance, there are 14 safety and critical control areas, and if you look at the submissions, OPG has a very good rating with respect to all of those, either fully satisfactory or satisfactory.

Environmental performance I'd like to talk about, because a lot of people have talked about this. The worker dose at Pickering, as stated, is well below regulatory limits. And the dose to the public from operations at Pickering have been in the range of 0.9 to 1.5 microsieverts. And even at the high range, this is one-six hundred and sixty-seventh of the regulatory limits.

To put this in perspective, natural background radiation in this part of the world, because we live in the Canadian Shield, is about 2000 microsieverts. And I want to note that there are places in the world where the natural background dose is as high as 260,000 microsieverts annually, which is more than 173,000 times higher than Pickering, with no apparent negative impacts on health. And that is a location in Iran.

And this is a graph I haven't put up before, but it's radiation dosage to the public in perspective, and where the volume of the cube is proportional to the annual radiation dose in these different areas. So the giant cube is the natural background in Ramsar, Iran. There should be effects from

the amount of radiation that they see, but they don't see it, presumably because there's an adaptive response to it.

The second-biggest box is if you ever go and have an abdominal CT scan done, that's how much radiation you're exposed to in about five minutes. The third-smallest box, that's the natural background in Ontario, a chest X-ray below that, and that tiny little box is the Pickering NGS. That's what you get at the station boundary if you happen to live right outside the fence.

So, yes, there is dose, there is extra radiation because of Pickering, but it is miniscule compared to what we experience by living in Ontario.

Pickering has requested the ability to operate some 295,000-equivalent full-power hours. We certainly endorse this. We also endorse the licence extension request for 10 years.

I want to mention one thing, if I can. In our opinion, Pickering, when it is shut down, will leave a big hole in the electricity-generating infrastructure. This is at a time when, at least under the previous government, there's a move to electrify the transportation sector. As an owner of an electric vehicle, I can tell you that people charge their cars in the middle of the night and if you were to electrify, for example, five percent of the transportation sector, that would increase the baseload

demand by 400 megawatts. If down the road you decided to electrify the entire transportation sector, and I'm just talking about light vehicles, you're going to need 8,000 megawatts more of baseload power.

Right now, unless you either build new reactors or you refurbish existing ones, including things like the Pickering station, you're going to have to go natural gas, and wind turbine, sure, but natural gas, as solar is not going to help you much with charging cars in the middle of the night, so one of the pitches that we would like to make as an engineering organization that designed the initial reactor is that we'd certainly like to see the Ontario government, the new one, revisit the assumptions that were made when they decided to close the Pickering reactor. We not only endorse the 10-year licence extension request, we would certainly call on the government to revisit the assumptions that went into the decision to shut down the reactors in a permanent way.

That's essentially my talk.

THE PRESIDENT: Thank you.

Questions? Let me start, then.

You mentioned in your Slide 9 five percent of light vehicles. What's your educated estimation as to how quickly transportation will be migrating to electricity?

DR. IVANCO: Right now, it's pretty slow. It depends on incentives. It depends on political will. It depends on engagement of the public.

I've had an electric vehicle now for four years, maybe I was one of the first ones to buy one, and I've seen some improvements in infrastructure in charging. I can go more places. Although, having said that, I drove my Jeep Patriot here today because I came from Oakville and I could get here in my electric vehicle, but unless I could charge it in about two hours, I wasn't going to get back, so there are things needed to improve the infrastructure.

There are places, like California, where I think they're getting close to 10 percent, for example, in terms of electric vehicles, but there are huge incentives there to buy vehicles, and there's a lot of grassroots support for doing those kinds of things.

I know that there are ambitious plans, or at least there were, in the long-term energy plan to try and electrify transportation. The whole reason is to try and reduce greenhouse gas emissions. From the electricity-generating sector, the GHG problem has essentially been solved. Our emissions must be about 50 grams per kilowatt hour. To put that into perspective, that's about one-tenth of what Germany's are, and they've invested $300 billion in renewables. But the real bang for

your buck now is in transportation and home heating, and if you can electrify those you can reduce your greenhouse gas footprint a great deal. Each car you replace with an electrical vehicle saves you five tonnes of CO_2.

THE PRESIDENT: Some of the arguments that are being made now to shut down Pickering is that there's a surplus of energy, but according to you even five percent --

DR. IVANCO: There's a bit of surplus in the middle of the night right now, certainly on cooler nights in the summer or warmer nights in the winter, but if we do electrify the transportation sector that excess will disappear because you naturally tend to charge your vehicle in the middle of the night. Electricity is cheaper and you're not driving it in the middle of the night, so that will go up over time.

The way that the ISO manages load in the middle of the night is a bit of a mystery, but many of you know they pay Bruce Power to blow off steam so they don't make electricity. They spill water and burn gas in the middle of the night. You can check it yourself. Look at the IESO generator reports. There's never less than about 600 or 700 megawatts of electricity being made, generated by gas in Ontario.

THE PRESIDENT: Questions? Mr. Lacroix.

MEMBER LACROIX: Yes, I do have a question.

Thank you very much for your presentation.

Coming back to safety, what is the biggest safety challenge that Pickering will face in the next 10 years?

DR. IVANCO: That's a big question. If it runs as an existing station without refurbishment or without being replaced, the lifetime of all reactors is limited by pressure tube elongation, so they're going to run into that barrier, I presume, at around 300,000 full-power hours.

In terms of safety, the Pickering B is a relatively modern CANDU reactor, believe it or not, in terms of safety system design. It has gadolinium nitrate injection. It has the regular shutdown rods that fall through gravity. The Pickering A reactors, I worked on a Pickering A unit for refurbishment many years ago and they still have dump tanks, I believe, and also the shutdown rods. The second one of those, the dump tanks, are not as fast as gadolinium injection, so from that point of view I suppose the Pickering A reactors are somewhat less safe because they don't have a fast-acting secondary shutdown system. Dumping the water from the moderator is not as fast as injecting gadolinium nitrate.

Having said that, in a pressure vessel where you have 400 channels, where it's multiplex like this, what is going to break is generally the weak link in the chain, and that has broken before. It has broken in Pickering A, in Unit 2, and there was no issue particularly, there was no safety issue. There was a huge economic issue because all the reactors had to be re-tubed with zirconium, and it cost a lot of money, but it was not a safety issue. I really don't believe that CANDU reactors have those same safety issues as pressure vessel reactors do.

MEMBER LACROIX: Thank you.

THE PRESIDENT: Actually, I'm looking at your Slide 17, and it's the first time I saw this kind of a very simplistic comparison between the Fukushima event and what would happen if that kind of accident happened with a CANDU. How did you figure out this calculation that it will take a couple of days?

DR. IVANCO: I didn't figure this out. This was done by AECL after their analysis of the Fukushima accident. I guess by then we were Candu Energy, so the safety analysts went through this and calculated that we have probably around 48 hours conservatively if we had a complete station blackout. That assumes core collapse, right, which is essentially what happened in Fukushima. It

assumes all the pressure tubes melt, all the fuel gets dumped out on the floor, the dousing system triggers, the end shields burst, and all the water comes out of those things. If all those horrible things happen in a CANDU reactor, which has never happened before, you have an order of magnitude more water inside the reactor building, and anyone who knows thermodynamics will tell you that water buys you time. It's got a large heat capacity, it takes a lot of energy to boil water, and it buys you about four times as much time as they had certainly at Fukushima to get water to the system. Of course, we also have the benefit of having fresh water nearby. It's hard to imagine you could have two days go by, in a situation like this, without being able to get some colder water inside the reactor building.

THE PRESIDENT: Okay. Thank you.

Any final thoughts?

DR. IVANCO: The only problem that I have is the one I made at the end. Pickering is one of the older licensed nuclear sites, and it's hard to get a greenfield nuclear site. The Province of Ontario, if it continues to try to meet its greenhouse gas emissions goals, it will need more baseload power going forward if it does indeed electrify the transportation sector and home heating sectors, even if it may have a temporary surplus in

that respect now. If you're going to need more baseload power and you don't have nuclear, and the hydroelectric capacity is pretty much exhausted, you're going to end up with a mixture of intermittent renewables, and a spinning reserve of natural gas, and mostly it's going to be the natural gas that's going to provide that, and that's a bit counterproductive if you're looking to reduce a greenhouse gas footprint.

THE PRESIDENT: Thank you.

The next presentation is by the Canadian Coalition for Nuclear Responsibility, as outlined in CMD 18-H6.63.

I understand that Dr. Edwards will make the presentation via teleconference.

Dr. Edwards, can you hear us? Is he on the line? You've got to push a button there somewhere. We can't hear you, Dr. Edwards.

I think what you should do is maybe do another connection.

In the meantime, why don't you set up the next intervenor, just to be ready. There's none. We may have an early dinner here.

Dr. Edwards, can you hear us?

--- Off microphone / Sans microphone

--- Pause

THE PRESIDENT: So, he's not on line now? He is.

MR. LEBLANC: He was.

--- Pause

THE PRESIDENT: Is that Dr. Edwards? No.

Well, we're going to give you another minute to fix it or else we're going to go for early dinner.

--- Pause

THE PRESIDENT: Are any of the intervenors who were supposed to present after dinner available right now?

I guess not.

--- Off microphone / Sans microphone

--- Pause

MR. BUCHANAN: The line monitor?

THE PRESIDENT: Dr. Edwards, can you hear us?

MR. BUCHANAN: Sorry, this wasn't Dr. Edwards. It sounded as though the line was muted on your end.

THE PRESIDENT: Okay, but can you hear us now?

MR. BUCHANAN: Yeah, I can hear you now, Dr. Binder. Sorry, it's Kevin Buchanan from Health

Canada. I think I'm the only one on the telephone line right now.

THE PRESIDENT: That doesn't help.

--- Laughter / Rires

THE PRESIDENT: But thanks for sharing with us, at least the telecommunication system works somewhere.

So, are you going to -- but are you going to hang up on Health Canada? Well, maybe not.

--- Off microphone / Sans microphone

--- Pause

THE PRESIDENT: Dr. Edwards, can you hear us?

--- Pause

DR. EDWARDS: Hello? Can you hear me?

THE PRESIDENT: Yes, we can.

--- Laughter / Rires

DR. EDWARDS: Oh, my phone was apparently muted, I didn't realize that.

THE PRESIDENT: And you're talking about the most complicated technology on earth.

--- Laughter / Rires

DR. EDWARDS: That's right. We need an emergency backup system.

--- Laughter / Rires

THE PRESIDENT: Okay. We have been waiting for you, so welcome and please proceed with your presentation.

CMD 18-H6.63

Oral presentation by the

Canadian Coalition for Nuclear Responsibility

DR. EDWARDS: Thank you very much, President Binder and good wishes on your retirement.

I have been actually involved in the nuclear debate for four and a half times as long as you have I think, because it's since 1975 that I've been involved.

We all know that nuclear power plants are potentially dangerous, it is the nature of the beast. Metaphorically speaking, we have a ferocious lion in a strong cage. From the point of view of public safety, it is important to know how ferocious the lion is and how strong the cage is.

Everyone agrees that if the lion gets out there will be hell to pay. So, extreme precautions must be taken and are taken.

As Alvin Weinberg, one of the pioneers of nuclear energy in the U.S.A., has expressed it, quote:

"The price of nuclear power is eternal vigilance."

Unquote. So, let's talk a bit about the lion and the cage. We'll start with the lion.

In the case of Pickering, the lion is the irradiated nuclear fuel containing hundreds of human made radioactive poisons that were never found in nature before the nuclear age, but are created in the core of the reactor.

Irradiated fuel is so fiercely radioactive that a single fuel bundle freshly discharged from a Pickering reactor would kill any unshielded human being at a distance of one metre in about 20 seconds. And radioactivity cannot be shut off by any method known to science. In fact, immediately after a nuclear reactor has been completely shut down, the radioactivity of the irradiated fuel continues to generate about seven per cent of full power heat. In the case of a Pickering reactor, that's over 100 megawatts of heat.

That heat, the so-called decay heat cannot be shut off. In the absence of adequate cooling, decay heat is more than enough to melt the core of the reactor at a temperature twice as high as the melting point of steel.

If the gases and vapours and ashes from the radioactive core material is disseminated into the

environment, large areas of land may remain uninhabitable for decades or centuries.

Within 30 kilometres of Chernobyl it is expected to be uninhabitable for at least a hundred years largely due to the deposit of radioactive cesium-137 on soil, trees, buildings and other living things.

Using existing technology, no one can change the nature of this beast. Our only option is to ensure that the cage is strong enough to contain this beast under any circumstances.

So, what is the cage that keeps the lion imprisoned? It is a combination primarily of two things, plumbing and containment. Without a proper plumbing system you may not be able to keep the fuel cool enough in an emergency to prevent the irradiated fuel from overheating and even melting, thereby liberating large quantities of radioactive gases and vapours, including a lot of cesium-137 from the fuel.

Under such dire circumstances, it is necessary to contain the radioactive material, not allowing it to escape into the environment, even in the event of severe core damage.

That's where the CNSC comes in. The CNSC has stated very firmly that it will never compromise safety, CNSC will always ensure that the cage is totally

secure. That means that the plumbing system will be the best that it can be and the containment will be absolutely top notch.

Indeed, Ontario's committed to spending tens of billions of dollars to replace the plumbing in 10 nuclear reactors, eight at Bruce and four at Darlington, most of them older than the Pickering reactors. The expense is justified for safety reasons.

Refurbishing a CANDU reactor means replacing thousands of irradiated pressure tubes and calandria tubes inside the cores of the reactors and replacing them with brand new tubes. It's kind of like a heart transplant.

The effort and expense is justified by the fact that the old tubes have become increasingly brittle over time and more likely to break, especially in case of a thermal shock caused by the injection of cold, emergency cooling water into the super-heated fuel channels.

Refurbishment also means replacing thousands of feeder pipes which are directly attached to both ends of the core, because these pipes have become weak and corroded and are not quite up to snuff. The steel walls of some of these feeder pipes have become much thinner and more fragile over time, in some cases only about 60 percent of the wall thickness of new pipes.

So the easiest thing to do for safety sake is to replace them with new pipes.

Refurbishment also involves the replacement of the oil boilers, weighing hundreds of tonnes each, like a kidney transplant. That also addresses the safety concerns because if several of the narrow tubes inside the boilers were to break under stress during a severe nuclear accident, it would establish a clear pathway for radioactivity to go from the crippled core, through the pipes, and reach all the way to the outside environment, a potentially weak link in the containment system. So it is best not to take any chances. Why not just replace the old boilers, also called steam generators? That's what has been done.

So most Ontario reactors are getting a major makeover being brought up to snuff at great expense with new pressure tubes, new calandria tubes, new feeder pipes, new boilers.

In 2012, Quebec decided not to refurbish its only operating nuclear reactor, Gentilly-2 and consequently that reactor has been permanently shut down.

Back to Pickering, OPG decided years ago to save some money and effort by not refurbishing any of the four reactors that go under the Pickering B designation. These four reactors are old. Like the

Gentilly-2 reactor in Quebec, they should be shutdown permanently. Indeed, when OPG decided not to refurbish them that was the stated intention. But now, here they are, asking to run these old reactors into the ground without bothering to bring the cage containing the lion up to state of the art conditions.

As for the two Pickering A reactors, they are of course the oldest power reactors in the province and they too do not represent state of the art safety because they have only one fast shutdown system, while all other CANDU reactors are required to have two independent fast shutdown systems. The necessity for two fast shutdown systems is based on the fact that any loss of coolant accidents caused, for example, by a pipe break, causes a surge of power to occur in the reactor core. Unless this surge is terminated within two seconds, there could be very severe core damage.

Back in 1952 at Chalk River, the NRX reactor destroyed its core because the one shutdown system it had, did not operate properly, so better to have two.

In the CANDU literature, severe core damage implies the pressure tubes and calandria tubes fail, ejecting fuel bundles into the calandria. The sudden pressure inside the calandria will burst the ruptured disks at the top of the calandria, expelling moderator water out

of the core and providing a pathway for radioactive gasses and vapours, including cesium-137 to escape into the containment along with a great deal of explosive hydrogen gas.

Now, inside the core of a CANDU reactor, a Pickering reactor, there is at least 50,000 terabecquerels of cesium-137. According to a study published by CNSC, they expect that the releases into the environment would only be 100 terabecquerels. That's way, way less. That's about a thousand times less than what is available to be released. So that raises a question: Is the containment actually that good?

Every example of a major nuclear accident that I am aware of has always been accompanied by violent hydrogen gas explosions. Is the containment of the Pickering reactor qualified to withstand such powerful explosions as were witnessed at Chalk River in 1952, at Three Mile Island in 1979, and at Fukushima in 2011. This is an important question because any failure of the containment system will allow radioactive gases and cesium-137 to escape and cause widespread radioactive contamination. At Chernobyl it is estimated that some 80,000 terabecquerels of cesium-137 escaped. That's 800 times more than the CNSC study has assumed. And as a result, we have a no-man's land around the crippled

Chernobyl reactor that extends for a radius of 30 kilometres and will remain inhabitable for an expected age of 100 years or so.

Within 30 kilometres of Pickering there are about 2.2 million people living. Can anyone imagine such a region remaining inhabitable for decades or centuries? Well, it all depends on the containment system if there is a severe core damage accident. It's important that this containment system be able to reduce the amount of cesium inside the reactor from several tens of thousands down to only 100 or less. It is not something that we can take a chance on just because OPG wants to cut corners by not providing a second fast shutdown system for the Pickering A reactors, and not replacing the plumbing in the Pickering B reactors.

By the way, it's important to realize that the distribution of iodine pills, the KI pills to the populations around Chernobyl would have done some good, especially for the children preventing thyroid exposures but it would not have prevented the evacuation of the territory and the uninhabitable nature of the region to this very day. That was necessitated by the cesium-137 contamination, not because of the ioidine-131 releases. The same thing at Fukushima; the regions closest to the reactor are still uninhabitable seven years later.

Even if the Pickering containment system somehow survives a series of hydrogen gas explosions, does anyone really know how good it is? Has the containment system ever been tested under realistic pressure loadings? In fact, how many times has the containment system at Pickering been actually physically tested? When was the last time it was done, and what was the result?

As a scientist myself who graduated from the University of Toronto in math, physics and chemistry, with a gold medal in mathematics and physics, and subsequently obtained a doctorate from Queen's University, I am disappointed in the CNSC senior staff who have chosen to disseminate what I consider to be biased and scientifically questionable information to the public on the potential releases following a severe core damage accident in a CANDU reactor. This is referring once more to the study which -- pick the number -- 100 terabecquerels of cesium-137 to be released. In the very report published by the CNSC they make it clear that that is the lowest amount of cesium-137 that could even qualify as a severe core accident situation.

So where is the conservatism? It seems to me that one has to take into account a leaky containment which would allow for much greater releases, orders of magnitude more, and in that case it could seriously affect

all of the emergency planning. I mean we are fooling people into thinking that the emergency planning only has to be distribution of pills and possible temporary evacuation, not dealing with the possibility that it could be far worse than that.

If the CNSC decides to allow this ancient reactor complex to keep operating under such conditions it should stop using the slogan: We will never compromise safety.

Given the accepted practice for all other CANDU reactors, which is to either refurbish them or retire them, it is clear that allowing the Pickering B reactors to run under these circumstances and also the Pickering A without the prescribed shutdown systems, is in fact compromising safety by reducing the safety margins that would have existed after refurbishment.

So I am asking the Commissioners to show some courage here in saying that, look, we want the very best containment. We want to replace the plumbing system or we want you to shut the reactors down, because otherwise it is setting a bad example and it's a slippery slope. How far is this going to be pushed?

Thank you.

THE PRESIDENT: Thank you. Questions?

So Dr. Edwards, I don't know if you had a

chance to listen over the last four days for a discussion about the emergency planning by the Office of the Fire Marshal; Health Canada. I guess I want to know how much are you aware of those discussions?

DR. EDWARDS: Well, I have been following the literature. I haven't listened to all of the discussions that have taken place, but it is my understanding that there are no plans in the emergency planning as they had to do in Japan to go from house to house decontaminating the roots and gardens and even decontaminating forested lands. This is a huge undertaking and it means that it severely interferes with normal life for a very long time to go -- to come in the future.

I don't know if that's part of the emergency planning, but I don't believe it is.

THE PRESIDENT: Okay, I just wanted to know -- we don't want to repeat the same kind of a discussion. I just wanted to know where you are in this particular thing.

So who wants to ask? Dr. Demeter...?

MEMBER DEMETER: Thank you for the intervention.

I wanted to ask OPG and, I guess CNSC, if need be. Dr. Edwards on page 6, I guess in a presentation to the Toronto health committee comes up with a scenario of

an explosion in a nuclear power plant that creates vaporization of the water in irradiated fuel bays. Get a sense, is this at all realistic? Is this considered --

DR. EDWARDS: No, I think you misread the document. This was a submission to the Ontario -- sorry -- the Toronto Board of Health who was considering the question of the effects of nuclear weapons. So the hearings were specifically about the effects of nuclear weapons.

And I pointed out just as an example that if a nuclear weapon were to explode anywhere close to the Pickering plant, it would liberate one to two million terabecquerels of cesium-137 from the spent fuel bays which are not under any strong containment such as the reactor itself is.

MEMBER DEMETER: Thanks for that.

DR. EDWARDS: That's what the scenario was.

MEMBER DEMETER: I'll withdraw the --

DR. EDWARDS: Actually that's not a realistic scenario but it does point out that any kind of -- any kind of accident such as a plane crash that would -- or a terrorist attack for that matter that could impact the spent fuel bays at Pickering could release an enormous amount of radioactivity, far more than you would

find from the fallout of all the nuclear test explosions that have been conducted all over the world up to the present time.

MEMBER DEMETER: I'll withdraw the question. Thank you for the clarification.

THE PRESIDENT: Okay.

Mr. Berube...?

MEMBER BERUBE: This is for CNSC. So Dr. Edward just pointed at the containment systems and saying that he doesn't know that they have been tested or that they have been certified. Could you please elaborate on what your findings are and what you've done?

MR. FRAPPIER: Gerry Frappier, for the record.

I'd go to Ottawa and ask Mr. Ken Kirkhope if he could explain a bit on, I guess, the vacuum building in particular that was being discussed?

MR. KIRKHOPE: Yes, hello. This is Ken Kirkhope, Engineering Design Assessment Division.

The Pickering containment systems, vacuum building, is subjected to tests every 10 years, according to CSA N287.7 Standard.

DR. EDWARDS: When was the last time?

MR. KIRKHOPE: I would have to ask OPG to perhaps answer that.

THE PRESIDENT: Go ahead please.

MR. GREGORIS: Steve Gregoris, for the record. I'm going to ask Paulina Herrera to expand on my answer. But I'll start by saying that there are a number of different tests we do on containment, some of those tests are on the reactor buildings themselves at low pressure, and also at higher full design pressure.

We also do a test of the pressure relief duct and the vacuum building every 10 years during a station outage, we call that the vacuum building outage.

All of those tests are required per our regulations and standards. There are very specific criteria around those tests that need to be met, including leak tightness. All of our tests have been well within those safety requirements in each of the tests that have been done.

I'll ask Paulina to expand on that.

MS HERRERA: Paulina Herrera, for the record. So, as Steve has stated, the containment structures at Pickering site, which include the vacuum building, pressure relief duct, and the reactor buildings, are tested periodically in accordance with CSA N287.7.

This pressure test consists of pressurizing the building to their design pressure. With the vacuum building, the last time it was tested was in

2010. The results of these tests are submitted to the CNSC, and they were well below our safety limits for leakage.

In the case of the reactor buildings themselves, we have been conducting them, they're performed on a six-year frequency, with the most recent ones through the units being conducted from 2016 and mostly recently in 2018.

All of these timelines are clearly stated in our Licence Conditions Handbook and our Periodic Inspection Program.

In addition, we do conduct exterior inspections of the reactor buildings themselves on a periodic basis as well to ensure the integrity of the structures, which have been confirmed.

Again, all of this is documented and submitted to the CNSC.

THE PRESIDENT: Thank you.

DR. EDWARDS: Can I ask, what is the design pressure that you test to in the case of the reactor building?

THE PRESIDENT: Go ahead, OPG. Have you got the numbers?

MS HERRERA: Paulina Herrera, for the record. I need to confirm, I think it's 43 kPa. I'll need

to confirm from our reports.

THE PRESIDENT: Okay, thank you.

DR. EDWARDS: Do you know if there have been any tests -- or calculations, even -- of hydrogen gas explosions and what that might do to the pressure boundary, especially of the reactor building itself?

THE PRESIDENT: Go ahead please.

MR. VECCHIARELLI: Jack Vecchiarelli, for the record. Yes, we have assessed this. That's part of the work that we did to address the generic action item 88G02 and is part of our probabilistic safety analysis.

We look at the impact on the containment from a range of potential hydrogen concentrations and the associated burns, and we found that there's lots of margin, containment is very robust and well able to withstand repeated burns as a matter of fact.

So there's no issue with respect to post-accident hydrogen burns in containment.

THE PRESIDENT: Thank you. Questions? Go ahead.

MEMBER BERUBE: Another concern that was brought up by Dr. Edwards was the suitability of a moderator drop tank as basically being a viable shutdown system on Pickering A.

CNSC Staff, could you speak to that first

please?

Dr. Edwards, are you still there?

DR. EDWARDS: Yes, I'm here.

MEMBER BERUBE: Okay.

THE PRESIDENT: Go ahead, Staff.

MR. ELDER: Peter Elder, for the record. I'm the Vice-President of Technical Support and the Chief Science Officer.

We did touch on this a little bit earlier in the hearings. So the dump tank as the second system is adequate for slow events. Dr. Edwards is correct, that what was the intent of having two independent shutdown systems was to make sure that you had very high confidence of shutdown for fast events.

In the mid-1990s the AECB, at the time, ordered OPG to make improvements to the fast system at Pickering A. So there's a substantial improvement to the design to make sure that it had the same functionality as the two shutdown systems, as two independent shutdown systems.

Since then, this has been reviewed a number of times through the periodic safety review and also through the PSAs, and we have achieved the same intent; that is we have very high confidence that the reactors will be shutdown on any situation.

THE PRESIDENT: Thank you. Questions?

DR. EDWARDS: Sorry, should I -- oh, you're asking the Commissioners?

THE PRESIDENT: No, I'm asking the Commission, anybody. Anybody has any other questions?

DR. EDWARDS: I would like to make a comment on that last answer if I could?

THE PRESIDENT: Go ahead please.

DR. EDWARDS: Yes, I mean, I just think it's, on the face of it, absurd that the one fast shutdown system is equivalent to the two fast shutdowns. Why then are you causing the other reactors to have two fast shutdown systems? Why don't you just get them all to use the really good fast shutdown system that Pickering A has?

There's a very good reason for this, and that is you don't take any chances. Fast shutdown systems do fail or not function perfectly. That can lead to total destruction of the core of a reactor. That's why you have two fast shutdown systems. I think, at the very least, the Commission should not allow those oldest reactors to continue operating.

I think given the reluctance of Ontario Power Generation to do a refurbishment, replacing the plumbing of Pickering B, the Commission should require that and say, look, if you want to continue operating it beyond

what was reasonable and what you previously pledged to do, then refurbish them.

THE PRESIDENT: Okay. Let me try to explain what I understand from Staff. Pickering A was first built with one shutdown, Pickering B was -- and the rest were with two. When the instruction was to improve, they put in an alternative means to a fast shutdown, which is the gadolinium and all that stuff.

Is that my understanding?

DR. EDWARDS: No, that's not right.

THE PRESIDENT: The alternative stuff is as good or is functional as having two shutdowns.

Am I understanding correctly?

MR. FRAPPIER: Gerry Frappier, for the record. Not quite. So Pickering A does not have a gadolinium system. We just went through the periodic safety review where we just went through the analysis. Perhaps I could ask Dr. Al Omar to explain exactly where it's centred around the shutdown system for Pickering A?

DR. OMAR: Al Omar, for the record. Again, Pickering A originally has two systems to assist the shutdown of the reactor. One of them was slow -- or judged slow -- which is the dump tank.

Currently in the PSR, the current PSR, the current two shutdown systems have been assessed and

declared qualified for the events that are analyzed. So we have two shutdown systems now for Pickering A. The only difference is that the extended or enhanced shutdown system, we'll call it shutdown system 2, does not have gadolinium injection, but we added absorber rods, but it satisfied the design function, safety and regulatory requirement as shutdown system 2.

THE PRESIDENT: Okay, thank you. Dr. Edwards, anything else you want to ask?

DR. EDWARDS: Well, it's definitely cutting corners, there's no question about it. I mean, it's an old reactor. You would not require the Bruce reactors, the Darlington reactors, the overseas reactors, you wouldn't require them to have two fast shutdown systems if one was enough.

If you solved the problem for Pickering A so that you have a fast shutdown system based on rods that's totally adequate to the two shutdown systems, then why go to the extra expense of having two shutdown systems in every other CANDU reactor?

I think that we're just banding words here. We're not really talking about the fact that you are, to some degree, shaving the margin off the safety margin, and that could be a huge difference in the event of a violent emergency.

If you have, for example, and earthquake situation which somehow interferes with the descent of the rods into the core, as happened at NRX in 1952, the rods just didn't descend into the core properly, and that's why the core of the reactor was totally destroyed.

So I think we're banding words here. My point is that if the CNSC is really dedicated to never compromising safety, then they shouldn't compromise safety.

THE PRESIDENT: Okay. OPG, you were going to say something about that?

MR. LOCKWOOD: Randy Lockwood, for the record. I'm going to ask Steve Gregoris to -- we spoke about this yesterday, that Pickering A does have two shutdown systems: one, drop rods into the core; and, as well, the second was the dump tank drop the moderator, hence you can't maintain criticality.

Sometime ago it was determined that for some events the dump tank wasn't fast enough. Then there was an extensive enhancement to the system that initiates dropping the rods.

I'll let Steve walk through the enhancements. Steve.

MR. GREGORIS: Steve Gregoris, for the record. So, as Mr. Lockwood said, there are two ways to shutdown the Pickering 1 to 4 reactors. Shutoff rods fall

in core or the moderator dumps. The moderator dump is the deepest insertion of reactivity, because you remove the moderator. There is no way that that reactor can go critical. You know, we talked about benefits and maybe some challenges to that system, that system is an effective system. You know, I want to give that appreciation to the Commission.

When this was reviewed in the mid-1990s to early-2000s, when Pickering 1 to 4 was coming towards return to service, there was a lot of discussion, it included the Staff, it included the Commission, Commission presentations.

To improve the shutdown systems on 1 to 4 there was a shutdown system enhancement done. That increased the number of shutoff rods that originally were designed for those reactors. It also included a set of separate parameters to monitor the different parameters that would require a shutdown; those are neutronic parameters and also process parameters.

So effectively, we have, you know, an additional set of parameters monitoring, we have additional shutoff rods, plus the original two systems and the original parameters that are monitored. With all of that, you know, it was proven that that's equivalent to two fast-acting shutdown systems, and it was proven that the

ability to shutdown the reactor or not shut it down was an incredible event.

DR. EDWARDS: Well, incredible, that's an interesting word. All the accidents that have ever happened in the nuclear field have been incredible.

The point of the matter is, and I repeat, nobody since the early days, like around the time of the Royal Commission on Electric Power Planning, it was by that time fully acknowledged that the moderator dump while, yes, shutting down the reactor, is way too slow. You have to shutdown the reactor within two seconds.

Because in a CANDU reactor you have a problem similar to the one at Chernobyl, which is when you lose the coolant, if you have a loss of coolant accident you're going to get a power surge. If you don't terminate that within two seconds, you're going to have a destroyed core. The core of the reactor's going to be totally destroyed. The moderator dump is absolutely incapable of dealing with that.

So these fast shutdown rods are one system, and you can increase the number of them, but they're not -- that doesn't make it independent.

It was decided early on by the Atomic Energy Control Board in order to make sure that we do not compromise safety, in order to ensure that we live up to

that high standard and the trust that the Canadian public has put upon us, we will insist that there be two fully-independent fast shutdown systems, each one of which could totally shutdown the reactor quickly in less than two seconds.

Because if one of those shutdown systems fails, there's still another one that can do it. You don't have that at Pickering A.

THE PRESIDENT: Okay. Staff, last word on that?

MR. FRAPPIER: Gerry Frappier, for the record. I'd ask Mr. Vali Tavasoli to explain the equivalency of the shutdown systems.

DR. EDWARDS: Is Mr. Frappier -- you're with CNSC, right?

MR. FRAPPIER: That's correct, Dr. Edwards.

DR. EDWARDS: I'm surprised that CNSC is defending OPG on this instead of letting OPG defend itself.

THE PRESIDENT: Okay. I'd like to hear about the regulatory oversight here and the inspection that goes with it.

Who's going to talk to this?

MR. FRAPPIER: Vali Tavasoli is in Ottawa, and should be able to talk to that.

THE PRESIDENT: Okay. Go ahead please, Ottawa.

MR. TAVASOLI: This is Vali Tavasoli, Director of Reactor Physics and Fuel Division at CNSC. There's a couple of things that I'd like to mention. One of them was a statement by our own Staff regarding the enhanced shutdown system being a second shutdown system. This is not true.

One other thing I'd like to add is that, as Dr. Elder said, the moderator dump is effective for more probable slower transients. These transients is because of some of the component failures that Dr. Edwards has brought up himself, like steam generator failure, pressure tube failure, feeder failure.

These are slower transients and for these types of transients which are very probable -- not very probable, more probable than other faster transients, the moderator dump is fully effective.

With respect to the fact that the moderator dump might not be fully effective for faster transients, there might be a residual risk. This residual risk has been taken into account in the PSA studies.

The statement that Mr. Jammal made in the first night about the equivalency of that was based on a risk-informed assessment that the CNSC had done many years

ago. That risk-informed result was that, yes, that on a risk-informed basis the two systems could be considered equivalent.

THE PRESIDENT: Okay. Dr. Edwards, any final thoughts you want to share with us?

DR. EDWARDS: Well, my final thought is that in my 40 years of intervening at CNSC hearings I have found it difficult to understand why the licensee and the CNSC Staff always seem to be saying the same things and supporting each other.

I would expect that in a proper regulatory agency that the Staff of the regulator would be asking tough questions all the time of the licensee, holding the licensee's feet to the fire and insisting that they get adequate answers in the interest of public safety, rather than simply echoing what the licensee is putting forward.

I do ask the Commissioners to consider the fact that we do not have the opportunity to engage in cross-examination. I cross-examined nuclear experts for a period of three months during the Royal Commission on Electric Power Planning, and was able to make a lot of headway, and the Commission came out with a report which sided against many of the claims that were being made by the industry.

In these hearings, these regulatory

hearings, licensing hearings, there's no such opportunity. As a result, you have both the regulator and the licensee coming in with the same story, asking for the same thing of the Commissioners, and the only opposition you really get or the only tough questions you get are from intervenors who are like gadflies, because they only get 10 minutes and then a short period of question and answer.

I believe that there are serious questions here that the Commissioners should examine their conscience about and say, do I really want to give a licence to a plant which is not really up to snuff even by the current practice that is acknowledged for all other CANDU reactors?

THE PRESIDENT: Okay, thank you. Thank you for your intervention.

DR. EDWARDS: Thank you.

THE PRESIDENT: We will now break for dinner. We'll resume at 6:30.

MR. LEBLANC: The reason it is 6:30 is because some intervenors have been told that it would be after 6:30, so we just don't know if they'll be here prior to that.

--- Upon recessing at 5:07 p.m. /

Suspension à 17 h 07

--- Upon resuming at 6:31 p.m. /
Reprise à 18 h 31

THE PRESIDENT: Okay. We are back and ready to proceed with the next presentation, which is by Mr. Ayazi, as outlined in CMD 18-H6.68. Go ahead, please.

CMD 18-H6.68

Oral presentation by Mr. Amir Ayazi

MR. AYAZI: Thank you.

So my name is Amir Ayazi. I am born and raised in Toronto in the GTA. I have lived in the East end for a large percentage of that time, over a decade, and I also attended the University of Toronto Scarborough campus, so I have lived very close to the Pickering plant for a long time.

Now, I have always known about the Pickering power plant because a friend that I grew up within Scarborough moved to Pickering -- his name is Joel Bowan (phonetic) -- and we would always make jokes, like Simpsons-style jokes. He lives right next to the power plant, three-eyed fish and whatnot. So one day a couple of years ago he called me, we were just talking regularly, and the pills had just arrived at his house and we kind of made

a couple of jokes. "What do you mean pills arrived at your house?" And he explained, "In the case of a nuclear catastrophe I'm supposed to take this pill." We just laughed and laughed and laughed. Like, "What? They sent you pills? In a nuclear..." Anyway, it kind of planted a seed of, huh, there is this thing going on here, you know.

It reminded me of an American friend of mine who lived during the Cold War and they were taught in school, as you probably all know, to duck and cover in case the Russians attack. and just silly, silly things. So that's what brings me here, to voice my opinion as a citizen of this great country and say my opinion that there is no such thing as safe nuclear. I know I'm not an expert, just a normal citizen who loves his city, but that's my opinion. I know it's a nuanced issue. The folks over here obviously think it's a safe thing. Well, nothing is 100 percent safe, I understand that, so maybe my standard of safety is a little too high. The oil refineries in Alberta are unsafe, there are people who die on them, but what makes this different is the scope, you know. When a catastrophe happens in Alberta, people die. That's a horrible thing obviously, but the potential for disaster is nowhere, to my knowledge, larger than it is here in Pickering, given that this nuclear power plant is so close to so many people.

Now, earlier, yesterday I heard a lot of good reasons for the continued operation of the nuclear power plant and there are obviously a lot of smart people who are trying to make sure it's very safe and technical and I don't know anything about that, so I'm not going to comment, but the thing that they, to me, really pushed the continued operation, the reason, their argument is 5000 jobs and $1.5 billion a year. In my opinion, it's simply not worth the risk even if that risk is only one in a million, which it might be even bigger than that because, well, you just can't put a price on the potential for disaster. That, knock on wood, hopefully won't happen. And anyway, I guess I will end there. Even if that risk is only one in a million, it's not worth the risk. Thank you.

THE PRESIDENT: Thank you.

Comments? Questions? Dr. Demeter...?

MEMBER DEMETER: Thank you for your intervention. Did you happen to be here during the discussion on earthquakes and fault lines? Part of your intervention talks a lot about, you know, concerns for earthquakes and stability and there was a relatively long discussion on earthquake potential, size, distance from the plant, the stability of the geology. I don't know if you heard that discussion yesterday -- I don't know if it was yesterday. It has been a blur, but yesterday or the day

before.

MR. AYAZI: I was here yesterday but I did not hear that. I guess you are obviously speaking about the submission that I sent. I had literally 100 different ideas of what to write about to you, because there are so many issues that I care about with this particular thing, so the earthquake was just one of many.

MEMBER DEMETER: Okay. If that is a particular concern, because we had someone I think on teleconference that talked about it, but the transcripts are available and you may want to look at the discussion on that particular facet of your intervention.

THE PRESIDENT: Okay. Thank you. Thank you for your intervention.

The next intervention is by Ms Guecha -- I don't know if I'm pronouncing that properly -- as outlined in CMD 18-H6.71 and H6.71A.

--- Pause

CMD 18-H6.71/18-H6.71A

Oral presentation by Estefany Guecha

MS GUECHA: Good evening, respected Members of the Canadian Nuclear Safety Commission and authorities.

I am Estefany Guecha Sanchez. I am an international student who has many loved ones here, so I made the decision to come to Canada rather than other countries because of the safety that just Canada can provide nowadays. This was my perception of Canada until I knew of the existence of a nuclear plant with the potential capacity to end the life of not hundreds or thousands but millions of people. And worse, that most of the people don't know how to react if something happens. Today I am here to give you my reasons why you should not renew the licence of the Pickering nuclear plant.

So in my presentation I am going to show you three main points: the first one, why the lack of information is a serious problem; the second one, why the risks and costs are too elevated; and the third one, which alternatives you should take into account.

First, the lack of information. OPG says that its staff is trained, they have alarms and adequate equipment to deal with an emergency. I really want to believe that they are ready, but what about the people who might be affected? Here are two scenarios in which people know how to react and the scenario in which the people don't know.

The first one, the scenario where the people know how to react. Surely they can have the KI

pills that are given for free. But here I have a different question. Do these people really know the side effects of these pills? Because while I am not an expert, I know that these pills are not all good. I read before that they have some restrictions and side effects. So the people I have asked don't know much about it. They know that if an alarm sounds they should take the pills and the effect lasts 24 hours. But then what? It is worth mentioning that although people are informed and have the pills, when a nuclear accident occurs there is no guarantee that they will have the pills with them. And it is important that you know that ads that are used to spread about the existence of these pills are not enough, because although I have heard that in Pickering there is some publicity about them, I have never seen this publicity in Toronto.

Now, the second scenario, the scenario in which people don't know how to react. Here I have other questions. What happens with people who don't live in this area, like citizens, international students and tourists, but at the moment of an emergency they are located near the Pickering nuclear plant, either 10 kilometres or 50 kilometres? Here there are different hypothetical situations that could happen: that they don't have the pills, so they will die of radiation without any protection; that they can have access to the pills, but

this implies a risk if they take them without consulting before if their conditions allow them to take the pills, cases such as being pregnant; and they can access the pills and know their limitations, but they ignore their current health status, so they will not be certain whether they can take the pills or not.

In all these scenarios the problem is the lack of information and awareness about how to react and this is a void that continues to exist because during the months I have been here I'm afraid that many are not aware that an old nuclear Pickering plant is very close where they study, where they work and they live. They ignore the existence of this plant. And it's clear that it is a game of probabilities that would not exist in a scenario that you as a Commission decide to not renew the Pickering licence.

The second point, why the scenario without the Pickering nuclear plant is better. Here I'm going to explain to you why the argument of jobs is not enough. When there are economic interests, one of the main arguments of the industry is jobs. I cite this from experience, because in Columbia for years we have tried to ban asbestos. Today we are presenting our eighth Bill in the Congress of the Republic, but this has not been approved because there are economic interests involved.

They have preferred to delay the decision even though they know that asbestos is banned in more than 55 countries and that 320 Colombians die each year because of asbestos exposition. My message here for you is that a responsible government prioritizes the right to live and health of its inhabitants over any economic interests.

Regarding the employment argument, I will explain to you later, there are other better alternatives that involve job creation, but if the priority is the current workers I would like to know if by extending the OPG licence the retirement age of their workers would be extended too. Because we are talking about people that are working in a really high risk. Also, it is important to mention that unemployment is not a big problem here in Canada. According to the last official report, Ontario has the lowest percentage of unemployment in the country.

So my third point, there are other alternatives. This year was the 32nd anniversary of the Chernobyl disaster, the world's biggest nuclear disaster that took place in Ukraine when it was part of the Soviet Union. In my letter I wrote about how the Chernobyl nuclear plant shared several characteristics with the Pickering nuclear plant, such as the viable number of reactors and the age of the facilities. And after that nuclear accident, different countries, being aware of the

risk, have been taking the decision to shut down their nuclear plants. One of them was Germany and they are still working on that because shutting down and nuclear plant requires time and attention. And the sooner this process happens, the better.

The economic benefit of energy production is not an exclusive benefit of the nuclear industry. There are other better ways to generate energy without the risk and possibly cost in human life that an old nuclear plant like Pickering represents.

And the truth is that this nuclear plant is not an essential thing for Canada. According to the government's last report, Canada is the sixth largest energy producer and the fifth largest net exporter in the world. So the necessity of energy is not a reasonable argument to renew the licence of OPG that OPG is asking for.

There is a saying in my country that states: Those who forget their own story are condemned to repeat it. I don't think that it is necessary to wait until a tragedy happens to take measures. I truly believe that it is possible to learn from the mistakes of the past and here and there is an alternative that I want to present to you, because this year in Chernobyl they decided to start a solar farm where the accident of Chernobyl took

place in 1986. I think that after shutting down Pickering, Canada could do the same, and not only generates solar energy, wind power, too. As you know, Canada is already investing in clean energy technology. This kind of green energy is a good alternative, but besides being a more secure energy, it will represent a new resource of jobs and this cannot be ignored.

I would like to be able to develop more my arguments, but the time is short.

So in summary, I have shown you three things: first, why the emergency management is inadequate; second, why the cost of the risks is not reasonable; three, why there are benefits to migrating to other kinds of sources of energy.

Canada has been an example for the world in many aspects for years, but if the licence of this nuclear plant is renewed, the level of importance that this government gives to the security of its citizens will be questionable. And here it is important to say that every year there are more of us who come to Canada temporarily, either for tourism or for academic purposes. Last year there were 494,525 international students, 20 percent more than in 2016. According to the Canada Bureau for International Education, one of the top three reasons why students choose Canada is safety, but if we knew about the

old nuclear plant that continues to operate despite being so close to the population, we could well question how safe we are. A nuclear plant is a time bomb, the time of many is in your hands, so take the better decision, Commissioners, please shut down Pickering.

THE PRESIDENT: Thank you.

Question? Anybody have a question? Go ahead, Dr. Demeter.

MEMBER DEMETER: Thank you very much for your intervention. I think it's important. I'm not sure if Health Canada is still on the line or if someone can speak to the side effects or potential contraindications to KI pills. I think it is important to judge the safety of these pills to the general public. Knowing that there are different recommendations by different countries that are subtly different, I want to make sure to keep this in the Canadian context.

THE PRESIDENT: But I would also like to hear from OPG. I think that with the kit there was instructions about how to take it, who should take it, not everybody should take it, and when to take it. So I would like confirmation, but I hear somebody here wants to talk about the side effects.

DR. ZABLOTSKA: Lydia Zablotska, for the record.

I am trained as a physician and also as an epidemiologist and I worked in Chernobyl since 1995 and heard a lot. And I did research in Chernobyl, so I know a lot about use of KI pills after Chernobyl. They were not distributed there in adequate amounts, so that didn't work, but in terms of the efficiency and side effects, we do have adequate data. And so the side effects are really small and they are less than 0.1 percent attributed in the literature. The side effects are very minor, irritation of the stomach. None of the big or really important side effects have been noted in the literature. There have been very big campaigns done in other European countries where they were distributed to more than a million people, in Poland for example, after Chernobyl and there were no really big side effects noted.

THE PRESIDENT: And there was a massive distribution in Japan.

DR. ZABLOTSKA: Yes.

THE PRESIDENT: Okay. So OPG...?

MR. MANLEY: Robin Manley, for the record.

So obviously, Dr. Zablotska knows lots more about that than I do. I would simply say that on the Prepare to be Safe website there is a Q&A that talks about the side effects and obviously we would agree.

THE PRESIDENT: So did you go on the

website to see if there are instructions on this?

MS GUECHA: Yes, I checked the side effects. But my point here is that people don't know about the side effects. Again, it's a problem of the lack of information that the people have.

THE PRESIDENT: Okay. Thank you.

Ms Penney...?

MEMBER PENNEY: Thanks for your intervention. And yes, I love interventions with pictures. A question for you about -- you said that you haven't seen any of the advertisements, you haven't heard and gotten any information. How should OPG and the Ontario government reach out to people your age?

MS GUECHA: How?

MEMBER PENNEY: Yes.

MS GUECHA: There are many ways. I think that nowadays what works more is with advertisement in social media. I think it could be Work Smart, but there are other channels, maybe with campaigns in the universities, in the language schools, because many people come here to study languages. There are a lot of students, international students, many students come here. So many of these students don't know anything about this nuclear plant or what to do if something happens, because they are just going to be here for a couple of months. So it is

important to focus your attention with this kind of population too, because if the citizens don't know how to react, what about the tourists and international students?

THE PRESIDENT: Questions? Anybody?

Okay. Thank you. Thank you for your intervention.

MS GUECHA: Thank you.

THE PRESIDENT: I understand that staff want to update us on something.

MR. FRAPPIER: Gerry Frappier, for the record. Yes, I would like to ask Mr. Jammal to talk a little bit about our plans going forward with respect to emergency preparedness and interactions with the province.

MR. JAMMAL: Thank you, Mr. Frappier. Ramzi Jammal, for the record.

A discussion this afternoon and for the last few days were going a little bit in circles with respect to the question from the Commission in specific on the capability of sensitive populations to obtain potassium iodide or KI pills in the designated ingestion control planning zone and in specific at any time.

What I am proposing to the Commission is we will -- CNSC staff is recommending we establish a working group that encompasses CNSC staff, OPG, the Ministry of Health and the Chief Health Officer, and then

other stakeholders in order to provide the Commission with a plan on the implementation of the requirement of 2.10.1, RD-2.10.1, and that we will be updating you with respect to the progress so that it will be clear to the responsible authority to deliver the KI pills when it is needed and then we will provide the Commission with the answers. And of course the final decision lies with the Commission with respect to direction.

THE PRESIDENT: So you had such a committee, a coordinating committee for the original KI. Are you talking about the same kind of committee or similar committee?

MR. JAMMAL: Ramzi Jammal, for the record.

The answer is yes, a similar committee in order to -- with an outcome, with a recommendation for an execution of the strategy that currently exists so we have a detailed implementation plan.

THE PRESIDENT: Go ahead.

MEMBER PENNEY: Question. So do you need to update the Licence Condition Handbook to compel OPG to participate?

MR. JAMMAL: It's Ramzi Jammal, for the record. I do not need to update the LCH to compel OPG. We can order OPG. On a serious note, it will be a -- since I'm providing the Commission this recommendation, so it

will be in the Record of Decision as a direction for us to establish this work group and then we will execute according to your Record of Decision.

As we put in place the terms of reference and the outcome we will provide you the updates via the status report and, at minimum, the regulatory annual report, but we would prefer to provide you more frequent updates on the progress associated with it. So the endpoint is I commit to do it, so we are going to do it, it does not need to be in the LCH, but we can put it in the LCH based on the recommendation coming from the Commission.

THE PRESIDENT: OPG, do you want to make a comment?

MR. LOCKWOOD: Randy Lockwood, for the record.

No need to order, we would be pleased. And in fact, I firmly believe, as I stated earlier today, that in the unlikely event we had to implement such a plan, we could, otherwise we would not be sitting here. But what has become very clear, because I do agree with the earlier comments that we have talked many times in circles and if we have talked in circles that means it's not clear. And from day one I have committed that we will do the right thing and nuclear safety will be top priority no matter what. So it's not a case of ordering, we will lead it.

THE PRESIDENT: Okay. Thank you.

Ms Velshi...?

MEMBER VELSHI: This is really good news, so I commend you for making this happen, Mr. Jammal. You didn't mention the Office of the Fire Marshal and Emergency Management in the Working Group. Are they a member of this?

MR. JAMMAL: Ramzi Jammal, for the record.

It's my mistake. Even though I wrote them down I did not list them, but as part of the terms of reference we will list who the members will be and then we will be updating the Commission based on the progress we are going to make. So that's the problem by naming some and not all the others, but definitely the major stakeholders for the implementation will be engaged.

THE PRESIDENT: I'm sure there are going to be other players like Health Canada, maybe even Transportation, because you talk about logistics, it's going to be complicated. And some of the municipalities, Durham, et cetera.

MR. JAMMAL: Let's start with baby steps first and then we will scope-creep afterwards.

THE PRESIDENT: I am waiting for the first report.

--- Laughter / Rires

MR. JAMMAL: Okay. Thank you.

THE PRESIDENT: Okay.

MEMBER DEMETER: I just wanted to say I truly look forward to the report and the information. Thank you very much.

THE PRESIDENT: So I understand, Marc, you want to update us on the next --

MR. LEBLANC: Yes. We had one remaining intervenor tonight and the train he was taking to Pickering was cancelled. And we have evidence of it, not that we needed it, and so we accepted that Mr. Kalevar present tomorrow morning instead of this evening. So I think he will be here tomorrow in that regard. So this closes the evening.

So to give you a sense of how the day will unfold tomorrow, we only have three interventions. We have the Lake Ontario Waterkeeper, the Registered Nurses' Association and we have Mr. Kalevar that will be presenting. This will be followed by rounds of questions from the Members to OPG and CNSC staff and departments that are still available and we will have some departments available for the Lake Ontario Waterkeeper intervention that deals with several issues.

So good evening, enjoy it. It's rare to have a Commission proceeding that ends that early.

THE PRESIDENT: Yes. So we give you a free evening here. See you tomorrow.

--- Whereupon the hearing adjourned at 6:59 p.m., to resume on Friday, June 29, 2018 at 8:30 a.m. / L'audience est ajournée à 18 h 59, pour reprendre le vendredi 29 juin 2018 à 8 h 30

GENERIC CRITERIA AND OPERATIONAL INTERVENTION LEVELS FOR NUCLEAR EMERGENCY PLANNING AND RESPONSE

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GENERIC CRITERIA AND OPERATIONAL INTERVENTION LEVELS FOR NUCLEAR EMERGENCY PLANNING AND RESPONSE

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» **NOTE TO READERS**

THE FIRST OCCURRENCES IN THE TEXT OF TERMS THAT ARE LISTED IN THE GLOSSARY ARE FORMATTED IN BOLD. TITLES OF ACTS, PLANS AND SUPPORTING DOCUMENTS ARE FORMATTED IN ITALICS. A LIST OF ACRONYMS AND A GLOSSARY OF TERMS USED IN THIS DOCUMENT ARE PROVIDED IN APPENDIX A AND APPENDIX B, RESPECTIVELY.

1 INTRODUCTION

The primary purpose of this document is to recommend dosimetric and operational quantities, in terms of **generic criteria** and **Operational Intervention Levels** (OIL), to assist emergency response authorities when developing **protection strategies** for nuclear emergencies.

Generic criteria and OILs are tools to support planning and implementation. Generic criteria are expressed as dose levels over a specified time interval which, when exceeded, signal that **protective actions** and associated response actions, such as notification, are warranted. OILs are used post-release to prompt the implementation of protective actions based on monitoring results.

The generic criteria and OILs recommended in this document support the International Atomic Energy Agency (IAEA) requirement to develop protection strategies for nuclear emergencies that are justified and optimized on the basis of identified hazards and potential consequences (Requirement 5, IAEA 2015a).

The requirement for protection strategies is also reflected in CSA N1600-16, *General requirements for nuclear emergency management programs*, published by the Canadian Standards Association (CSA 2016). Generic criteria and OILs support the requirements related to protective actions,[1] including the need for organizations to identify and apply decision-making criteria when delineating **emergency planning zones** and establishing other planning arrangements.

This document was developed in accordance with Health Canada's responsibilities under the Federal Nuclear Emergency Plan (FNEP, HC 2014a), which defines Nuclear Emergency Functions (NEF) specifically related to **nuclear emergency** preparedness and response. Responsibility for each NEF is assigned to primary or supporting federal department(s) or agency(s). Health Canada has the primary responsibility for NEF 5.1: Provide recommendations for protective actions in areas of federal jurisdiction or as requested by a province and NEF 6.1: Provide radiological protection advice, assistance and equipment for first responders and federal emergency workers, including provision of emergency dosimetry services. Health Canada also has a supporting role for NEF 5.2: Implementing protective actions under federal jurisdiction and NEF 5.3: Contributing to the assessment of actual or potential impacts of protective actions.

This document replaces two previous Health Canada documents: *Canadian Guidelines for Intervention During a Nuclear Emergency* (HC 2003) and *Canadian Guidelines for the Restriction of Radioactively Contaminated Food and Water Following a Nuclear Emergency* (HC 2000). It has been updated with considerations of international recommendations for nuclear emergencies current at the time of this publication. An overview of these international recommendations can be found in Appendix D.

This document is not intended to supersede existing criteria in provincial or territorial plans, but rather to serve as guidance when these plans are reviewed or modified. Provinces and territories are encouraged to adopt the generic criteria and OILs presented in this document as significant benefits related to decision-making and public confidence can be achieved by the adoption of consistent national criteria.

[1] Note that the term "protective actions," as used in this document, includes ingestion controls. See also Table 1.

1.1 Scope

This document supports Health Canada's responsibilities under the FNEP and, therefore, supports planning to protect the public from many types of scenarios involving uncontrolled sources of radioactivity. The FNEP outlines five categories of nuclear emergencies, depending on the scope of impacts in Canada and the scale of the federal response that is required.

The five categories are (HC 2014a):

- Category A: An emergency at a nuclear power plant in Canada;
- Category B: An emergency at a nuclear power plant in the United States or Mexico;
- Category C: An emergency involving a nuclear-powered vessel in Canada;
- Category D: Other serious nuclear emergencies or potential threats in North America that require a multi-departmental response; and
- Category E: A nuclear emergency outside of North America.[2]

The generic criteria recommended in this document are applicable to all five nuclear emergency categories, as are OILs 3_γ–6. However, the default values for OILs 1_γ and 2_γ were derived specifically for an emergency involving a severe release of **radioactive material** from a nuclear reactor or its spent fuel (IAEA 2017). These OILs may not be appropriate for emergencies involving other sources of radioactivity and may need to be recalculated before being applied to Category D emergencies as well as some scenarios in Category E. Due to the wide range of possible scenarios for non-reactor emergencies, this document does not provide a detailed approach to such calculations, although some considerations are discussed briefly in Appendix E.

Note that the values in this document for food controls apply only to consumption of domestic products after domestic contamination events. The international food standard *Codex Alimentarius* (Codex 2010) should guide decisions about importing and exporting potentially contaminated food.

This document does not cover all aspects of planning during nuclear emergency preparedness or decision-making during nuclear emergency response. The generic criteria and OILs provided in this document are only part of the larger protection strategy that authorities should develop in order to achieve the response objectives. Other components include, but are not limited to (IAEA 2015a)

- decision-making triggers based on other observable indicators, such as plant conditions (for reactor facilities);
- plans and arrangements to ensure that protective actions, when warranted, can be implemented, adjusted, and rescinded safely and effectively; and
- plans and arrangements to mitigate non-radiological consequences.

More comprehensive guidance on nuclear emergency planning can be found in the references included at the end of this document. Health Canada's Radiation Protection Bureau can also assist; contact us at hc.rpb-brp.sc@canada.ca.

1.2 Dose-related terminology

For the purposes of talking about radiation protection, international organizations have adopted a vocabulary for different kinds of dose and dose quantities. These have been designed by the International Commission on Radiological Protection (ICRP) and the International Commission on Radiation Units & Measurements (ICRU) to precisely communicate information required to interpret dose values in a given context. A brief overview of the terms used in this document is provided below; more complete definitions are provided in the glossary (Appendix B).

[2] In the case of events abroad, the criteria in this document will be considered when providing advice to Canadians in affected areas in light of protective actions taken by the relevant local authorities and the recommendations of the international community.

Protection quantities relate radiation exposure to the risk of impacts on human health. The following protection quantities are used in this document:

- **equivalent dose**, when the exposure and the risk relates to a specific organ or tissue; and
- **effective dose**, when the exposure and risk relates to the whole body.

Most of the generic criteria are expressed as effective dose (E) and equivalent dose to the fetus (H_{fetus}); the exception is **Iodine Thyroid Blocking** (ITB), which is expressed as equivalent dose to the thyroid ($H_{thyroid}$). The units in this document are millisieverts (mSv).

To relate measurements from instruments to protection quantities, the following operational dose quantities are used:

- **ambient dose equivalent**, for environmental monitoring; and
- **personal dose equivalent**, for individual monitoring.

The generic criterion for **off-site emergency workers** is personal dose equivalent ($H_p(10)$) and the units are mSv. OILs 1–4 are expressed as ambient dose equivalent ($H^*(10)$) rates with units microsieverts per hour (μSv/h).

When using protection quantities for exposure planning and decision-making, the following terms are used (based on ICRP 2009):

- **projected dose** is the effective or equivalent dose that would be expected to be received if protective actions were not taken;
- **averted dose** is the effective or equivalent dose that can be avoided by the implementation of protective actions; and
- **residual dose** is the effective dose that is expected to be received as a result of the decisions made regarding protective actions In other words, the residual dose is the projected dose minus the averted dose. The timeframe used to calculate residual dose from the emergency should correspond to the period for which the reference level applies.

2 KEY CONCEPTS FOR CONSIDERING RADIOLOGICAL RISK IN NUCLEAR EMERGENCY PLANNING AND RESPONSE

The practical goals of the response to a nuclear emergency include (modified from IAEA 2015a):

- ensuring that an adequate capability is in place to respond to an emergency;
- regaining control of the situation and mitigating radiological consequences;
- protecting human health, property and the environment;
- mitigating non-radiological consequences;
- keeping the public informed and maintaining their trust; and
- preparing for the resumption of normal societal and economic activity.

ICRP and IAEA state, and Health Canada agrees, that radiological risk must be considered appropriately in order to achieve these goals (e.g., ICRP 2007; ICRP 2009; IAEA 2015a). Fundamentally, this means that the level of protection from radiation exposure should be the best possible under the prevailing circumstances, such that the benefits resulting from the reduced exposure outweigh the detriment caused by taking the action. If radiation levels are high enough to cause **severe deterministic injuries**, actions to reduce exposures are definitely warranted. However, when radiation levels are lower, authorities should consider all significant risks, radiological and non-radiological, in order to optimally protect the public and workers under their jurisdiction. As recent history has shown, decisions based entirely on avoiding dose may cause significantly more harm than good (e.g., SHAMISEN 2017).

At the same time, doses should be kept as low as reasonably achievable. In order to help bound what is "reasonable" and keep the risks of radiation exposure in perspective, ICRP and IAEA recommend that authorities determine, in advance, criteria and operational quantities to guide decisions about implementing protective actions. These include:

- an initial reference level;
- generic criteria; and
- OILs.

These parameters are only some of the inputs that authorities will require in order to develop and implement effective protection strategies, which are the key to optimizing exposure during an emergency. The concept of a protection strategy is briefly described below, followed by explanations of the afore-mentioned parameters.

2.1 Protection Strategy

A protection strategy describes what needs to be done and how it will get done in order to achieve the goals of a nuclear emergency response, in consideration of all of the risks, constraints, and other factors that will need to be managed—not just the radiological ones. IAEA states the following about protection strategies (IAEA 2015a, para 4.29):

> *Each protective action, in the context of the protection strategy, and the protection strategy itself shall be demonstrated to be justified (i.e. to do more good than harm), with account taken not only of those detriments that are associated with radiation exposure but also of those detriments associated with the impacts of actions taken on public health, the economy, society and the environment.*
>
> (*Examples of such [health] impacts include possible deaths among patients evacuated without the necessary medical care and possible reduced life expectancy due to resettlement.*)

According to the IAEA (2015b), protection strategies should be developed at the preparedness stage and involve all relevant response organizations, as well as other interested parties. Arrangements should cover the period from when the emergency is declared until it is terminated and, for large-scale events, may continue through the transition to recovery and beyond.

2.2 Reference Level

The reference level is the level of residual dose above which it is generally judged to be inappropriate to plan to allow exposures to occur. For comparison against the reference level, residual dose should be calculated as the effective dose (or the equivalent dose to the fetus) remaining after the implementation of an optimised protection strategy, considering all exposure pathways (ICRP 2007).[3]

It is prudent to set the reference level for an emergency situation higher than for more controlled exposure situations because there are risks associated with taking protective actions and these may be higher than the incremental risk associated with a higher residual dose.

For off-site nuclear emergency planning, a reference level should be established and then protection strategies developed in order to keep total doses to all affected people below it. During an emergency, the reference level is a tool to help gauge the effectiveness of the protection measures being implemented and signal the need to make adjustments. If it appears that residual dose to some groups of people could exceed the reference level, authorities should take additional actions to reduce exposure.

ICRP 109 (2009) recommends setting reference levels for emergencies between 20 and 100 mSv, acute or annual dose, depending on the type of emergency. Severe deterministic injuries do not occur at these levels and there is no epidemiological evidence to suggest increased risk of other **tissue reactions** or **stochastic effects**, like cancer, at doses below about 100 mSv (ICRP 2007) The values for generic criteria and OILs presented in this document are appropriate for emergencies where authorities have established a reference level towards the upper end of this range, based on annual effective dose, in order to be inclusive of all categories of emergency addressed by the FNEP, including severe accidents.

2.3 Generic criteria

Generic criteria are triggers within protection strategies that help authorities identify when, where, and to what extent arrangements for protective actions should be planned (in advance of an emergency) and implemented (during an emergency). They are determined during the planning stage, when planners have time to think through all possible contributors to dose and the incidental impacts of taking action to limit them. Once established, generic criteria facilitate decision-making: if the level for an action is exceeded, implementation of that action should be considered a priority as it will almost definitely do more good than harm.

In advance of an emergency, generic criteria are used to characterize the extent to which arrangements for protective actions might be required. For example, by comparing projected doses from postulated accident scenarios to the generic criteria for **stable iodine thyroid blocking** (ITB), **evacuation, temporary relocation** and **ingestion controls**, emergency planners can better understand the likelihood that these protective actions will be required. This supports the delineation of emergency planning zones and the corresponding arrangements within them.

During the early stages of an emergency, after urgent protective actions have been implemented but before measurements are available, generic criteria for exposure control can be compared to projected dose in order to confirm, for example, that the pre-determined arrangements to protect populations are sufficient for the scenario that is unfolding.

Throughout the emergency, generic criteria for medical management and for off-site emergency workers are used to identify situations where intervention is required to manage or mitigate risks to individuals.

It is recognized that, even with thoughtful planning, authorities may require flexibility in order to manage the risks posed by unforeseen hazards in an emergency. In these cases, generic criteria may need to be revised so that protection can be optimized in a different way in order to respond to the specific demands of an emergency.[4] The changes, along with the reasons for the change, should be communicated to the public quickly and transparently.

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[3] ICRP (2009) states that reference levels in terms of equivalent dose to specific organs may be considered for some exposure scenarios, notably irradiation of the thyroid by radioiodine. Given Canadian practice to ensure the availability of iodine thyroid blocking agents for emergency scenarios involving radioiodine, Health Canada has determined that a separate reference level is not necessary.

[4] Changing generic criteria during an emergency should be avoided if possible as it can create confusion for both responders and members of the public.

The generic criteria recommended by Health Canada should keep total residual doses for all affected populations and individuals well below the upper limit of the reference level for the emergency (100 mSv).

More information about how generic criteria are used before and during an emergency, as well as the default values recommended by Health Canada, is provided in Section 5.

2.4 OILs

OILs are values that support decision-making by quickly relating discrete measurements of contamination to generic criteria, thereby identifying the need for or confirming the adequacy of protective actions. Exceeding an OIL triggers the requirement to implement the corresponding protective action within a pre-determined timeframe.

OILs are derived from generic criteria and so are calculated to keep total residual doses for all affected populations and individuals well below the upper limit of the reference level (100 mSv), when implemented within the recommended timeframes. Information on how OILs are calculated can be found in Appendices E and F.

Information on how OILs are used during an emergency as well as default values recommended by Health Canada is provided in Section 6.

2.5 Functions of protective actions

For ease of reference in this document, Health Canada occasionally refers to groups of protective actions by their function in a protection strategy. These groupings are explained in Table 1.

TABLE 1. Protective actions, grouped by function and response objectives. More information on the protective actions is provided in Section 7.

FUNCTION	RESPONSE OBJECTIVE	PROTECTIVE ACTIONS
Exposure Control	• To preclude severe deterministic injuries • To reduce the risk of stochastic effects to populations living in contaminated or potentially contaminated areas	• Stable iodine thyroid blocking • Evacuation • **Sheltering** • Temporary relocation
Ingestion Control	• To reduce the risk of stochastic effects to consumers of food and water that may be contaminated	• Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other foods
Population Monitoring and Medical Management	• To identify individuals who may require intervention to reduce internal and/or external contamination • To identify individuals who require treatment of radiation injuries or **medical follow-up** as a result of exposure	• Personal decontamination[5] • Internal contamination assessment • Medical follow-up
Off-Site Emergency Workers	• To reduce the risk of stochastic effects to off-site workers	• Restriction of activities for individual workers

[5] For the purpose of health protection, personal decontamination refers to removing external contamination when quantities are sufficient to justify action to reduce skin exposure, when there is a significant risk of inadvertent ingestion, and/or when external contamination levels interfere with the ability to detect internal contamination. Decontamination for the purposes of contamination control.

2.6 Public communications

Effective public communication is essential to achieving the goals of nuclear emergency response. This section touches very briefly on communication matters directly linked to successful use of generic criteria and OILs for nuclear emergency planning and response and is in no way a comprehensive review of the topic. More information on public communications can be found in CSA N1600-16, *General requirements for nuclear emergency management programs* (CSA 2016), and *Communication with the Public in a Nuclear or Radiological Emergency* (IAEA 2012). Additional guidance from IAEA is in development at this time.

One of the main goals of public communications during a nuclear emergency is to provide affected populations with timely, clear and appropriate information about the nuclear emergency situation and the protective actions which they should undertake (typically referred to as public alerting). Protection strategies should include arrangements to ensure that this happens using all available communication channels (e.g., the National Public Alerting System,[6] the media, and social media).

The public must also be confident that authorities are prepared and that plans are in place. To this end, information about protective actions and triggers for their implementation should be shared with the public in advance of an emergency event. If it is necessary to deviate from pre-determined criteria during an emergency, changes should be communicated quickly, clearly, and transparently.

Finally, other provinces and countries may issue advice to their citizens who may be affected by the emergency, or may impose temporary embargoes on food from the affected area. If the advice is found to be in conflict with the advice of local authorities, this may have an impact on public confidence. Therefore, coordinating and harmonizing decision-making criteria from other response authorities will assist in maintaining public confidence.

[6] The National Public Alerting System is an all-hazards system that provides emergency management organizations across Canada with the ability to alert the public of imminent or unfolding hazards via radio, television, email and text messages (PS, 2014).

3 OVERVIEW OF THE HEALTH IMPACTS OF RADIATION EXPOSURE

The reference dose level and corresponding quantities for action that are recommended in this document reflect the current scientific knowledge of the biological effects of radiation doses above and below about 100 mSv.

Humans are always being exposed to small amounts of radiation and radioactive materials that are present in the environment and in our own bodies. Small levels of radioactivity are not considered harmful to human health. While ionizing radiation can cause damage to human cells, these cells are very capable of repairing minor damage. In cases where damage cannot be repaired, or is repaired incorrectly, the cell may not be able to survive or reproduce, or the cell may remain viable but be modified. Most organs or tissues remain unaffected by the loss of a few cells.

However, if enough cells are lost, the organ or tissue may no longer be able to properly function. These effects are known as tissue reactions and may include anything from radiation-induced cataracts that can take years to manifest, to acute radiation syndrome that may even lead to death within days or weeks. Tissue reactions such as these only occur at dose thresholds that are far above the reference level stated in these guidelines and simply do not occur at lower dose levels. Above the threshold, the severity of the effect increases with increasing dose.

Alternatively, radiation exposure can cause modifications to cells without killing them, which may lead to abnormal cell growth, or cancer. This is known as a stochastic effect, where the probability of a health effect is assumed to increase with dose received. To put this in perspective, it is estimated that the fatal cancer risk from off-site emergency exposures of the order bounded by the reference level and generic criteria is 5% per Sv effective dose (ICRP 2007). This means that a member of the public who receives an effective dose of 100 mSv (0.1 Sv) is assumed to have a 0.5% increase in the probability of developing a fatal cancer, based on the ICRP risk model. For stochastic effects, the severity of the effect is not related to the dose.

It should also be noted that, below approximately 100 mSv, it is very difficult to identify the relation between radiation dose and cancer risk. This is largely due to the fact that the “normal” incidence of cancer is so high in the general population that it is extremely difficult to identify any small number of excess cancers (if any) that can be attributed to low levels of radiation exposure.

4 FUNDAMENTAL PRINCIPLES

The following principles, which emphasize overall protection of public health, have been followed in choosing the dose criteria for initiating protective actions.

4.1 Justification and optimisation

The primary considerations in the derivation of generic criteria and OILs are the protection of public health and confidence, and the achievement of a positive net benefit if a protective action is implemented. When a net benefit is achieved, the action is considered justified. Optimisation goes one step further, by extending the level of protection beyond what is required to what is reasonably achievable, with the intent to maximize the net benefit given the prevailing circumstances and taking non-radiological factors into account.

During a nuclear emergency, potential doses to the public can only be reduced through protective actions that, themselves, may introduce risks. These non-radiological risks include the physical risk associated with the protective action, economic losses, social disruption, and anxiety. For example, an evacuation order given during severe weather may introduce a higher risk from a transportation accident or other related hazard than the risk posed by waiting for safer driving conditions and incurring a slightly higher residual dose. Expected benefits and risks associated with each protective action should be taken into account during the planning stage.

Because of these additional risks, it is justified to plan to allow people to receive more dose in an emergency situation than they would under normal circumstances, to a point. This point is the reference level. If projected doses are above the reference level, some intervention to reduce doses is almost always justified (ICRP 2007; ICRP 2009). Generic criteria facilitate **optimisation of protection** below the reference level. The generic criteria in this document are considered reasonably achievable in the Canadian context, especially with advance planning.

4.2 Consideration of the most sensitive group in the population

Generally, protective actions should be applied to the entire population in the affected zone, and not just to selected individuals or age groups. However, no population group is uniform, and although it is inappropriate to use overly conservative assumptions for estimating exposures, it is reasonable to give priority to the protection of more sensitive age groups in the event of an emergency. Therefore, the generic criteria should be compared with the projected doses for the most sensitive or susceptible population group (e.g., oftentimes infants or developing fetuses are more sensitive to radiation exposure).

The OILs in this document are protective of the most sensitive age groups and the developing fetus. For instance, OILs 1_γ and 2_γ that correspond to evacuation and temporary relocation protective actions, respectively, have been evaluated for both an infants and the fetus, and the most conservative OILs were selected. Another example is in the calculation of the OIL6 values for laboratory measurements of drinking water, milk and other foods and beverages. As described in Appendix F of this document, these OILs were calculated for 5 age groups and only the most restrictive value recommended.

4.3 Consistency with international practices

Health Canada's guidance for nuclear emergencies has been updated to align with international recommendations for nuclear emergencies current at the time of this publication, including:

- *ICRP Publication 103, The 2007 Recommendations of the International Commission on Radiological Protection* (ICRP 2007);
- *ICRP Publication 109, Application of the Commission's Recommendations for the Protection of People in Emergency Exposure Situations* (ICRP 2009);
- IAEA General Safety Guide (GSG) 2: *Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA 2011);

- IAEA Emergency Preparedness and Response Nuclear Power Plant (EPR-NPP) Public Protective Actions: *Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor* (IAEA 2013);
- IAEA GSR Part 3: *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards* (IAEA 2014);
- IAEA GSR Part 7: *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA 2015a); and
- IAEA Emergency Preparedness and Response (EPR-NPP-OILs): *Operational Intervention Levels for Reactor Emergencies and Methodology for Their Derivation* (IAEA 2017).

Health Canada has considered and, for the most part, adopted the values for generic criteria and OILs recommended by the IAEA (IAEA 2015a, IAEA 2017). Appendix D provides more information on how Health Canada's recommendations compare to those of the IAEA and of other industrialized countries that generate nuclear power.

5 GENERIC CRITERIA

The bases for implementing protective actions are the generic criteria. If the generic criterion for an action is exceeded, implementation of that action should be considered a priority. Table 2 identifies the generic criteria recommended by Health Canada. Doses include exposure from all pathways (e.g., external irradiation, ingestion, inhalation).

TABLE 2. Generic criteria. *E* is effective dose, $H_{thyroid}$ is equivalent dose to the thyroid; H_{fetus} is equivalent dose to the fetus, and $H_p(10)$ is personal dose equivalent at 10mm.

STRATEGY NAME	PROTECTIVE ACTIONS	GENERIC CRITERIA
Exposure Control	Stable iodine thyroid blocking	50 mSv in the first 7 days ($H_{thyroid}$)
	Evacuation	100 mSv in the first 7 days (*E* or H_{fetus})
	Sheltering	10 mSv in 2 days (*E)* *(averted dose)*
	Temporary relocation	100 mSv in the first year[7] (*E*) or 100 mSv for the full period of in utero development (H_{fetus})
Ingestion Control	Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other foods	3 mSv/y (1 mSv/year for each of the following categories: drinking water, milk and other foods and beverages) (*E*)
Population Monitoring and Medical Management	Population monitoring, internal assessment, and medical follow-up	100 mSv in a month (*E*) or 100 mSv for the full period of in utero development (H_{fetus})
Off-Site Emergency Workers	Restriction of activities for individual workers	50 mSv[8] over the duration of the response ($H_p(10)$ or *E)*

The generic criteria in Table 2 have been largely adopted from the generic criteria recommended by the IAEA (IAEA 2015a). Appendix D provides a comparison.

[7] This is an initial value. As the response progresses, this generic criterion should be reduced. See sections 5.1.1 and 7.4.

[8] This value may be exceeded under some circumstances, as discussed later in this section.

5.1 Notes on the application of generic criteria

5.1.1 Generic criteria for Exposure Control and Ingestion Control

These values describe the projected dose levels at which actions should be taken to protect populations. When developing nuclear emergency plans for scenarios where the location of the radioactive source is known in advance (such as a reactor facility or a port designated for visits by nuclear-powered vessels), the likelihood of exceeding these dose levels should be considered, among other inputs, when delineating emergency planning zones and when determining non-dosimetric triggers (such as plant conditions) for protective actions. In areas where generic criteria for Exposure Control are likely to be exceeded, special arrangements should be made for populations who may be unable to relocate without assistance and for those who require extra support or accommodation.

The generic criteria for evacuation and temporary relocation reflect the relative urgency with which action should be taken to move populations out of areas with the highest potential for exposure—that is, resources should *first* be directed at helping people to safely relocate from areas where the generic criterion for evacuation will be exceeded and *then* towards areas where the generic criteria for temporary relocation will be exceeded. Once these actions have been completed, authorities should revise the generic criterion for temporary relocation downward. The default lower limit for the generic criterion for temporary relocation is 20 mSv/y, which is the equivalent of the lower limit for an emergency reference level (ICRP 2009, IAEA 2012a). Strategies to manage long-term exposures for affected populations should be developed, in consultation with all stakeholders, as part of the transition to recovery.

Sheltering should be ordered as an interim protective action when the projected dose exceeds the generic criteria for ITB or evacuation, but where prevailing circumstances prevent timely implementation. Because it is a less-disruptive protective action (IAEA 2012b), authorities may order sheltering for up to two days at lower dose levels if it will reduce exposures by at least 10 mSv. More information on scenarios where sheltering may be appropriate is provided in Section 7.

Parameters used for dose projections should correspond to the groups at greatest risk (considering, for example, age, sex and habits) and consider all pathways, but they should not be grossly pessimistic (ICRP 2009).

The limitations of the models used to predict the characteristics and dispersal of releases should be recognized, understood, and taken into account. Dose projections that are generated during an emergency, when accident/event progression may be highly unpredictable, should be used with caution, especially for making decisions to deviate from the planned protection strategy. This is because the high degree of uncertainty compromises the ability to assess whether an action is justified.

5.1.2 Generic criterion for Population Monitoring and Medical Management

This value is the level of dose that has been received by an individual (including external irradiation and **committed dose** from inhalation and ingestion) at which action should be taken to ensure medical follow-up when required. It applies equally to members of the public and to emergency workers, although this generic criterion need only be considered for individuals who were in high exposure situations. Dose should be determined by individual dosimetry (including retrospective dosimetry) and include assessments of all relevant pathways. Internal contamination levels should be determined by whole-body counting, bioassay and thyroid monitoring (if exposure includes radioiodine). Follow-up actions may include, but are not limited to registering the patient and the dose, targeted screening for health effects, counselling and long-term surveillance. Medical follow-up is elaborated in Section 7.7. More information can be found in the *Canadian Guide on Medical Management of Radiation Emergencies* (HC 2015).

5.1.3 Generic criterion for Off-site Emergency Workers

NOTE: This generic criterion is not appropriate for female workers who may be pregnant. These individuals should be excluded from emergency duties that would result in a dose greater than the relevant dose limit for non-emergency situations.

This value, when considered in terms of projected dose to individual workers, is useful for work planning and **dose management.** During the emergency response, once tasks are identified and the radiation fields in the work environment are characterized, dose management strategies should be implemented to optimize exposures, keeping all individual doses below 50 mSv except in extraordinary circumstances.

When considered in terms of dose already received, exceeding this value should result in restricting the activities of the individual worker, such that they are not in a position to receive significant additional dose as a result of the emergency. Effective dose from exposure via all pathways should be included in the assessment. If internal contamination is suspected, the off-site emergency worker should undergo internal contamination assessment and be considered for medical follow-up.

It may be necessary in some, exceptional, cases, to allow a small number of off-site emergency workers to volunteer to receive doses of 100 mSv or more. Examples of situations where this might be considered include life-saving activities and tasks that, when complete, can prevent the development of conditions that could significantly affect people and the environment. These workers should be fully aware of the health risks associated with the potential dose they may receive, and they should voluntarily accept these risks.

6 RECOMMENDED OPERATIONAL INTERVENTION LEVELS (OILS)

OILs are values that support decision-making post-release by quickly relating discrete measurements of contamination to generic criteria, thereby identifying the need for or confirming the adequacy of protective actions.

The OILs presented in this section should ensure that doses do not exceed the generic criteria recommended by this document. Measurements should be made in accordance with the details and timeframes provided in Table 3, and using properly calibrated equipment that is fit for purpose.

TABLE 3. OIL values and associated monitoring conditions.

OIL#	PROTECTIVE ACTION	MEASUREMENT DETAILS	LEVEL	TIMEFRAME FOR ACTION, RELATIVE TO RELEASE (IAEA 2013)
Exposure Control				
1_{γ}	Evacuation	Gamma dose rate (H*(10)), 1m from the ground	1000 µSv/h	Complete within a day
2_{γ}	Temporary relocation	Gamma dose rate (H*(10)), 1m from the ground, measured within 10 days of reactor shutdown	100 µSv/h	Initiate after evacuation
		Gamma dose rate (H*(10)), 1m from the ground, measured more than 10 days after reactor shutdown	25 µSv/h	
Ingestion Control				
3_{γ}	Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other food	Gamma dose rate (H*(10)) at 1m from the ground	1 µSv/h	Implement with Exposure Control and extend within days
5_{α}	Confirm ingestion controls (with lab measurements)	Gross alpha activity	See Table 4	Initiate within a week to a month, depending on importance of local food and drinking water to the community
5_{β}		Gross beta activity	See Table 4	
6		Activity concentrations for specific radionuclides	See Table 12	
Population Monitoring and Medical Management				
4_{γ}	Personal decontamination and/or medical follow-up	Skin measurement at 10 cm from the hands and the face	1 µSv/h	Implement concurrently with Exposure Control

The default values for OILs 1_{γ} and 2_{γ} in Table 3 were derived specifically for an emergency involving a severe release of radioactive material from a nuclear reactor or its spent fuel (IAEA 2017). For other types of emergencies, the default values for urgent actions (evacuation, food and water restrictions) should be sufficiently protective for most scenarios involving gamma-emitting radionuclides and so can be adopted directly if necessary. However, OIL2_{γ} (10 or more days after shut-down) may not be appropriate and so should be re-assessed, as soon as time allows, based on the isotopic composition of the source term. See Appendix E for further discussion.

If default OILs are not used, the responsible emergency response authority should be prepared to promptly assess the requirement to deviate from the generic guidance and the impacts of doing so. Some considerations for doing so are provided in Appendix E.

6.1 Notes on the Application of OILs

6.1.1 OILs for Exposure Control

OILs 1_γ and 2_γ are triggers that can be directly compared to common field survey measurements, shortly after a release or other exposure situation has been identified, to enable rapid decisions and rapid actions. The default values are presented in terms of gamma dose rates (H*(10)) measured 1 metre from the ground. If the survey instrument expected to be used in the emergency response does not provide a direct output in H*(10), the default OILs 1_γ and 2_γ may not be appropriate and new values, in the units displayed by the instrument, should be calculated during the preparedness stage. This will ensure that instrument readings can be quickly compared to OILs during an event and reduce the risk of conversion errors.

When $OIL1_\gamma$ is exceeded, arrangements for safe evacuation and other urgent actions to protect the public, including ITB, ingestion controls, and population monitoring, should be implemented immediately. If it is not possible to initiate safe evacuation immediately (e.g., due to bad weather or damaged infrastructure), the public should be instructed to shelter until they are told otherwise. In some cases, such as critical patients in hospitals or care homes, the risks of being moved quickly may be significantly higher than the risks of exceeding the generic criterion. As much as possible, arrangements should be made in advance to manage these situations. Where prior arrangements have not been made or are inadequate, authorities should make it a priority to identify individuals who require special assistance and to provide it.

The basis for the default $OIL2_\gamma$ identified in Table 3 is the generic criterion for temporary relocation in the early stages of the emergency (100 mSv in the first year following the accident). Separate $OIL2_\gamma$ values are provided for use at different times after reactor shutdown. The different values take into account the expected change in dose rate within the first 10 days compared to afterwards, largely as the short-lived radionuclides decay.

As time progresses and if resources permit, the generic criterion for temporary relocation may be reduced gradually to a lower limit of 20 mSv/y. As the generic criterion is reduced, the value for $OIL2_\gamma$ (> 10 days after shut down) can be scaled down linearly, so that $OIL2_\gamma$ may eventually drop to 5 μSv/h. All populations in areas where ambient dose rates exceed default $OIL2_\gamma$ should be identified and relocated within a month.

6.1.2 OILs for Ingestion Control

Like OILs 1_γ and 2_γ, $OIL3_\gamma$ is a trigger that can be directly compared to common field survey measurements, shortly after a release or other exposure situation has been identified. Default $OIL3_\gamma$ is gamma dose rate (H*(10)) measured 1 metre from the ground. The instrument must display dose rate in H*(10) to use the default $OIL3_\gamma$; if other survey instruments are used, new values, in the units displayed by the instrument, should be calculated during the preparedness stage.

$OIL3_\gamma$ is adopted directly from IAEA (IAEA 2015a). It is an early indicator that drinking water, milk and other foods and beverages may be contaminated. If $OIL3_\gamma$ is exceeded, restrictions should be put in place and replacement supplies should be made available until more detailed assessments can be completed.[9,10]

Once the time for urgent action has passed, representative samples of restricted food and drinking water should be collected and analyzed in a lab, for comparison against OIL5 and/or 6 values.

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[9] Restricting essential drinking water, milk and other foods and beverages could result in dehydration, severe malnutrition or other severe health impacts; therefore, essential drinking water, milk, and other foods and beverages are to be restricted only if alternatives are available (IAEA 2015a).

[10] In a situation where $OIL3_\gamma$ is exceeded due to iodine contamination and replacement supplies of essential drinking water, milk and/or other foods and beverages are not available, emergency response authorities should consider ITB to prevent uptake of radioactive iodine (radioiodine) and reduce dose from ingestion. ITB would need to occur prior to or as soon as possible after exposure in order to be effective (see Section 7.1).

ALPHA/BETA SCREENING

If the relative contribution to total dose from predominantly alpha- or beta-emitting radionuclides is significant or if it is unknown, samples may also be screened by comparing gross alpha and/or beta activity against OIL5 values in order to determine whether lab analysis for specific alpha- or beta-emitters is required. Radionuclides emitting low-energy beta activity, such as tritium, and some gaseous or volatile radionuclides, such as iodine, may not be detected by standard gross activity measurements. If their presence is suspected, radionuclide-specific sampling and measurement techniques should be used (HC 2009).

Thresholds for OILs 5_{α} and $5_{ß}$ are based on the most restrictive radionuclide-specific OILs for alpha and beta emitters, respectively, and are presented in Table 4.

TABLE 4. OILs for alpha/beta screening

			MEASURED QUANTITY (Bq/L)		
OIL	Action	Measurement details	Drinking water	Milk	Other foods and beverages
5_{α}	Restrict distribution and ingestion pending radionuclide-specific analysis	Gross alpha	1	1	3
$5_{ß}$		Gross beta	10	30	30

For the gross beta laboratory analysis, the contribution from potassium-40 (^{40}K), a naturally occurring radionuclide found commonly in food and water, should be subtracted. This requires a separate determination of total potassium content in the food and water. The beta activity of the ^{40}K included in natural potassium is 2.76 x 10^4 Bq/kg (IAEA 2011).

If one or more of the alpha/beta screening OILs are exceeded, the radionuclide-specific concentrations in the drinking water, milk and other foods and beverages should be determined and compared to the radionuclide-specific OILs.

Table 12, in Appendix F, lists the radionuclide-specific OILs. Details on how they were calculated can also be found in Appendix F.

For samples with multiple radionuclides present, the following formula should be used:

$$\sum_i \left(\frac{C_i}{OIL6_i} \right) \geq 1$$

Where:

C_i is the concentration of radionuclide *i* in the drinking water, milk or other foods and beverages (Bq/kg or Bq/L);

$OIL6_i$ is the radionuclide-specific value of OIL6 for radionuclide *i* in drinking water, milk or other foods or beverages (Bq/kg or Bq/L).

If one of the radionuclide-specific OILs or if the condition for multiple radionuclides is exceeded, then the restrictions should be continued. Essential drinking water, milk and other foods and beverages should be replaced as soon as possible. If the radionuclide-specific OILs and the condition for multiple radionuclides are not exceeded, then the drinking water, milk and other foods and beverages should be considered to be suitable for consumption.

6.1.3 OILs for Population Monitoring and Medical Management

The OIL for population monitoring and medical management is a trigger for determining whether individuals require personal decontamination and/or medical follow up, based on skin measurements of the hands and face.

Default $OIL4_{\gamma}$ is gamma dose rate measured 10 cm from the hands or face. The instrument must display dose rate in $H^*(10)$[11] to use the default $OIL4_{\gamma}$; if other survey instruments are used, new values, in the units displayed by the instrument, should be calculated during the preparedness stage.

If an individual is found to be contaminated at levels above the $OIL4_{\gamma}$, monitoring staff should provide advice on how to prevent **inadvertent ingestion** and proceed with personal decontamination and internal contamination assessment. Where internal contamination is suspected, individuals should be referred promptly to internal monitoring specialists for whole body counting, bioassay and/or thyroid measurements (for exposures to radioiodine). Delays in making internal measurements will affect the accuracy of the dose estimate and the timeliness of treatment, so arrangements should be made in advance for specialized resources to quantify exposure and to initiate medical follow-up. At a minimum, medical follow-up should be implemented when the generic criterion for medical follow-up is exceeded. Monitoring results should be registered for future use during medical follow-up.

More information on medical follow-up, as well as on medical management for radiation emergencies in general, can be found in the *Canadian Guide on Medical Management of Radiation Emergencies* (HC 2015).

6.1.4 Off-Site Emergency Workers

Health Canada has not identified specific OILs for Off-Site Emergency Workers because it is not practical for us to do so. Instead, we recommend that authorities or designated radiation safety personnel develop and implement dose management strategies for off-site emergency workers based on the work that needs to be done and the exposure scenarios.

[11] Note that the calculation for $OIL4_{\gamma}$ (not reproduced in this document) includes a factor to convert activity on the skin surface to ambient dose equivalent rate ($H^*(10)$).

7 DISCUSSION OF PROTECTIVE ACTIONS

This section describes the protective actions triggered by the criteria provided in this document, and provides some information on risks, benefits, and considerations for implementation and rescinding.

7.1 Stable Iodine Thyroid Blocking

Iodine Thyroid Blocking (ITB) works by saturating the thyroid with stable iodine, thus reducing the uptake of radioactive iodine (radioiodine) and subsequent risk of radiation-induced thyroid cancer. Studies of populations affected by the nuclear accident at Chernobyl indicate that increased incidence of thyroid cancer, especially in children, is the predominant health impact directly attributable to radiation exposure (UNSCEAR 2012). Therefore, ensuring that ITB agents (usually **potassium iodide** (KI) pills) are readily available to those who might need them is an essential component of an effective protection strategy for scenarios involving radioiodine.

ITB agents are only effective at reducing internal exposure to radioiodine; they offer no protection against external radiation or internal exposure to other radionuclides (ICRP 2009). ITB is most effective when used in conjunction with other protective actions such as sheltering or evacuation

7.1.1 Implementation

ITB agents are used primarily to protect people who are at risk of inhaling airborne radioiodine during or immediately following a release.

The effectiveness of KI in limiting the uptake of radioiodine depends greatly on timing. KI administered immediately before or during a release is approximately 100% effective at blocking uptake of radioiodine by the thyroid. Administration of KI in the first few hours can still be 80% effective at blocking the uptake of radioiodine by the thyroid. The effectiveness of KI continues to decrease with time to about 20% after 24 hours (WHO 1999; NAP 2004).

Radioiodine may also enter the body through ingestion of contaminated food and drinking water, especially milk; however, preventing consumption of contaminated foodstuffs offers more protection (from all radionuclides) and is therefore considered the more appropriate action for limiting radioiodine exposure from ingestion. In situations where uncontaminated substitutes for essential foodstuffs, such as milk for children, are not available, it may be necessary to order extended administration of ITB agents while arrangements are made for alternate food and/or water supplies.

Because of the importance of timing in the effectiveness of ITB, protection strategies must include arrangements for ensuring that individuals have access to KI prior to or within the first few hours of an emergency involving radioiodine. This requires pre-distribution within communities that are most at risk of exceeding the generic criteria for ITB, as determined by the planning basis for the emergency scenario. It is the responsibility of the emergency response authority to decide on the manner and extent of KI pre-distribution, in consideration of site-specific factors, implementation plans for other urgent protective actions and/or regulatory requirements, such as those specified in CNSC REGDOC 2.10.1 *Emergency Management and Fire Protection: Nuclear Emergency Preparedness and Response* (CNSC, 2016).

Emergency response authorities should ensure that KI tablets are readily available for off-site emergency workers responding to an event involving radioiodine.

7.1.2 Risk/benefit considerations

Health risks from consuming KI at the recommended dosages and in accordance with instructions provided by public health or emergency management officials are low for most people.

KI is not recommended for people with some pre-existing conditions, such as autoimmune diseases affecting the thyroid. The prevalence of these types of health conditions increases with age. Due to this increased risk of adverse effects coupled with the extremely low risk of developing thyroid cancer after 40 years of age, administration of KI may not be beneficial for this age group (WHO, 1999).

Tincture of iodine is not an alternative to KI. Tincture of iodine is poisonous, and there are significant health risks associated with its consumption. Messaging about stable ITB should clearly differentiate between safe and unsafe sources of stable iodine, and should include warnings against self-medicating.

The pre-distribution of KI also carries both benefits and risks. Benefits include immediate access to tablets in the event of an emergency requiring their use. People do not have to leave their homes or workplaces to receive them, which may place them in a situation of potential exposure or interfere with the implementation of other protective actions. However, people may lose or misplace their tablets and not have them available at the time of the emergency, or they may take them at inappropriate times.

7.1.3 Dosages

KI should be administered at the dosage levels specified by the World Health Organization (WHO, 1999). Public health authorities should ensure that instructions on how KI must be taken are clear and easily understood, as the correct dose of KI will differ according to age. Recommended age-specific dosages are given in Table 5. Administration of KI may be repeated in the event of prolonged or repeated exposure, however, newborns (less than 1 month) and pregnant and breastfeeding women should only receive 1 dose.

TABLE 5. Recommended single dosage of KI according to age group

AGE GROUP	RECOMMENDED QUANTITY OF ELEMENTAL IODINE (mg)[12]	CORRESPONDING DOSAGE OF POTASSIUM IODIDE (KI) (mg)
Adults and adolescents (over 12 years), including pregnant and breastfeeding women	100	130
Children (3–12 years)	50	65
Infants (1 month–3 years)	25	32
Newborns (< 1 month)	12.5	16

7.1.4 Endpoint

Administration of KI should cease when outdoor air no longer contains significant amounts of radioiodine, i.e. the dose to the thyroid from exposure to radioiodine is below the generic criteria.

7.2 Sheltering

Sheltering is using the structure of a building to reduce exposure from an airborne plume and/or radioactive material deposited on the ground (ICRP 2009). At a minimum, people told to shelter should stay inside, shut their windows and doors, turn off outside ventilation systems, and pay attention to messages from emergency authorities. It is recommended to shelter in the basement of a house or in the middle floors of a multistory building, away from the walls or roof.

7.2.1 Implementation

Sheltering can be an effective protective action over a short period of time but is not intended to be implemented for more than a couple of days. It should be considered as an option for situations where the risks associated with evacuation outweigh the benefits—for example, when road conditions are unsafe or when the radiological hazard is short-lived. In some cases, such as for hospitals and long-term care facilities, the requirement for sheltering is clear in advance and arrangements should be built into the protection strategy. In others, the decision to shelter may be made by authorities based on the prevailing conditions of the emergency. Sheltering may be initiated as a standalone measure or in conjunction with other protective actions such as ITB.

[12] A 65 milligram (mg) tablet of KI contains 50 mg of stable iodine.

Ideally, sheltering should be implemented prior to a release of radioactive material. Examples of when sheltering should be considered include:

- Releases consisting mainly of noble gases and/or short-lived radioisotopes;[13]
- Situations where an evacuation may be required but cannot be carried out prior to an expected release; or
- Situations where the risks of staying in place are assessed as lower than those from evacuation, when all hazards are considered (e.g., poor weather conditions or transporting critical care patients).

During the sheltering order, emergency response authorities should provide information about the situation and further instruction via established communication channels.

7.2.2 Risk/benefit considerations

Sheltering is considered less disruptive than other protective actions, such as evacuation, but leaves individuals in a situation of potential exposure to radiation. Although discomfort to individuals will increase with the length of time sheltering is in effect, the physical risks from sheltering are not likely to be significant.

The effectiveness of sheltering as a means of dose reduction depends on the building type, size, and construction materials. Examples of dose reduction factors from different building types can be found in IAEA EPR-NPP-PPA *Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor* (IAEA 2013), among other references.

It may be difficult for some populations (e.g., some patients in hospitals) to evacuate and therefore sheltering may be preferred. These types of vulnerable populations and the staff required to care for them should be identified in advance of an emergency, to the extent practicable, as workers may need to be designated and trained as off-site emergency workers.

7.2.3 Endpoint

A sheltering order should not extend beyond two days as this represents the maximum amount of time that people can usually be expected to remain indoors. Beyond that time, they may need to obtain provisions or to escape from a confining and stressful situation. If outdoor radiation levels are still high after two days, relocation should be considered.

After confirmation that the radioactive plume has passed and outdoor air concentrations have fallen, people should be instructed to open their windows and doors and re-establish ventilation to reduce airborne radioactivity that may be trapped inside.

7.3 Evacuation

Evacuation is urgent removal of a group of people from an area in order to reduce short-term exposure to radioactivity released during a nuclear emergency. Affected people are directed to leave an identified area or zone in an urgent but controlled manner for a limited period of time. Evacuation centres are established to provide temporary accommodations.

7.3.1 Implementation

Ideally, evacuation should be implemented prior to a release of radioactive materials as evacuation has the potential to avert most or all exposure to radiation if carried out in the pre-release stage of an event. Evacuation generally does not take place during the passage of a plume. In this case, sheltering is used as an interim measure, followed by evacuation if appropriate. Evacuation may be implemented during a release if it involves a small number of people, it can be performed safely, and the doses that would be received during the evacuation are lower than the doses that would be received if the individuals remained in place. If evacuation occurs during the release, arrangements should be made for population monitoring and medical management.

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[13] As long as the residual dose from all exposure pathways can be kept below the reference level, and the population is not required to shelter for more than two straight days.

7.3.2 Risk/benefit considerations

Evacuation is among the most disruptive of the protective actions. Risks and detriments to evacuees include transportation accidents, anxiety, separation of family members, and possible exposure to severe weather conditions or competing disasters. Evacuations also impact the communities that receive the evacuees. Finally, arrangements must be in place to ensure the safety and security of people for whom evacuation is unadvisable (including vulnerable populations) and of the infrastructure and property left behind.

Actions initiated in response to previous large-scale emergencies, such as weather events, demonstrate that evacuations of large numbers of people can take place quickly and safely. This is due, in part, to the existence of elaborate systems of expressways around most North American cities, together with traffic management arrangements and the fact that many people have access to automobiles, facilitating self-evacuation. Emergency planners must ensure that transportation is available for evacuees who do not have access to private vehicles and that these arrangements are communicated to these individuals in advance of a nuclear emergency.

In order to avoid the need to urgently displace people more than once in an emergency, evacuees should be directed to areas where contamination levels are expected to remain well below the OILs.

7.3.3 Endpoint

Evacuees should be allowed to return home when contamination in the affected area has been assessed as meeting the criteria for re-occupation. These criteria will include confirmation that there is no further threat of a release of radioactive material, that the situation that gave rise to the emergency is stable and that the residual dose to returning individuals will not exceed the upper limit of the ICRP's reference band for existing exposure situations (i.e., 20 mSv/y).

Seven days is considered to be the longest time that people can be lodged in temporary accommodations such as emergency evacuation centres. Therefore, monitoring and dose assessment to support decisions regarding re-occupation should be priority activities for responsible authorities. If the assessment of the situation indicates that the criteria for re-occupation will not be met for some time, displaced persons may require support to prepare for an extended absence from their home, including gathering important possessions or tending to animals.

7.4 Temporary Relocation

Temporary relocation is the non-urgent removal of a group of people from an area in order to avoid longer-term exposure to contamination on the ground. By comparison, evacuation is the urgent removal of people in order to reduce short-term radiation exposure (threatened or actual). Evacuation may transition into temporary relocation if post-release monitoring indicates that immediate re-occupation is not possible.

Orders for temporary relocation may be in place for months or longer. Temporary relocation should transition into **permanent resettlement** if detailed assessments indicate that re-occupation will not be possible within a year.

7.4.1 Implementation

The decision to temporarily relocate people should be made based on monitoring data collected following the release of radioactivity. In order to facilitate timely decisions, protection strategies should include plans and mechanisms for establishing monitoring priorities, sharing monitoring data, and interpreting results in the context of protective actions.

Over time, as people are relocated from the most contaminated areas, the generic criteria and the OIL for temporary relocation should decrease in a step-wise manner until the annual residual dose to the remaining population will not exceed the upper limit of ICRP's reference band for existing exposure situations (20 mSv/y).

In areas where the ambient dose rates are above $OIL2_{\gamma}$ but below $OIL1_{\gamma}$, authorities may allow residents to take some time (in the order of a few days) to prepare for a prolonged absence.

7.4.2 Risk/benefit considerations

As with evacuation, temporary relocation is a highly disruptive protective action, but the extended time frame usually allows it to be conducted in a more orderly and controlled manner than evacuation. The physical risk of temporary relocation is thereby lower but the stress and anxiety may still be high because individuals find themselves in a transitory situation for an uncertain period of time. The economic costs are also significant as it disrupts normal economic and social activity in the contaminated areas. Planning for temporary relocation should include arrangements for alternate accommodations for the displaced population and for integrating them into new communities, schools and other social services. It may also involve relocating or compensating businesses and factories.

7.4.3 Endpoint

The time period for temporary relocation is variable. As time progresses, more accurate dose assessments will become available. If radiological conditions require that the period of temporary relocation extend beyond one year, then the relocation may be in the process of becoming permanent. In addition to the radiological conditions, decisions on returning populations to their residences following temporary relocation or undertaking permanent resettlement will require thorough consideration of many socio-economic factors and engagement with the affected communities.

7.5 Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other foods and beverages

To prevent or reduce doses arising from consuming contaminated foodstuffs, restrictions should be placed on drinking water, milk and other foods and beverages that may have been contaminated. These restrictions apply to foodstuffs that may have been contaminated with radioactive material at the time of the emergency or that continue to be produced in contaminated areas. It should be noted that foodstuffs that were protected during the emergency such that they could not have become contaminated (e.g., packaged foodstuffs, foodstuffs stored in the pantry, fridge or freezer) would likely still be considered safe for consumption. To determine whether the drinking water, milk and other foods and beverages are suitable for international trade, the guidance values provided by the Codex Alimentarius Commission (Codex, 2010) should be consulted and will be referred to in the event of trade disputes regarding differences in national guidelines.

7.5.1 Implementation

Actions to prevent consumption of drinking water, milk and other foods and beverages, and to prevent contaminated food from entering the distribution system, should begin with the onset of the emergency. Measures to protect food and water from contamination, such as moving grazing animals inside and placing them on uncontaminated feed, should also be considered if the prevailing circumstances allow.

Further constraints should be implemented based on monitoring data collected following the release of radioactivity, beginning with dose rates measured from the ground (as per $OIL3_{\gamma}$), followed by more detailed laboratory measurements. In order to facilitate timely decisions, protection strategies should include plans and mechanisms for establishing monitoring priorities, sharing monitoring data and interpreting results in the context of protective actions.

Arrangements may need to be made to replace essential commodities, such as drinking water and some country foods.

7.5.2 Risk/benefit considerations

IAEA (2013) states that restrictions should not be applied if they could result in malnutrition or other health consequences. This is not likely going to be an issue in most parts of Canada, where the fraction of locally grown and consumed food is quite small; however, special measures may need to be implemented if remote communities are affected.

Restrictions may be in place for extended periods of time. In addition to immediate contamination through deposition, radioactivity may be transported into foodstuffs through a variety of environmental pathways, such as uptake by plants growing in contaminated soil, ingestion of contaminated forage by livestock or bioaccumulation higher in the food chain (e.g., in fish). Therefore, sampling and analysis programs should be prepared to operate throughout the transition to recovery and possibly for even longer.

7.5.3 Endpoint

Restrictions should remain in place as long as sampling and analysis indicates levels of radioactive contamination above OILs 5 and 6. The process of lifting restrictions on distribution and ingestion of potentially contaminated drinking water, milk and other foods and beverages may also be dependent on other socio-economic factors, such as international trade concerns. These types of restrictions could extend for many years, potentially into the recovery stage.

7.6 Personal decontamination

Personal decontamination is the physical removal or reduction of external radioactive contamination on an individual.[14] It may involve the removal of contaminated clothing, showering, or other types of washing. Measures to reduce internal contamination levels are addressed in Section 7.7.

7.6.1 Implementation

Personal decontamination for the purposes of health protection should be available for individuals who are at risk of being significantly contaminated, such as might be the case if protection strategies fail. The decision to attempt decontamination *in situ* should be based on knowledge of the exposure scenario and contamination levels identified on the affected individual(s). If skin contamination is the primary concern, prompt decontamination should be the priority.

When personal decontamination is carried out, contaminated clothing should be removed and contaminated skin washed, repeatedly if necessary. Authorities should plan to establish decontamination-sites in uncontaminated areas near where adequate showering facilities are available. If such a site cannot be established in a timely manner, facilities and supplies to support alternative decontamination methods, such as disrobing and/or washing with a wet cloth, should be made available.

Self-decontamination is not appropriate for individuals who exceed $OIL4_{\gamma}$.

7.6.2 Risk/benefit considerations

Risks associated with personal decontamination include the risk of inadvertently spreading contamination to personnel, facilities, equipment, or parts of the body that weren't contaminated before. Proper decontamination protocols and pre-designated, trained staff are essential to minimizing cross-contamination.

Additional considerations for decontamination include how to decontaminate vulnerable populations such as children or people with disabilities as well as considerations for social or cultural requirements related to privacy.

Internal contamination assessment is required for those who are suspected of having internal contamination with radioactive material, in order to identify the radionuclide(s) and quantify the intake. Protection strategies should include arrangements to ensure that this type of follow-up is available if it is required.

Internal assessment techniques, such as bioassay, provide an accurate estimate of internal exposure but require urine and/or faecal samples to be collected soon after exposure and sent to specialised laboratories for analysis. Techniques to measure radioactivity directly in exposed individuals (*in vivo*) include thyroid measurements as well as lung and whole body counting.

7.6.3 Endpoint

Personal decontamination can stop when measured skin levels are below $OIL4_{\gamma}$, or when repeat washings become ineffective.

If the measurement of radioactive contamination remains elevated after several attempts at decontamination, or if the exposure scenario suggests that internal contamination is likely, the individual should undergo internal contamination assessment and should be considered for medical follow-up. Even if external measurements drop to below $OIL4_{\gamma}$ after decontamination, authorities and public health officials should consider whether further assessment is necessary, based on the exposure scenario.

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[14] Decontaminating the affected area and infrastructure is considered part of the recovery stage and is outside the scope of this document.

7.7 Medical Follow-Up

Medical follow-up is the process of registering patients who have received significant exposures and/or intakes, documenting them, treating internal contamination if appropriate, and implementing a long-term surveillance plan to detect and effectively treat radiation-induced health effects. Treatment of internal contamination may involve the administration of different agents to prevent the uptake, reduce the absorption or increase the excretion of radioactive material from the body.

7.7.1 Implementation

The registration of individuals suspected to have received significant doses as early as is feasible in the emergency response is extremely important to identify people who may require medical follow-up.

Treatment of internal contamination should occur as soon as possible following the intake of radiation in order to be effective; however, any treatment should only be considered upon the advice of a qualified medical professional.

7.7.2 Risk/benefit considerations

Considerations for the treatment of internal contamination include cases where the use of a certain agent is contraindicated or may not be beneficial if too much time has passed. Treatment of internal contamination may not be possible in all cases. Medical follow-up may continue over a long period of time and be costly. This should be considered during the preparedness stage.

7.7.3 Endpoint

The various aspects of medical follow-up can occur over different time-frames. The registration of individuals should continue at least until all individuals who exceed the generic criterion for medical follow-up have been identified and their information collected.[15] Any individuals with internal contamination should participate in medical follow-up to the extent possible. If future follow-up to detect and effectively treat radiation-induced health effects is implemented, it may continue for many years, potentially for the lifetime of any individuals to which it applies.

7.8 Restriction of activities for off-site workers

This protective action protects individual workers by removing them from active duty in contaminated areas once they have exceeded the generic criterion for off-site workers.

7.8.1 Implementation

Off-site emergency workers should be clearly and comprehensively informed in advance of the potential health risks of radiation exposure.

This protective action is implemented based on measured doses to workers. In order to reduce the likelihood that individual workers will exceed this generic criterion, authorities should ensure that effective dose management practices are in place, including all necessary training and equipment. Doses from intake or skin contamination should be avoided by taking preventive measures, such as wearing appropriate **personal protective equipment** (PPE). In circumstances where workers might be exposed to radioactive iodine, ITB should also be considered.

External exposure should be monitored using personal dosimeters calibrated to measure personal dose equivalent at 10mm ($H_p(10)$). A supply of dosimeters, ideally from a licensed dosimetry service provider, should be maintained, regularly tested and calibrated so that they are ready for use during a nuclear emergency.

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[15] For epidemiological purposes, authorities may consider expanding the registry to include exposure data from more than just individuals who require follow-up for medical reasons.

The doses received by emergency workers should be recorded and reported to the workers along with any information concerning the consequent health risks (IAEA 2014).

Administrative controls, such as **turn-back limits**, **stay times** and appropriate PPE and contamination control procedures, should be implemented as part of dose management.

Further details on the planning requirements for off-site emergency workers are available in IAEA GSR Part 7: *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA 2015a) and CSA N1600-16: *General requirements for nuclear emergency management programs* (CSA 2016).

7.8.2 Risk/benefit considerations

Appropriate PPE should be worn when there is a risk of internal contamination and/or skin contamination. However, wearing PPE may increase non-radiological risks, such as heat stress or errors caused by limited visibility. These risks should be managed by on-site health and safety personnel.

Some workers may receive dose outside of work hours if they live in the affected area. In these cases, dose to individuals from all exposure scenarios should be assessed and managed so that is does not exceed the reference level for the emergency.

7.8.3 Endpoint

Restrictions on activities of individual workers who have exceeded the generic criteria should remain in effect for the duration of the emergency response.

APPENDIX A: ACRONYMS AND ABBREVIATIONS

Bq	becquerel
CANDU	Canada Deuterium Uranium
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
E	effective dose
FERP	Federal Emergency Response Plan
FNEP	Federal Nuclear Emergency Plan
GSR	General Safety Requirements (IAEA)
***H**(10)**	ambient equivalent dose at 10mm depth
$H_p(10)$	personal equivalent dose at 10mm depth
H_{fetus}	equivalent dose to the fetus
$H_{thyroid}$	equivalent dose to the thyroid
HC	Health Canada
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ICRU	International Commission on Radiation Units & Measurement
ITB	Iodine Thyroid Blocking
KI	Potassium Iodide
LWR	Light Water Reactor
MAC	Maximum Acceptable Concentration
mSv	millisievert
NEF	Nuclear Emergency Function
OECD	Organisation for Economic Cooperation and Development
OIL	Operational Intervention Level
PHWR	Pressurized Heavy Water Reactor
PPE	Personal Protective Equipment
RDD	Radiological Dispersal Device
Sv	sievert
µSv/h	microsievert
WHO	World Health Organization

APPENDIX B: GLOSSARY

Absorbed Dose: A dose quantity that describes the radiation energy imparted to matter.

Ambient Dose Equivalent ($H^*(d)$): An operational environmental measurement quantity for strongly penetrating radiation. It is a measurement of the dose equivalent that would be produced by a uniform and unidirectional radiation field in the ICRU tissue equivalent sphere at depth d (ICRU, 1988). Typically set for a tissue depth of d = 10mm.

Averted Dose: The dose that can be avoided by the implementation of protective actions.

Committed Dose: Dose from radionuclide intakes (internal contamination). Radionuclides incorporated in the human body irradiate the tissues over time periods determined by their physical half-life and their biological retention within the body. The committed dose from an incorporated radionuclide is the total dose expected to be delivered within a specified time period. The committed *equivalent* dose is the committed dose to a tissue or organ. The committed *effective* dose is the product of the committed equivalent dose and the tissue weighting factor, summed for all tissues and organs in the body that are considered to be sensitive to the induction of stochastic effects. ICRP recommends a commitment period of 50 years for adults and 70 years for infants and children (adapted from ICRP 2007).

Dose Management: Includes administrative controls to limit doses, monitor doses and record doses received by emergency workers while fulfilling their duties related to nuclear emergency response (or other individuals to whom dose management may be applicable).

Effective Dose: Calculated as the product of the equivalent dose in a tissue and the tissue weighting factor, summed for all tissues and organs in the human body that are considered to be sensitive to the induction of stochastic effects. Typically used to represent whole body dose.

Emergency Planning Zones: Areas in which implementation of operational and protective actions are or might be required during a nuclear emergency, in order to protect public health, safety, and the environment (CSA 2016).

Equivalent Dose: A measure of radiation dose to a specific tissue, taking into account the relative biological effectiveness of the type of ionizing radiation and calculated by multiplying the **absorbed dose** to the organ with the radiation weighting factor.

Evacuation: In this document, evacuation is a directed protective action for the controlled displacement of the population from an area which has been or might become contaminated by radioactive substances to avoid exposure (from CSA 2016).

Generic Criteria: Dose levels at which protective actions should be taken. These are also the values used in the derivation of the OILs.

Inadvertent Ingestion: Unintentional ingestion of radionuclides as a result of eating, drinking or smoking with contamination on the hands.

Medical Follow-Up: The process of registration and documentation of individuals' exposures and intakes, treatment of internal contamination, if appropriate, and future follow-up to detect and effectively treat radiation-induced health effects.

Nuclear Emergency: A non-routine situation that necessitates prompt action to mitigate a radiological hazard which could result in adverse consequences for human health and safety, quality of life, property or the environment (ICRP 2007). In this document, the term nuclear emergency is used to refer to both nuclear and radiological emergencies.

Off-Site Emergency Worker: A person having specified duties as a worker in response to a nuclear emergency who: is required to remain in or enter areas affected or likely to be affected by radiation from an accident; might be exposed while performing his/her duties; and for whom special safety arrangements are required. This may include police officers, firefighters, medical personnel, drivers and crews of evacuation vehicles and field teams.

Operational Intervention Level: A calculated or derived quantity that corresponds to a generic criterion and above which a specific protective action is generally justified. Environmental measurements, measurements of contamination levels among affected populations and/or laboratory measurements can be directly compared to the OILs.

Permanent Resettlement: Permanent relocation of the population to a new location if their home environments are contaminated above acceptable limits and decontamination efforts are not able to restore them to habitable conditions.

Personal Dose Equivalent (H_p(d)): An operational quantity for individual monitoring . The dose equivalent in soft tissue (ICRU sphere) below a specified point on the body at an appropriate depth (d). For deep organs and the control of effective dose, a depth of 10 mm is used (ICRU, 1988).

Personal Protective Equipment: Clothing or other specialised equipment designed to prevent or reduce exposure to radioactive material.

Population Monitoring: The measurement of radioactive contamination on or in people who may have been exposed as a result of a nuclear emergency.

Potassium Iodide (KI): Substance containing stable iodine used to prevent or reduce the uptake of radioactive iodine (radioiodine) by the thyroid. Typically comes in tablet/pill form for ingestion. KI is an example of an iodine thyroid blocking agent.

Projected Dose: The dose that would be expected to be received as a result of an emergency exposure situation if planned protective actions were not taken.

Protective Action: A measure taken to reduce radiation doses which could be incurred by the population or off-site emergency workers as a result of a nuclear emergency. It is sometimes called countermeasure or protective measure (adapted from CSA 2016). In this document, it should be understood that references to implementing protective actions include the implementation of associated response actions, such as notification.

Protection Strategy: A protection strategy describes what needs to be done and how it will get done in order to achieve the goals of a nuclear emergency response, in consideration of all of the risks, constraints, and other factors that will need to be managed.

Radioactive Material: Nuclear substances as defined in the *Nuclear Safety and Control Act* (2000).

Reference Level: The level of dose above which it is judged inappropriate to allow exposures to occur, and below which optimisation of protection should be implemented. For emergency exposure situations the reference level recommended by the ICRP is 20 mSv–100 mSv (ICRP 2007). In this document, generic criteria and OILs are set for the upper bound of this band.

Representative Person: An individual that, due to his/her characteristics, habits and location of residence, is representative of the more highly exposed individuals in the population.

Residual Dose: The dose that is expected to be received after the planned protective actions have been implemented. It is the effective dose from all exposure pathways remaining after the implementation of an optimised protection strategy, and is the quantity that is compared with the appropriate reference level when selecting and assessing protection strategies. It can be assessed by estimating the exposure during emergency response planning (e.g., as the difference between the projected dose and the dose averted by implementing a protective measure or combination of protective measures), or by measuring and/or calculating the actual dose after an emergency exposure situation has occurred. (ICRP 2009)

Severe deterministic injuries: This term refers to injuries that are directly attributable to high levels of radiation exposure, irreversible in nature, and which severely impair the quality of life of individuals (ICRP 2009). This is a subset of tissue reactions.

Sheltering: A directed protective action to take immediate refuge in an enclosed structure for protection from an airborne plume, deposited radionuclides, or both (CSA 2016).

Stable Iodine Thyroid Blocking: Administration of stable iodine to block the uptake of inhaled or ingested radioiodines into the thyroid gland. Also referred to as Iodine Thyroid Blocking.

Stay Times: The calculated maximum amount of time a worker can remain in an area at a given ambient dose rate without surpassing a specified dose level.

Stochastic Effects: Radiation-induced health effects, such as cancer and heritable diseases, which are associated with a statistical risk and where no threshold has been established. The probability of occurrence is proportional to the dose (the higher the dose, the higher the probability of occurrence) but the severity of the effect is independent of dose.

Temporary Relocation: The non-urgent removal or extended exclusion of people from a contaminated area to avoid chronic exposure, for a finite period (up to a year or two, as long as eventual return is foreseeable). Temporary relocation may be a continuation of the urgent protective action of evacuation (IAEA 2007).

Tissue Reactions: Radiation-induced health effects including changes to cells and tissues that are certain to occur in an individual exposed to a radiation dose greater than some threshold dose, with a severity that increases with increasing dose. (ICRP 2012a).

Turn-Back Limit: A pre-determined dose rate used to manage exposure in a contaminated area. When an off-site emergency worker finds themselves in a field that exceeds the turn-back limit, they should automatically leave the area.

APPENDIX C: OVERVIEW OF EMERGENCY MANAGEMENT IN CANADA

It is important to place this document in the context of overall emergency management in Canada. *An Emergency Framework for Canada* (PS 2017) states that emergency management is comprised of four interdependent components (also referred to as the four pillars of emergency management[16]) which can be described as follows (PS 2017; OECD 2010):

- **Prevention and Mitigation:** Actions to prevent the occurrence or reduce the impact of a potential accident.
- **Preparedness:** Actions taken in the preparedness stage in order to be ready to respond to an emergency. Includes assessing potential threats and risks, and developing related plans, procedures and capabilities.
- **Response:** Actions taken in the response stage when there is an emergency. Includes response initiation, crisis management, consequence management and transition to recovery.
- **Recovery:** Actions taken after a disaster to repair or restore conditions to an acceptable level. This may include transitioning to a new normal. Long-term rehabilitation and capturing lessons learned are also part of recovery.

Although this document is not relevant to the prevention and mitigation of nuclear emergencies, it will be useful for emergency response authorities involved in nuclear emergency preparedness and response. Furthermore, while it does not deal specifically with recovery, some of the recommendations for protective actions implemented during the emergency response stage, such as temporary relocation and the restriction of distribution and ingestion of potentially contaminated drinking water and foods, may continue to apply while communities transition out of the emergency and into a longer-term exposure situation.

C1. Roles and Responsibilities Related to Nuclear Emergency Preparedness and Response in Canada

The preparedness for and response to a nuclear emergency in Canada is a multi-jurisdictional responsibility shared by all levels of government; however, provincial and territorial governments have the primary responsibility for protecting public health and safety, property and the environment within their borders. Provincial and territorial governments are responsible for decisions on protective actions, including the development and application of relevant criteria for decision-making. The occupational health and safety of off-site emergency workers is the responsibility of their individual employers, as outlined in the *Canada Labour Code* (1985) and/or relevant provincial legislation.

Federally, the Government of Canada's all-hazard *Federal Emergency Response Plan* (FERP) outlines the processes and mechanisms to facilitate an integrated Government of Canada response to an emergency (PS 2011b). It is designed to harmonize federal emergency response efforts with those of the provincial and territorial governments, non-governmental organizations and the private sector. The *Federal Nuclear Emergency Plan* (FNEP) is an event-specific annex to the FERP (HC 2014a). The FNEP provides the supplemental multi-departmental and inter-jurisdictional arrangements necessary to address the scientific and technical aspects of the response to a nuclear emergency. In addition to specific federal responsibilities, the federal government, under the FNEP, coordinates with and provides support to the provinces and territories in their response to a nuclear emergency. Health Canada is responsible for administration of the FNEP.

Pursuant to the *Nuclear Safety and Control Act* (2000), the operators of nuclear power plants are responsible for on-site emergency management, including the occupational health and safety of on-site emergency workers, as regulated by the Canadian Nuclear Safety Commission (CNSC). Foreign nuclear-powered or nuclear-capable vessels invited into Canada are specifically excluded under the Section 6 of the *Nuclear Safety and Control Act* (2000). Protection of on-site emergency workers at ports visited by such foreign vessels is outlined in the *Nuclear Safety Orders and Directives* (2009) issued under the authority of the Director Nuclear Safety pursuant to the Department of National Defence *Defence Administrative Orders and Directive 4002-0 Nuclear Technology Regulation and Control* (DND 2000).

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[16] Some jurisdictions refer to the five pillars of emergency management, as prevention and mitigation are considered as two separate pillars (EMO, 2010).

C2. Roles and Responsibilities Related to Food Safety in Canada

Food safety in Canada is a multi-jurisdictional responsibility shared by all levels of government. As a component of nuclear emergency preparedness and response, provincial, territorial and municipal governments have the primary responsibility for decisions on protective actions in the affected area related to food safety.

Under the *Food and Drugs Act* (1985), the Government of Canada has a responsibility for the safety of all domestic and imported food offered for sale within Canada. Health Canada is responsible for establishing standards for the safety and nutritional quality of all foods sold in Canada. Once food products have left the affected area, or if food is imported from an affected area abroad, the Canadian Food Inspection Agency is responsible for enforcing the food safety standards and guidelines established by Health Canada, which may include taking regulatory actions such as product recalls. The federal government can also provide support to the provinces, territories and municipalities in their food safety related actions.

The principal responsibility for ensuring the safety of drinking water rests with the provinces and territories, while municipalities usually ensure the day-to-day operations of treatment facilities and distribution systems. Health Canada worked with the provinces and territories to develop the *Guidelines for Canadian Drinking Water Quality* (HC 2014b). These guidelines are used by each province and territory, as well as by the federal government, as a basis to establish their own requirements for drinking water quality. This would include the development and implementation of regulations, as well as decisions regarding drinking water treatment and distribution. Health Canada also provides drinking water guidance to federal, provincial and territorial departments upon request.

APPENDIX D: RECOMMENDATIONS FROM OTHER AGENCIES

In the time since Health Canada published the *Canadian Guidelines for the Restriction of Radioactively Contaminated Food and Water Following a Nuclear Emergency* (2000) and the *Canadian Guidelines for Intervention During a Nuclear Emergency* (2003), there have been updates in the international and national guidance which are relevant to radiological protection in a nuclear emergency.

This appendix compares the recommendations in this document to the current IAEA guidance, as well as to criteria established in other countries.

D1. Generic criteria compared to IAEA

TABLE 6. Health Canada's recommended generic criteria compared to IAEA recommendations

PROTECTIVE ACTIONS	GENERIC CRITERIA (HC 2017)	GENERIC CRITERIA (IAEA 2015a)
Stable iodine thyroid blocking	50 mSv in the first 7 days ($H_{thyroid}$)	50 mSv in the first 7 days ($H_{thyroid}$)
Evacuation	100 mSv in the first 7 days (E or H_{fetus}))	100 mSv in the first 7 days (E or H_{fetus}))
Temporary relocation (starting point, see text)	100 mSv in the first year (E) or 100 mSv for the full period of in utero development (H_{fetus})	100 mSv in the first year (E) or 100 mSv for the full period of in utero development (H_{fetus})
Sheltering	10 mSv in the first 2 days (E)	—
Restriction of distribution and ingestion of potentially contaminated drinking water,[17] milk and other foods	3 mSv/y (E) (1 mSv/year for each of the following categories: drinking water, milk and other foods and beverages)	10 mSv/year (E)
Medical follow-up	100 mSv in one month (E) or 100 mSv for the full period of in utero development (H_{fetus})	100 mSv in one month (E) or 100 mSv for the full period of in utero development (H_{fetus})
Restriction of activities for off-site emergency workers	50 mSv over the duration of the response, except in exceptional circumstances ($H_p(10)$ or E)	100 mSv over the duration of the response, except in exceptional circumstances ($H_p(10)$ or E)

In most cases, Health Canada has adopted the IAEA values. Exceptions are explained below.

- Health Canada has adopted a lower dose level for ingestion controls because the lower threshold is considered reasonably achievable in the Canadian context, given the ready availability of alternative sources of food and water in those areas most likely to be impacted by a significant release of radioactivity.

[17] From water supplies that could include contaminated rainwater or contaminated surface water.

- Health Canada has maintained the practice of having a separate generic criteria for sheltering, primarily in order to accommodate the current needs of some Canadian organizations. It corresponds to two days at the daily intervention level recommended in the previous edition of the Guidelines (HC 2003).

D2. OILs compared to IAEA

TABLE 7. Health Canada recommended OILs compared to IAEA recommendations

OIL#	PROTECTIVE ACTION	OIL (HC 2017)	OIL (IAEA 2015a)
Exposure control			
1_{γ}	Evacuation	1000 µSv/h	1000 µSv/h
2_{γ}	Temporary relocation	100 µSv/h	100 µSv/h
		25 µSv/h	25 µSv/h
Ingestion control			
3_{γ}	Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other food	1 µSv/h	1 µSv/h
5_{α}		See Table 4	–
$5_{ß}$		See Table 4	–
6		See Table 12	–
7		–	I-131: 1000 Bq/kg Cs-137: 200 Bq/kg
Population monitoring and medical management			
4_{γ}	Personal decontamination and/or medical follow-up	1 µSv/h	1 µSv/h See also OIL8
8_{γ}		–	0.5 µSv/h above background

In most cases, Health Canada has adopted the IAEA values. Exceptions are explained below.

- Health Canada has not adopted IAEA's OIL7. This OIL is calculated so that food and water can be efficiently screened using measurements of marker radionuclides (Cs-137 and I-131). It is based on the estimated ratios of radionuclides in a release from an accident at a nuclear power plant. Health Canada has not included it in our recommendations because it is not appropriate for all categories of emergency that are addressed in the FNEP. Instead, we have retained and expanded upon the radionuclide-specific activity concentrations presented in *Canadian Guidelines for the Restriction of Radioactively Contaminated Food and Water Following a Nuclear Emergency* (HC2000). Canadian specific ingestion data was used to inform the OIL calculations (HC 1993; HC 2011; HWC 1976).
- Thyroid monitoring is an essential activity if radioiodine exposure is suspected. However, Health Canada has not adopted IAEA's OIL8 and recommends that thyroid monitoring and dosimetry be carried out, when required, by specialists in internal assessment.

D3. Other countries

Table 8 compares recommendations in this document with generic criteria adopted by other countries. The list is not comprehensive; rather, it represents a selection of nations with nuclear power plants who have updated their guidance since the Fukushima accident.

TABLE 8. Examples of generic criteria adopted internationally. Checkmarks indicate that the criterion matches the recommendation from Health Canada.

PROTECTIVE ACTION	HEALTH CANADA (2017)	IAEA (2015a)	US EPA (2016/17)	SECRÉTARIAT GÉNÉRAL DE LA DÉFENSE ET DE LA SÉCURITÉ NATIONALE (FRANCE) (SGDSN 2014)	BUNDESAMT FÜR STRAHLENSHUTZ (BfS 2014)	NORDIC GUIDELINES[18] (2014)
ITB	50 mSv	✓	✓	✓	50 mSv for children <18 and pregnant women, and 250 mSv for people aged 18–45	50 mGy (dose to adult) or 10 mGy (dose to child)
Evacuation	100 mSv/7d	✓	10–50 mSv/4d	✓	✓	20 mSv/7d
Sheltering	10 mSv/2d	Considered with evacuation criteria	Considered with evacuation criteria	✓	10 mSv/7d	✓
Restriction on food and drinking water	1 mSv/y for each category: food, milk, drinking water	10 mSv/y All categories	5 mSv/y for food, 1 mSv/y for drinking water	–	–	–
Temporary Relocation	100, dropping to 20 mSv/y	✓	<20 mSv/y	–	–	–

D4. Summary

The generic criteria adopted by Canada are generally in line with both international and other nation- or agency-specific generic criteria. Some differences may arise due to differing definitions of protective actions and the ways in which they are carried out, as well as country-specific conditions that may affect the level of conservatism that is justifiable, optimal and/or practical.

[18] The Nordic countries who have agreed to the guidelines are Denmark, Finland, Iceland, Norway, and Sweden.

APPENDIX E: OIL CALCULATIONS FOR ENVIRONMENTAL MEASUREMENTS

The default values for OILs 1_γ and 2_γ recommended in this document are based on the default OIL values for ground monitoring that are provided by the IAEA to protect the public in an emergency involving a severe release of radioactive material from a light water reactor (LWR) or its spent fuel (IAEA OIL). Work is underway internationally to recalculate these OILs specifically for pressurized heavy water reactors (PHWR), also known as CANDU reactors; however, preliminary assessments indicate that the values will not change. Therefore, the default OILs for environmental measurements presented in Table 3 are considered appropriate for severe releases of radioactive material from nuclear reactors, including most emergencies in the following FNEP categories:

- Category A: An emergency at a nuclear power plant in Canada (or involving a Chalk River Laboratories reactor);
- Category B: An emergency at a nuclear power plant in the United States or Mexico;
- Category C: An emergency involving a nuclear-powered vessel in Canada; and
- Category E: A nuclear emergency outside of North America (if this concerns a reactor emergency).[19]

The default OILs for environmental measurements may not be appropriate for emergencies involving other sources of radioactivity (primarily FNEP Category D and some scenarios in Category E). In these cases, OILs may need to be recalculated taking context-specific conditions or assumptions into account. Due to the wide range of possible scenarios for non-reactor emergencies, this document will not provide a detailed approach to such calculations, although some considerations are discussed briefly at the end of this appendix.

E1. Overview of OIL Calculations for Evacuation and Temporary Relocation

All considerations and assumptions used by the IAEA in deriving default OILs for evacuation and temporary relocation have been adopted by Health Canada. As a result, default OIL values are the same. While it is out of scope of this document to detail the IAEA derivations in full, a general overview is provided. (For details on the complete derivations, please refer to (IAEA 2017).)

IAEA performed OIL calculations for 19 mixes of radionuclides. These mixes reflect potential releases that could occur from a LWR or its spent fuel during a severe emergency and include radionuclides that may significantly contribute to dose received by members of the public and/or affect instrument response. For each mix, OILs were determined for multiple time points over which the dose was projected. The final OIL was chosen such that it would be protective for all mixes at all relevant points in time for when the measurement should be taken. This is demonstrated in Figures 1 and 2.

[19] In the case of events abroad, this document will be considered when providing advice to Canadians in affected areas, in light of protective actions taken by the relevant local authorities and the recommendations of the international community.

FIGURE 1. $OIL1_\gamma$ (t,mix) functions (for evacuation) and default $OIL1_\gamma$ value (in red).

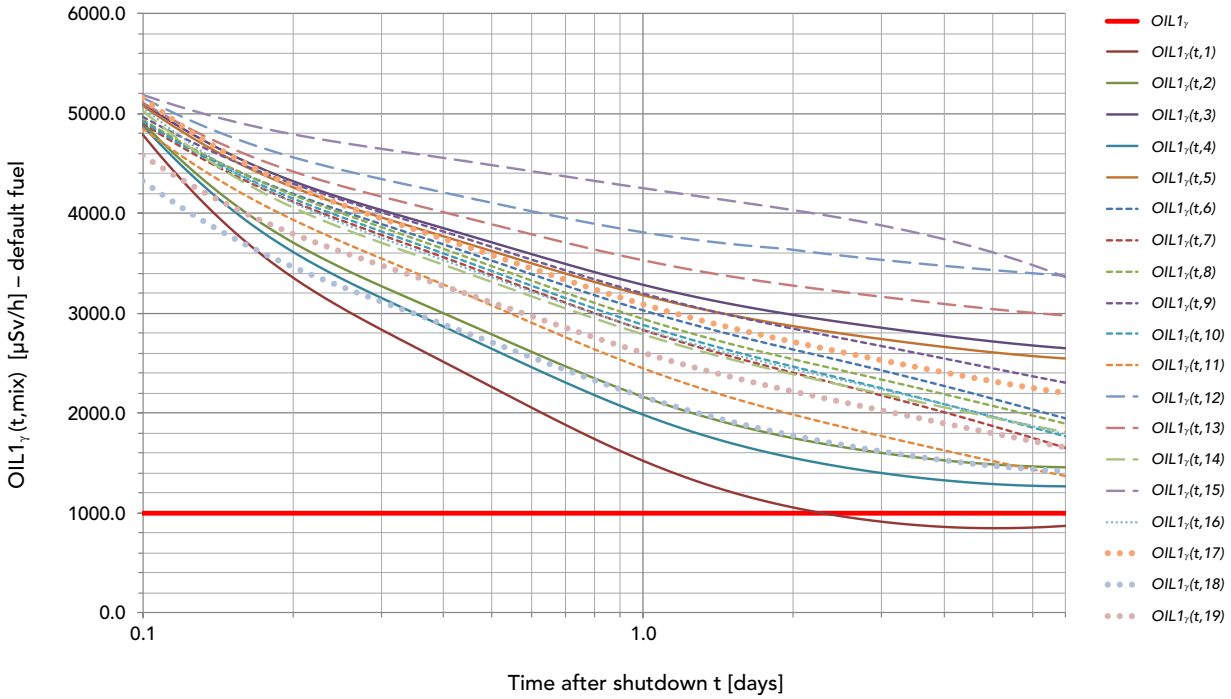
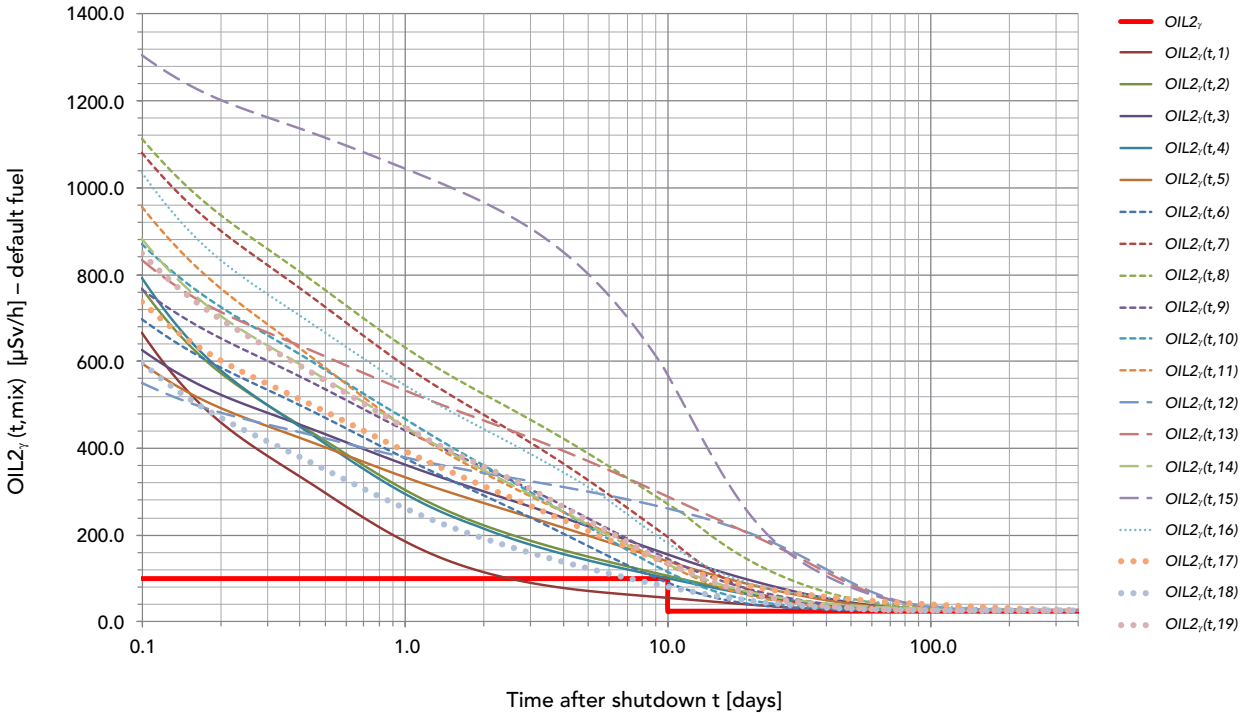


FIGURE 2. $OIL2_\gamma$ (t,mix) functions (for temporary relocation) and default $OIL2_\gamma$ value (in red).



The essential components of IAEA's approach to deriving default OILs for ground measurement are summarized in the equation below.

$$\text{OIL(t,mix) (μSv/h)} = \left[\text{Calculated}^{*} \text{ gross activity on the ground (Bq/m}^2\text{)}\right] \times \left[\text{Ambient dose equivalent rate per unit activity (μSv/h)/(Bq/m}^2\text{)}\right] \times \left[\text{Weighting factor to avoid implementation of unwarranted actions (unitless)}\right]$$

* This is a calculated value for ground deposition that will lead to an effective dose equal to the generic criteria

The calculation for gross activity on the ground considered several factors, of which some primary examples include:

- Most sensitive populations (infants, fetus)
- Decay and ingrowth of radionuclides/progeny
- Dose from groundshine
- Dose from air shine due to resuspended ground deposition
- Dose from inhalation of resuspended ground deposition
- Dose from inadvertent ingestion
- Ground roughness
- Weathering
- Shielding and occupancy factors for homes

The value for ambient dose equivalent rate per unit activity also accounted for the following:

- Ground roughness
- Effective to ambient dose rate correction factor

The weighting factor used to avoid implementation of unwarranted response actions is included to help ensure that resources are best used to protect those at highest risk.

For completeness, the summary equation is restated below so that it more closely reflects how it is presented by the IAEA (IAEA 2017):

$$OIL_{\gamma}(t,mix) = (\sum_i (RA_i(t,mix) \times H^{*}_{grd-sh,i})) \times WF_{OIL_{\gamma}} \times UC \times DA_{OIL}(t,mix)$$

Where:

- t [s] is the time after shutdown of the reactor (i.e. after the fuel was last irradiated in a reactor).
- 'mix' refers to the radionuclide mix, or postulated core to containment release scenario, for a LWR.
- $RA_i(t,mix)$ [unitless] is the relative activity of radionuclide i at time t after reactor shutdown for a specific radionuclide mix.
- $H^{*}_{grd-sh,i}$ [(Sv/s)/(Bq/m^2)] is the ambient dose equivalent rate at 1 m above ground level, per unit ground surface activity of radionuclide i.
- $WF_{OIL\gamma}$ = [unitless] is a weighting factor used to avoid the implementation of unwarranted response actions based on the default OIL_{γ} value.

- UC = 3.6E+09 (μSv/h)/(Sv/s) is the unit conversion factor from Sv/s to μSv/h.
- $DA_{OIL}(t,mix)$ [Bq/m^2] is the derived gross activity on the ground at time t after reactor shutdown, which, for the 'ground' scenario, results in any of the generic criteria specified for the OIL_γ being met, for a specific radionuclide mix.

For further details on derivations of the terms in the above equation, in addition to values and assumptions used, please refer to (IAEA 2017).

E2. OILs for other emergencies

If the assumptions outlined in the previous section do not hold for a particular emergency scenario, there is a risk that the default values for $OIL1_\gamma$ and $OIL2_\gamma$ recommended in these guidelines will not be a good basis for taking protective actions. This is potentially of concern with respect to scenarios that fall into FNEP Category D, or "other" radionuclear events. The generic criteria and protection strategies would remain the same; however, measured values might over- or under-estimate projected dose, particularly if the mix and behaviour of radionuclides differ from those considered in IAEA's LWR scenarios. This is briefly discussed below.

As indicated in Equations E.1 and E.2, calculating OILs from ground measurements requires deriving projected dose by integrating gross activity concentration on the ground over the time period specified for each generic criteria. The default OILs 1_γ and 2_γ assume that this gross activity decreases significantly during the first few days of the event, primarily due to decay of short-lived radionuclides, after which time residual contamination persists for an extended period of time (with some reduction due to decay and natural removal processes). The expected changes in gross activity over time are reflected in the curves shown in Figures 1 and 2. In emergency scenarios where gross activity is not expected to change in the same way, such as an event involving a radiological dispersal device (RDD), integrated activity (and, therefore, integrated exposure) over the same time period will be different. The dose coefficient for each radionuclide of concern is an important factor as well, as dose coefficients can vary by orders of magnitude depending on the radionuclide, the pathway of exposure and the **representative person**. Higher dose coefficients result in the calculation or selection of lower OILs.

This being said, Health Canada considers the default $OIL1_\gamma$ as protective for use in the urgent phase of most emergency situations involving gamma-emitting radionuclides.[20] This is because $OIL1_\gamma$ is meant to trigger actions that keep exposure times well below the 7 days specified in the generic criteria for evacuation/sheltering, for conservatively-selected radionuclide mixes. Therefore, as long as measurements are collected and decisions are made promptly, it should be possible to keep doses to members of the public below the generic criteria by using the default $OIL1_\gamma$ value (1000 μSv/h) for most emergency scenarios.

The default values presented in this document for $OIL2_\gamma$, however, may be less appropriate for use with different radionuclide mixes. Since the decision to relocate people is based on projected annual dose, specific knowledge about how the radioactive source will change over the year (e.g., decay, weathering) and the dose coefficients for the component radionuclides should be considered when setting OILs for temporary relocation. For this reason, emergency managers planning for FNEP Category D threats should consider calculating initial default values for $OIL2_\gamma$ for specific scenarios of concern, such that the annual projected dose does not exceed the generic criteria for temporary relocation in the early phase of the event (100 mSv in the first year).

While the value of $OIL2_\gamma$ may change for different scenarios, its purpose remains the same: it facilitates setting priorities and allocating finite resources based on risk to populations, established by measuring ambient dose rates. As populations in higher priority areas are relocated, the generic criteria for temporary relocation (and the associated OIL) should be reduced over time until the annual projected dose to people remaining in the area is no more than 20 mSv/y (ICRP 2007).

Finally, it should be noted that ground monitoring OILs are based on gamma measurements only. The contribution of other types of radiation to effective dose has been considered for the radionuclide mixes used to calculate the default OIL values; however, for other source terms where alpha- or beta-emitting radionuclides may contribute significantly to the total effective dose, these OILs should not be relied upon for decision-making.

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[20] Or mixes, where relative quantities of alpha- and beta-emitters can be derived from gamma measurements.

APPENDIX F: OIL CALCULATIONS FOR LABORATORY MEASUREMENTS

OIL6 values are calculated based on the following conservative assumptions:

- all the affected drinking water, milk and other foods and beverages are immediately contaminated and consumed throughout a full year;
- short-lived radionuclides (with a half-life of less than 13 days) are only contaminated and consumed over a two month period;
- the most restrictive age-dependant dose conversion factors (ICRP 2012b) and ingestion rates (HC 1993; HC 2011; HWC 1976) are used; and
- 100% of drinking water and milk and 20% of other foods and beverages were assumed to come from contaminated sources.

OIL6 values are calculated based on the following equation:

$$OIL_{i,j,k} = \frac{GC_{IC}}{M_{j,k} \times DC_{i,k} \times f_j} \times 1000$$

Where:

$OIL_{i,j,k}$ is the radionuclide specific OIL for radionuclide *i* in food group *j* and age group *k* (Bq/kg or Bq/L);

GC_{IC} is the generic criteria for Ingestion Control: 1 mSv (0.001 Sv) per year per food group for each of drinking water, milk and other foods and beverages;

$M_{j,k}$ is the mass of food group *j* consumed by age group *k* over the assessment period (kg or L per year);

$DC_{i,k}$ is the ingestion dose coefficient for radionuclide *i* and age group *k* (Sv/Bq); and

f_j is contamination factor, equivalent to the fraction of an individual's dietary intake of food group *j* assumed to be uniformly contaminated to the full value of the OIL.

Both the mass of food consumed and the radionuclide ingestion dose coefficients are age-specific and their values reflect the classification of the population into a limited set of representative age groups. For the purpose of this document, the six age groups recommended by the ICRP (ICRP 2012b) have been used. These are identified in Table 9.

TABLE 9. ICRP age groups (ICRP 2012a)

ICRP AGE GROUP	RANGE
3 months	From 0 to 1 year of age
1 year	From 1 year to 2 years
5 year	More than 2 years to 7 years
10 year	More than 7 years to 12 years
15 year	More than 12 years to 17 years
Adult	More than 17 years

Age-specific annual dietary intakes seen in Table 10 are based on recommended Canadian reference values derived from a 1970–1972 Canada-wide survey for food consumption and a Health Canada report on drinking water consumption rates (HC 1993; HC 2011; HWC 1976). In calculating OILs for short-lived radionuclides (those with a half-life of less than 13 days) these values are scaled to a two-month time period. Consumption rates for 3-month-old infants have been based on individuals that consume formula milk prepared with tap water at a rate of 400 mL/day (HC 1993).

TABLE 10. Food category and average consumption rates for Canadian populations

FOOD CATEGORY	CONSUMPTION RATE BY AGE GROUP					
	3 month	**1 year**	**5 year**	**10 year**	**15 year**	**Adult**
Fresh Milk (kg/y)	145	185	215	205	190	85
Other Foods and Beverages (kg/y)	155	215	380	450	520	500
Drinking Water (L/y)[21]	150	275	275	425	425	730

Committed effective dose coefficients are estimates of the integrated dose expected to be imparted to the whole body of a reference individual over a defined period of time following a single intake by ingestion of 1 Bq of activity of a specific radionuclide. Effective dose coefficients take into consideration all affected organs and tissues, accounting for their individual susceptibilities to radiation-induced harm. Committed effective dose coefficients to age 70 years[22] for the six ICRP age groups have been taken from ICRP Publication 119 (ICRP 2012b) and represent the latest international recommendations at the time of this publication.

The contamination factors provided in Table 11 describe the average fraction of an individual's intake of a food group that is assumed to be uniformly contaminated to the full value of the OIL for the duration of the assessment period. For ingestion of milk, it is assumed that the entire intake by all age groups is contaminated over the duration of the assessment period. Marketed fresh milk supplies generally come from local and regional sources and, therefore, an individual's intake may be composed entirely of supplies that have been directly affected by the emergency. A contamination factor of 1 is also assumed for drinking water drawn from public supplies, since it is usual for most individuals to obtain their water from a single source. For other foods and beverages, a contamination factor of 20% is assumed based on the expectation that normally less than 10% of the annual dietary intake of most members of the public could consist of locally-produced food directly affected by the emergency. A factor of 2 was applied to the expected value of 10% to account for sub-groups that might be more dependent on local foods.

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[21] Litres per year (L/y). Reference Values for Canadian Populations (HC 1993) recommends an adult rate of 1.5 litres per day (L/d) (550 L/y) for drinking water consumption. A value of 2 L/d (730 L/y) is used here for consistency with the *Guidelines for Canadian Drinking Water Quality: Guidelines Technical Document—Radiological Characteristics* (HC 2009).

[22] Committed effective dose coefficients are integrated over 50 years for adults and over 70 years for children (ICRP 2012b).

TABLE 11. Food group contamination factors

FOOD GROUP	CONTAMINATION FACTOR
Drinking water	1
Milk	1
Other foods and beverages	0.2

To derive the radionuclide-specific OILs presented in Table 12, individual values were calculated for each radionuclide, for each food group and for each of the six ICRP age categories. The most restrictive of the six calculated values was selected for the OIL. To reflect the uncertainty in the calculated values and to simplify implementation by minimizing the number of unique values, the calculated OILs were rounded to a value of 1, 3, 10, 30, 100, 300, 1000, 3000, 10000, 30000, 100000, 300000, or 1000000 Bq/kg.

Table 12 provides an exhaustive list of radionuclide-specific OILs. Radionuclides from this list should be chosen based on the type of emergency and laboratory capabilities.

TABLE 12. Radionuclide specific OILs for laboratory measurements of drinking water, milk and other foods and beverages

OIL6				
		RADIONUCLIDE SPECIFIC ACTIVITY CONCENTRATION		
RADIONUCLIDE	SYMBOL	DRINKING WATER (Bq/L)	MILK (Bq/kg)	OTHER FOODS AND BEVERAGES (Bq/kg)
Tritium[23]	^{3}H	100000	30000	100000
Carbon-14	^{14}C	3000	3000	10000
Sulphur-35[24]	^{35}S	3000	3000	30000
Chromium-51	^{51}Cr	10000	30000	100000
Iron-55	^{55}Fe	1000	3000	10000
Iron-59	^{59}Fe	100	100	1000
Cobalt-58	^{58}Co	1000	1000	3000
Cobalt-60	^{60}Co	100	100	1000
Zinc-65	^{65}Zn	100	100	1000
Rubidium-86	^{86}Rb	100	300	1000
Strontium-89	^{89}Sr	300	300	1000
Strontium-90	^{90}Sr	30	30	100
Strontium-91	^{91}Sr	10000	10000	30000
Strontium-92	^{92}Sr	10000	10000	30000
Yttrium-90	^{90}Y	3000	1000	10000
Yttrium-91	^{91}Y	300	300	1000
Yttrium-92	^{92}Y	10000	10000	30000
Yttrium-93	^{93}Y	3000	3000	10000
Niobium-95	^{95}Nb	1000	1000	3000

[23] Tritium is assumed to be organically bound tritium in the case of milk and other foods and beverages, and tritiated water in the case of drinking water.

[24] Inorganic sulphur

OIL6

RADIONUCLIDE	SYMBOL	RADIONUCLIDE SPECIFIC ACTIVITY CONCENTRATION		
		DRINKING WATER (Bq/L)	MILK (Bq/kg)	OTHER FOODS AND BEVERAGES (Bq/kg)
Zirconium-95	^{95}Zr	1000	1000	3000
Zirconium-97	^{97}Zr	1000	1000	3000
Molybdenum-99	^{99}Mo	3000	10000	30000
Technetium-99	^{99}Tc	100	100	300
Technetium-99m[25]	^{99m}Tc	1000	100000	300000
Ruthenium-103	^{103}Ru	1000	1000	3000
Ruthenium-105	^{105}Ru	1000	10000	100000
Ruthenium-106	^{106}Ru	100	100	300
Rhodium-105	^{105}Rh	3000	3000	30000
Silver-110m	^{110m}Ag	300	300	1000
Antimony-127	^{127}Sb	300	300	3000
Antimony-129	^{129}Sb	1000	10000	30000
Tellurium-127	^{127}Te	3000	30000	100000
Tellurium-127m	^{127m}Te	1000	1000	10000
Tellurium-129	^{129}Te	10000	100000	300000
Tellurium-129m	^{129m}Te	100	100	1000
Tellurium-131m	^{131m}Te	1000	3000	10000
Tellurium-132	^{132}Te	1000	1000	3000
Iodine-129	^{129}I	10	30	30
Iodine-131	^{131}I	100	100	300
Iodine-132	^{132}I	3000	10000	30000
Iodine-133	^{133}I	1000	1000	3000
Iodine-134	^{134}I	300	30000	100000
Iodine-135	^{135}I	1000	1000	3000
Cesium-134	^{134}Cs	100	300	1000
Cesium-136	^{136}Cs	300	300	3000
Cesium-137	^{137}Cs	100	300	1000
Barium-139	^{139}Ba	10000	30000	100000
Barium-140	^{140}Ba	300	300	3000
Lanthanum-140	^{140}La	300	300	3000
Lanthanum-141	^{141}La	1000	10000	30000
Lanthanum-142	^{142}La	1000	30000	100000
Cerium-141	^{141}Ce	1000	1000	3000
Cerium-143	^{143}Ce	100	3000	10000
Cerium-144	^{144}Ce	100	100	300

[25] m = metastable

OIL6				
		RADIONUCLIDE SPECIFIC ACTIVITY CONCENTRATION		
RADIONUCLIDE	SYMBOL	DRINKING WATER (Bq/L)	MILK (Bq/kg)	OTHER FOODS AND BEVERAGES (Bq/kg)
Praseodymium-143	^{143}Pr	300	300	3000
Neodymium-147	^{147}Nd	300	300	3000
Iridium-192	^{192}Ir	300	300	3000
Uranium-235	^{235}U	30	30	100
Neptunium-237	^{237}Np	3	3	10
Neptunium-239	^{239}Np	3000	3000	30000
Plutonium-238	^{238}Pu	1	1	3
Plutonium-239	^{239}Pu	1	1	3
Plutonium-240	^{240}Pu	1	1	3
Plutonium-241	^{241}Pu	100	100	300
Plutonium-242	^{242}Pu	1	1	3
Plutonium-244	^{244}Pu	1	1	3
Americium-241	^{241}Am	1	1	10
Curium-242	^{242}Cm	30	30	100
Curium-244	^{244}Cm	1	1	10

For samples with multiple radionuclides present, the OIL6 is exceeded if the following condition is satisfied:

$$\sum_i \left(\frac{C_i}{OIL6_i} \right) \geq 1$$

Where:

C_i is the concentration of radionuclide i in the drinking water, milk or other foods or beverages (Bq/kg or Bq/L); and

$OIL6_i$ is the radionuclide specific value of OIL for radionuclide i in drinking water, milk or other foods or beverages (Bq/kg or Bq/L).

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Canada's Nuclear Regulator

Report – Emergency Distribution of Potassium Iodide Within the Ingestion Planning Zone of Pickering Nuclear Generating Station

KI Pill Working Group

E-DOC # 6055615

DRAFT

December 2020

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

Canada

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Table 1 – Acronyms

Acronym	Definition
AAZ	Automatic Action Zone
CEMC	Community Emergency Management Centre
CMOH	Chief Medical Officer of Health
CNSC	Canadian Nuclear Safety Commission
CPZ	Contingency Planning Zone
DNERP	Durham Nuclear Emergency Response Plan
DPZ	Detailed Planning Zone
EMCPA	Emergency Management and Civil Protection Act
EOC	Emergency Operations Centre
EMO	Emergency Management Ontario
EPZ	Emergency Planning Zones
FERP	Federal Emergency Response Plan
FNEP	Federal Nuclear Emergency Plan
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IPZ	Ingestion Planning Zone
ITB	Iodine Thyroid Blocking
KI	Chemical formula of potassium iodide
MOH	Ministry of Health
MOHLTC	Ministry of Health and Long-Term Care
NGS	Nuclear Generating Station
NPP	Nuclear Power Plant (found only in document excerpts)
OFMEM	Office of the Fire Marshal and Emergency Management
OPG	Ontario Power Generation
PEOC	Provincial Emergency Operations Centre
PHU	Public Health Unit
PNERP	Ontario's Provincial Nuclear Emergency Response Plan
TNERP	Toronto Nuclear Emergency Response Plan
WHO	World Health Organization

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1. Introduction

The Canadian Nuclear Safety Commission (CNSC) held a public hearing from June 25-29, 2018, to consider the licence renewal application from Ontario Power Generation (OPG) for the Pickering Nuclear Generating Station (NGS). A number of intervenors raised concerns about the distribution of potassium iodide (KI) pills in the event of an emergency, and more specifically, how the vulnerable population (children under 18, pregnant women, and breastfeeding women) in the Ingestion Planning Zone (IPZ) would obtain KI.

At the hearing, the CNSC Executive Vice-President and Chief Regulatory Operations Officer made a commitment to the Commission to form a working group with Emergency Management Ontario (EMO), Ontario Ministry of Health (MOH), and OPG.

On May 14, 2019, the Terms of Reference (Appendix A) enacting the Working Group were signed by the CNSC, EMO, MOH, and OPG. Formal invitations to join the Working Group were sent on June 7, 2019 to Health Canada, Public Health Units, and Community Emergency Management Coordinators for the municipalities within the IPZ. The municipalities within the IPZ include York Region, City of Kawartha Lakes, Simcoe County, Peel Region, City of Toronto, and Durham Region. The City of Peterborough was also invited to join the Working Group as they are a designated host community. All invitations were accepted.

A dedicated webpage[1] [1] for the Working Group was launched in June 2019 on the CNSC website. The webpage currently provides general background information on the Working Group, project milestones, the Terms of Reference, information on the Advisory Committee, meeting minutes, and quick facts on KI pills. This webpage will be used as a repository of information for the Working Group and will continue to be populated with information and documentation related to the Working Group. In accordance with the Terms of Reference, this will include the Working Group deliverables such as the Phase I and II reports, and meeting minutes of the Working Group and Advisory Committee.

This document was written to meet the objectives and mandate of Phase I of the Working Group:

> *"To fulfill the commitment to the Commission to provide clarity on the existing plans and associated responsible authorities for distributing KI pills in the IPZ in the event of an emergency at the Pickering NGS."*

[1] URL: http://nuclearsafety.gc.ca/eng/resources/emergency-management-and-safety/potassium-iodide-pill-working-group.cfm

1.1 Purpose and Scope

This report meets the mandate of Phase I of the CNSC KI Pill Working Group by detailing existing plans and associated responsible authorities for the emergency distribution of KI in the Pickering NGS IPZ (depicted in Figure 1). The mandate of Phase I is described in the Terms of Reference (Appendix A)

The report is organized into the following sections:

1. **Introduction** – introduces the purpose of this document, defines key terminology, and provides relevant background information regarding the use of KI and nuclear emergency management.
2. **Planning for KI Emergency Distribution** – identifies current plans and details the current roles and responsibilities. (Appendix B contains specific plan excerpts and discussion of documents referenced in this report)
3. **Public Resources Relating to KI** – highlights the public information currently available by various stakeholders.
4. **Concept of Operations for KI Emergency Distribution** – highlights how emergency distribution of KI would be implemented based on the plans identified in Section 2.
5. **Conclusion** – summarizes sections 2 through 4 and defines the next steps intended for Phase II of the KI Pill Working Group.
6. **References** – lists the references to the various sources of information and documents discussed.

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1.2 Definitions

The following terms used in this report are defined below. Unless otherwise stated, the definitions in this section are consistent with Ontario's Provincial Nuclear Emergency Response Plan (PNERP) [2].

Automatic Action Zone (AAZ)	A pre-designated area immediately surrounding a reactor facility where pre planned protective actions would be implemented by default. This zone has a 3 km radius.
Contingency Planning Zone (CPZ)	An area surrounding a reactor facility, beyond the DPZ, where contingency planning and arrangements are made in advance. This zone is within a 10 km to 20 km radius.
Designated Host Municipalities	Municipalities designated in the PNERP that must address hosting an evacuating population in their municipal emergency plans. Relevant to Pickering is City of Peterborough.
Designated Municipalities	Municipalities designated in the PNERP that must address protecting their citizens from the hazard of a nuclear emergency in their municipal emergency plans. Relevant to Pickering are Durham Region and City of Toronto.
Detailed Planning Zone (DPZ)	A pre-designated area surrounding a reactor facility, incorporating the AAZ, where pre-planned protective actions are implemented. This zone has a 10 km radius.
Emergency Distribution	For the purposes of this document all distribution of KI to the general public during a nuclear emergency, as part of emergency response, shall be referred to as emergency distribution.
Emergency Management Ontario (EMO)	As of June 2020, the Office of the Fire Marshal and Emergency Management (OFMEM) is now Emergency Management Ontario (EMO). Documents published prior to June 2020 will refer to the ministry under its previous name. This document will refer to the organization with the current name.
Emergency Planning Zones (EPZ)	Planning zones define the areas beyond the boundary of a reactor facility, in which implementation of operational and protective actions are or might be required.
Ingestion Planning Zone (IPZ)	A pre-designated area surrounding a reactor facility where plans or arrangements are made to protect the food chain and drinking water supplies. This zone has a 50 km radius. For the purposes of this document, IPZ shall refer to the area between a radius of 10 km and 50 km, or the entirety of the CPZ and IPZ.
Iodine Thyroid Blocking (ITB)	ITB is a general term to refer to any form of stable iodine thyroid protection, including KI. For the purposes of this document, KI can be considered to refer to any form of ITB.

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Ministry of Health (MOH)	As of June 2019, the Ministry of Health and Long-Term Care (MOHLTC) is now the Ministry of Health (MOH). Documents published prior to June 2019 will refer to the ministry under its previous name. This document will refer to the organization with the current name.
Municipalities	The Municipalities referred to in this document are those with borders within the IPZ of Pickering Nuclear Generating Station. They are: City of Toronto, Durham Region, Kawartha Lakes, Peel Region, Simcoe County, the Regional Municipality of York, and associated lower-tier municipalities.
Potassium Iodide (KI)	KI can take many forms such as pills, tablets, liquid, etc. For the purposes of this document KI will be used to refer to any preparation generically.
Pre-distribution	For the purposes of this document all distribution of KI in advance of an event, as part of emergency preparedness, shall be referred to as pre-distribution.
REGDOC 2.10.1[2] Requirements [3]	For the purposes of this document, as 2.10.1 is part of Pickering NGS's licensing basis, items denoted with the word "shall" in the CNSC regulatory document are considered requirements.
Staging	For the purposes of this document, moving KI from the central stockpile to local storage locations in advance of possible emergency distribution shall be referred to as staging.
Vulnerable Population	During a nuclear emergency the vulnerable population, with respect to exposure to radioiodine and the use of KI, is considered children under 18, pregnant women, and breastfeeding women.

[2] URL: https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-10-1/index.cfm

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1.3 Overview of Canada's Nuclear Emergency Management Framework

The arrangements for KI pre-distribution and emergency distribution are relevant to the preparedness and response phases of emergency management for nuclear emergencies.

Preparedness relates to actions taken before a nuclear emergency in order to be ready to respond and manage its consequences, and includes the development of response plans and procedures, training of workers, maintaining emergency facilities, conducting exercises, pre-distribution of KI, and fostering public awareness.

Response refers to those actions taken during a nuclear emergency, both onsite and offsite, to reduce the magnitude of the hazard and manage its consequences on health, safety, and the environment. Response actions include supporting onsite accident management activities, protecting the public and emergency workers, emergency public communication, emergency medical assistance, and public protective actions (e.g. shelter-in-place, evacuation, KI pills).

In Canada, the respective roles of the various levels of government in nuclear emergency preparedness and response are derived from legislated responsibilities. Provincial and territorial governments bear the primary responsibility for protecting public health and safety, property, and the environment within their borders. The federal government regulates the peaceful use of nuclear energy in Canada, manages nuclear liability, and supports the nuclear emergency response of provinces within their boundaries.

The administrative framework of the Federal Emergency Response Plan (FERP) [4] and the Federal Nuclear Emergency Plan (FNEP) [5] bring together the resources and expertise available across the federal government to respond to nuclear emergencies in federal jurisdiction or support provinces in their response. In general, different levels of government, along with various agencies and organizations, have responsibilities for developing and implementing emergency plans to address nuclear emergencies with offsite impacts (i.e. outside the boundaries of CNSC-licensed nuclear facilities).

Guidelines for protective actions, such as Health Canada's *Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response* [6], are intended to assist federal and provincial emergency response authorities on choosing appropriate protective actions to protect public health and safety. Intervention levels in such guidelines are used to inform decisions on what measures are necessary to protect the public during a nuclear emergency. These guidelines are based, in part, on advice from international organizations such as the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP) and are found on the Government of Canada's publications website.

Regulatory requirements for licensees relevant to KI are established in CNSC REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response* [3] and Ontario Power Generation (OPG) must meet these requirements in accordance with the Pickering NGS *Licence Condition Handbook* [7].

As the offsite authority, the Province of Ontario maintains nuclear emergency response plans, which include provisions for KI pre-distribution and emergency distribution. The plans relevant to this document are Ontario's *Provincial Nuclear Emergency Response Plan (PNERP) – Master Plan* [2] and *Provincial Nuclear Emergency Response Plan (PNERP) – Implementing Plan for the Pickering Nuclear Generating Station (PNGS)* [8].

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1.4 KI Background

The information included in this section is derived from a variety of sources, most predominantly the MOH's *Potassium Iodide (KI) Guidelines* [9]. Excerpts of the pertinent sections can be found in Appendix B.4.2.2. Further information can also be found in Health Canada's Guidance. [6] (Appendix B.2).

1.4.1 What is KI?

KI pills or tablets are made of potassium iodide salts. KI contains stable non-radioactive iodine. Iodine is an essential element for human life. The thyroid gland uses iodine to produce the hormones thyroxine (T4) and triiodothyronine (T3). Nearly all of the iodine in the body is absorbed by the thyroid gland.

Because of iodine's role in human physiology, the thyroid gland is specifically vulnerable to radioactive iodine (e.g. I-131), also known as radioiodine. Uptake of radioiodine, such as that released in the very unlikely event of a nuclear emergency, is linked with increased risk of thyroid cancer.

KI provides a plentiful source of iodine, which saturates the thyroid gland with safe, stable iodine the human body needs. If taken shortly before or immediately after radioiodine exposure, KI reduces the uptake of radioiodine by the thyroid, greatly reducing the absorbed dose to the thyroid [10]. In this way, KI provides a valuable emergency protective action to guard against the risks of thyroid cancer.

The use of KI is well established as a supplemental emergency protective action when applied together with other protective actions such as sheltering-in-place and evacuation. KI is not capable of providing protection against any other forms of radiation (e.g. radioactive caesium) and does not protect against external radiation such as radiation deposited on the ground or surfaces. While KI does not prevent radioactive iodine from entering the body through ingestion or inhalation, it reduces the time it remains in the body. KI provides a valuable extra layer of protection during the very unlikely event of radioiodine release during a nuclear emergency.

1.4.2 Target Population

The risks and benefits of taking KI should be considered on an age-specific basis. Newborns and children are especially vulnerable to radioiodine, while members of the public over 40 years of age are unlikely to require KI. It is also important to note that elderly people are at a lower risk of developing radiation-induced thyroid cancer, and also may be at higher risk of experiencing adverse effects from KI ingestion.

Children (<1 month – 18 years), pregnant women, women who are breastfeeding, and workers responding within the zone where public evacuation, sheltering, or KI is considered are at highest risk for negative health effects to the thyroid from radioiodine, and therefore will benefit the most from ITB.

1.4.3 The Decision to Administer KI

In Ontario, the decision to instruct the public to consume KI is made by the Chief Medical Officer of Health (CMOH) in coordination with the Provincial Emergency Operations Centre (PEOC) and the local medical officers of health. Communication will be coordinated with local medical officers of health, the PEOC, and community emergency management centres (CEMC) to ensure consistency in messaging.

The communication of the CMOH decision to administer KI will include information about when, how, and by whom KI should be taken. It will also include incident-specific information such as: a rationale for the recommendation, risks and benefits of taking KI, where to obtain KI, dosage recommendations, and any other pertinent information deemed necessary at the time.

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1.4.4 KI Ingestion Timing Considerations

The benefits of KI are greatly dependant on their timely ingestion. Maximum protection comes if KI is taken less than 24 hours before radioiodine exposure [10], with rapidly reducing protection after exposure [11].

Ideally, KI ingestion should commence before exposure to radioiodine. The optimum time is two to six hours before a release occurs [9]. However, if that is not possible, it should commence as soon after first exposure as possible. After four hours, effectiveness is reduced by half, while no benefit is gained after a delay of 24 hours.

A single dose of KI protects the thyroid gland for 24 hours. The MOH may recommend taking a dose of KI every 24 hours if the potential dose to the thyroid is still high and evacuation is not feasible (excluding some at risk groups, see Section 1.4.5).

1.4.5 Risks and Other Concerns of KI

Individuals intolerant of KI at protective doses (i.e. individuals in whom repeat administration of KI raises safety issues) must be given priority with regard to other protective measures.

The risk of side effects from taking a dose of KI is extremely low for all age groups, and the overall benefit of KI outweighs the risk of side effects. Nevertheless, the possibility of such effects, though rare, requires that KI be:

- Reserved only for situations where it is absolutely necessary
- Only be taken when directed by the Province
- Be taken for a short time frame, i.e., one or two doses.

There is an increased risk of side effects for people with thyroid disorders. Such disorders are more commonly seen in adults and the elderly and are rare in children.

Thyroidal side effects may result from KI administration, especially in people with iodine deficiency. Further information regarding the risks of KI, including conditions that contraindicate administration of KI, can be found in the MOH guidelines [9].

1.4.6 Pre-distribution in Detailed Planning Zone

KI is pre-distributed within the detailed planning zone (DPZ), available at reception centres, and stockpiled for the IPZ of Canadian Nuclear Power Plants by the host province, as required by CNSC REGDOC 2.10.1 [3], section 2.3.4. Pre-distribution ensures that KI is available quickly for residents within 10 km of a Canadian NPP.

KI is also available for pre-distribution in the IPZ of Pickering and Darlington NPPs to those residents who request it, through a program coordinated between the designated municipalities and OPG (see Section 3.1.1). Details on the status of this voluntary pre-distribution are available in Appendix C.

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1.5 Emergency Planning Zone Terminology

Figure 1 depicts the Pickering NGS emergency planning zones (EPZs) as described in the PNERP [2].The boundaries of these EPZs may be defined by natural or infrastructure separation, resulting in nominally larger 3 km and 10 km zones.

Table 2 shows the various radii of Ontario EPZs as well as the related terminology used by different documents and organizations.

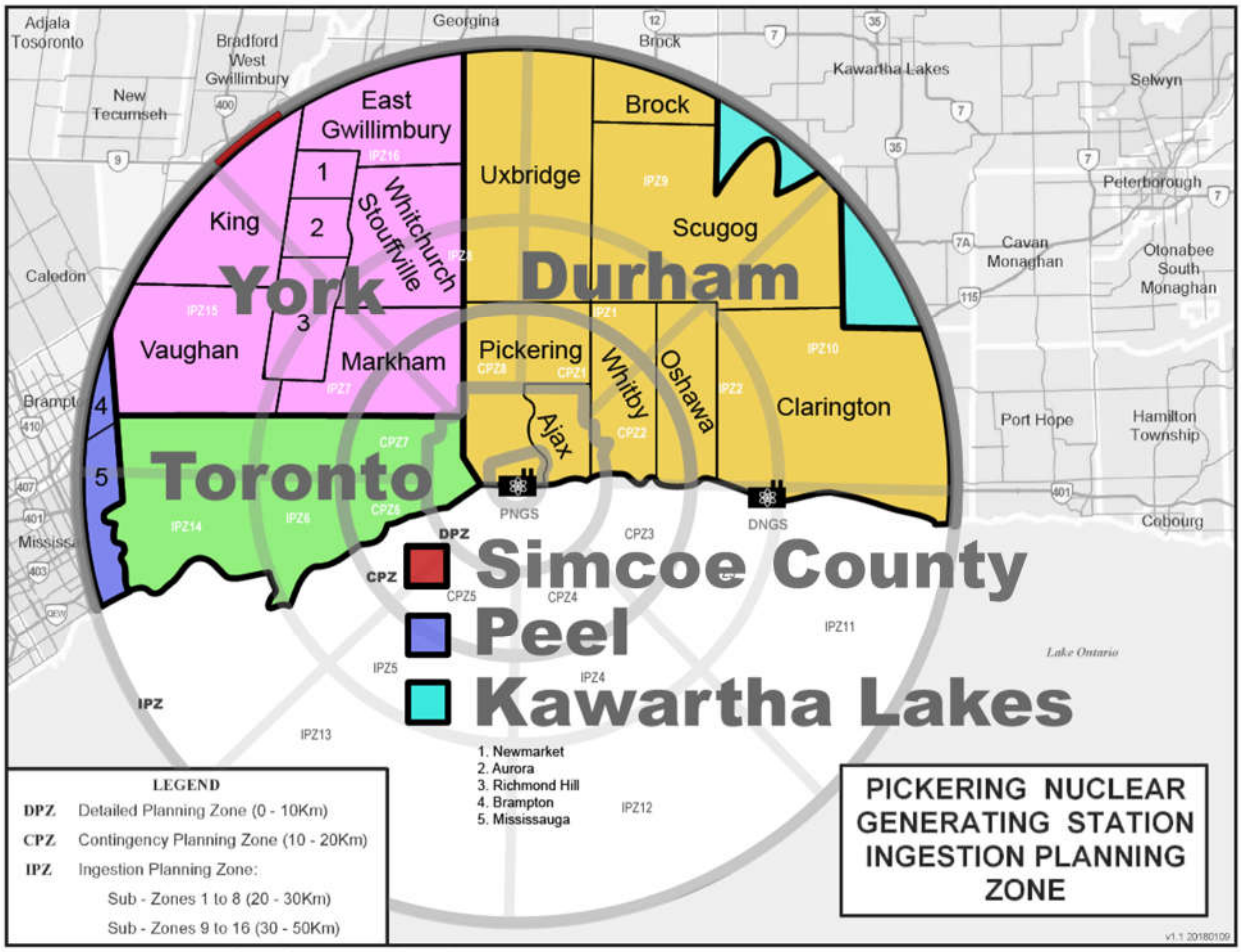


Figure 1 – Pickering NGS Planning Zones Map

Table 2 – Emergency Planning Zone Terminology

2017 PNERP (CSA N1600-16 [12]**)**	**IAEA***	**CNSC REGDOC 2.10.1**	**Province of Ontario Historical Nomenclature**
Automatic Action Zone (AAZ, 3 km)	Precautionary Action Zone (PAZ)	–	Contiguous Zone (3 km)
Detailed Planning Zone (DPZ, 10 km)	**Urgent Protective Action Zone (UPZ)**	**Plume exposure planning zone**	**Primary Zone (10 km)**
Contingency Planning Zone (CPZ, 20 km)	Extended Planning Distance	–	–
Ingestion Planning Zone (IPZ, 50 km)	**Ingestion and Commodities Planning Distance**	**Ingestion control planning zone**	**Secondary Zone (50 km)**

* The suggested radius of IAEA EPZs are found in *Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor* [13] and *GS-G-2.1* [14]. The UPZ radius is defined as out to 15-30 km based on the former [13] and out to 5-30 km as defined by the latter [14] (depending on site specific characteristics such as reactor power), which overlaps the DPZ and CPZ. The IAEA also defines and Extended Planning Distance out to 100 km and an Ingestion and Commodities Planning Distance out to 300 km.

1.6 International Guidance

The World Health Organization (WHO) has published guidelines on ITB [15]. These guidelines emphasize the importance of quick availability due to the time-limited effectiveness of ITB. Pre-distribution is recommended close to a reactor site. Farther from the site, where more time for decision-making is likely, stockpiling is suggested if pre-distribution is not feasible.

The IAEA also points to the necessity of pre-distribution within the precautionary action zone (PAZ, equivalent to AAZ) and urgent protective action planning zone (UPZ, equivalent to DPZ) due to the time dependant efficacy of ITB in GS-G-2.1 [14]. Canada's emergency preparedness review (EPREV) mission, detailed in the IAEA's *Peer Appraisal of the Arrangements in Canada Regarding Preparedness and Response for A Nuclear or Radiological Emergency* [16]*,* identified KI pre-distribution as a good practice:

> *"Good Practice 2 – The implementation of the arrangements for pre-distribution of KI pills maximizes the public awareness and the effectiveness of the protective action."*

International guidance is used in the creation of national guidance documents such as Health Canada's *Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response* [6], CNSC REGDOC-2.10.1 [3], and CSA Standard N1600 [12].

Some highlights of domestic and international KI distribution practices can be found in Appendix D.

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2. Planning for KI Emergency Distribution

This section contains an overview and discussion of the current roles, responsibilities, plans, and documentation related to KI distribution within the IPZ of Pickering NGS. All documents relevant to the Pickering IPZ's KI distribution (pre-distribution and emergency distribution) were considered.

2.1 Overview of Roles, Responsibilities, and Document Hierarchy

The roles and responsibilities of the various stakeholders, along with their relevant documentation, are summarized in Table 3. Requirements defining these roles & responsibilities are established in section 2.3.4 of the CNSC's REGDOC 2.10.1 [3] and confirmed in Ontario's PNERP [2, 8] and OPG's *Consolidated Nuclear Emergency Plan* [17]. For detailed excerpts from these plans and documents relevant to KI distribution, refer to Appendix B. The documents listed are those currently available as of June 2020.

Figure 2 shows the relative relationship of the documents listed in Appendix B. Arrows show linkages between the various plans (e.g. sources of information, declarations of responsibilities, overlapping plans). Generally, document linkages are structured in the same manner as the governmental hierarchy.

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Table 3 – Roles & Responsibilities

Roles & Responsibilities	Relevant Documentation Highlights and Linkages
CNSC	
• Define requirements in regulatory documents and ensure compliance with the *Nuclear Safety and Control Act* [18].	• REGDOC 2.10.1 [3] – defines requirements related to KI and is included in the Pickering NGS Licence Condition Handbook [7].
Health Canada	
• Provide recommendations on protective actions in accordance with responsibilities outlined in the FNEP [5].	• *Generic Criteria and Operational Intervention Levels for Nuclear Emergency Preparedness and Response* [6] includes dose-based criteria for the administration of KI as well as general guidance and advice related to its use.
OPG	
• Procure KI within the expiry date for residents and businesses in the DPZ and have KI stockpiled and ready for prompt emergency distribution in the IPZ [3, 7]. • Procure KI for institutions and first responders [3, 7]. • Work with designated municipalities to pre-distribute KI to the DPZ [3, 7]. • Ensure information pertaining to KI is publicly available [3, 7]. • Conduct robust, cyclical, and ongoing public education and awareness campaigns with the involvement of designated municipalities and the province [3, 7, 2, 8]	• The *OPG Consolidated Emergency Plan* [17] – considers KI pre-distribution.

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<table>
<tr><th colspan="2">Province of Ontario (MOH, EMO)</th></tr>
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The province is the offsite authority in the event of a nuclear emergency [2].
The province provides assistance, coordination, and guidance to municipalities [2, 8].
The Chief Medical Officer of Health (CMOH) shall direct the use of KI [2, 19].
EMO and MOH are to maintain a strategy for the emergency distribution of KI within the IPZ [2].
The province leads emergency communications strategies related to KI [7, 8].
Public education and awareness programs are co-ordinated by EMO in close cooperation with OPG and Designated Municipalities. [3, 2, 8].

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EMO:

The PNERP and Pickering Implementing Plan [2, 8] – consider KI pre-distribution and emergency distribution.

The PNERP references an IPZ KI emergency distribution strategy that is the responsibility of MOH and EMO. This strategy is not a document and is expanded on through Section 4.
Working level plans for the pre-distribution of KI are delegated to the designated municipalities.

MOH

Radiation Health Response Plan and Potassium Iodide (KI) Guidelines [19, 9] – Provide details about KI use.

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<tr><th colspan="2">Designated Municipalities of Pickering NGS (Durham Region & City of Toronto)</th></tr>
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Designated municipalities work with OPG to pre-distribute KI in the DPZ [2, 8, 20, 21, 22].
Designated municipalities must detail in their plans how KI will be made available to the public in the DPZ and IPZ [3, 2, 8].
The designated municipalities participate in emergency communications strategies to meet KI related objectives [3, 2, 8].
With the assistance of OPG and the province, the designated municipalities conduct public education and awareness campaigns with respect to KI [2, 8].

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<td>
Durham Region

The Durham Nuclear Emergency Response Plan (DNERP) [23] – considers KI pre-distribution.

The DNERP refers to the Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution [20] for KI specific details.

The NESF – considers pre-distribution (including voluntarily in the IPZ).

Emergency distribution in the IPZ is noted as the responsibility of MOH and EMO.

City of Toronto

The Toronto Nuclear Emergency Response Plan (TNERP) [21] – considers KI pre-distribution to workers and staff.

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Other governments within designated Municipalities (Ajax, Clarington, Oshawa, Pickering, Brock, Scugog, Uxbridge, Whitby)	
• Lower-tier municipalities assist the designated municipality in their response [22]. • There is no specific role defined for the lower tier municipalities.	• The Town of Ajax's all-hazard plan [24] – refers to the DNERP as the specific nuclear plan. • The Municipality of Clarington's all-hazard plan [25] – refers to KI pre-distribution and provides wording identical to the DNERP. • The City of Oshawa's all-hazard plan [26] – refers to a specific nuclear plan [27] which is not available to the public. • The City of Pickering's all hazard plan [28] – refers to the DNERP as the specific nuclear plan • The Townships of Brock [29], Scugog [30], Uxbridge [31], and the Town of Whitby [32] all hazard plans – Nuclear emergencies are not explicitly distinguished in these all-hazard plans.
Other Municipalities within IPZ (York, Peel, Kawartha Lakes, Simcoe County)	
• Municipal governments make arrangements to cooperate with and/or support OPG, designated municipalities, and Ontario in the response to a nuclear emergency [2].	• The Regional Municipality of York, Region of Peel, Kawartha Lakes, and Bradford West Gwillimbury (Simcoe County) all-hazard emergency response plans [33] [34] [35] [36] – Nuclear emergencies are not explicitly differentiated.

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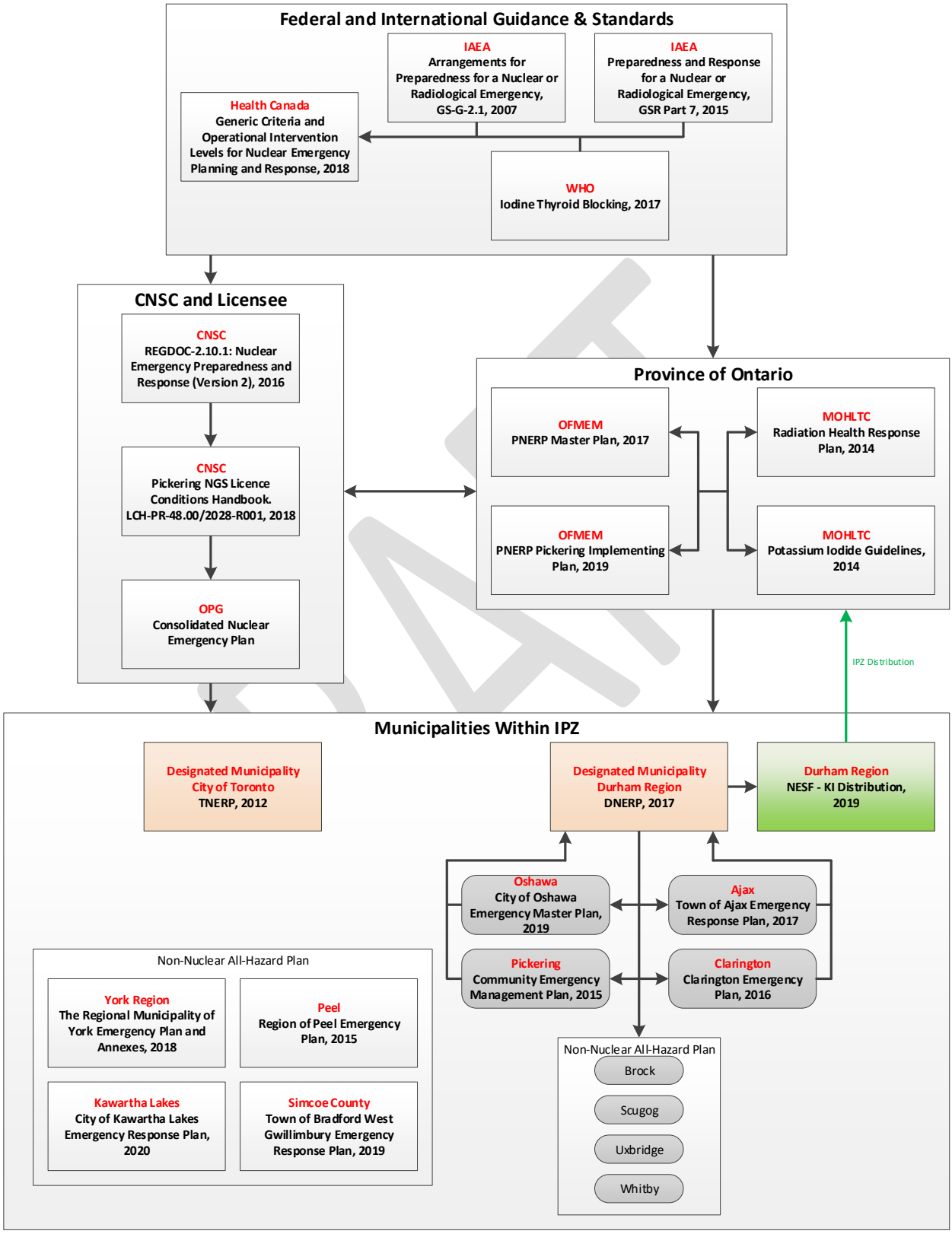


Figure 2 – KI document Map

2.2 Discussion on the Existing Arrangements for KI Emergency Distribution in the IPZ

This section will provide a discussion on the current status of KI emergency distribution planning for the Pickering NGS.

2.2.1 Documentation

The general hierarchy of the plans is well established and KI is clearly defined as a priority in most municipal, provincial, and federal plans. While DPZ pre-distribution is well documented in publicly available plans, specific plans for KI emergency distribution are not. The lack of specific plans for emergency distribution has led to increased requests for information from the public on how to obtain KI during an emergency.

Additionally, some municipalities do not mention KI or nuclear risks in their publicly available all-hazards emergency response plans. While cities and municipalities within Durham Region do not all explicitly state that they fall under the DNERP in their own plans, this is addressed through the *Emergency Management and Civil Protection Act* (EMCPA) [37]. The act states that lower-tier municipalities shall conform to the emergency plans of the upper-tier municipalities. As such, municipalities within Durham Region would conform to the DNERP during an emergency.

Durham Region's KI related NESF [20] is the sole KI specific document available at the municipal level and provides detailed information regarding how KI is pre-distributed in the DPZ. However, this document does not detail IPZ distribution or accessing stockpiles during an emergency, which is noted as the responsibility of the province in the PNERP [2].

In general, the IPZ and KI emergency distribution are often lacking consideration in publicly available plans, which are focused on pre-distribution activities in the DPZ. This report is intended to provide information to the public on KI emergency distribution (Section 4) and identify areas for the KI Pill Working Group to consider further in Phase II such as the establishment of detailed plans for KI distribution during an emergency (Section 5.2).

2.2.2 Responsible Authorities

The requirements of KI distribution are clearly defined by the CNSC and EMO (PNERP), and include requirements for both pre-distribution in the DPZ and availability in the IPZ. As the offsite authority, the province of Ontario is responsible for defining further requirements in its PNERP and works with OPG and the designated municipalities to ensure these requirements are met.

The PNERP defines that only designated municipalities are responsible for detailing in their plans the means by which the availability of KI pills is facilitated for any resident of the DPZ and the IPZ (PNERP Master Plan 6.5.2 (b) (vi)). This has been facilitated through large scale pre-distribution campaigns in the DPZ and public awareness in the IPZ. Through partnerships with OPG and the municipalities, KI is available to all residents of the IPZ upon request. This includes residents of non-designated municipalities. Details pertaining to the voluntary pre-distribution of KI in the IPZ can be found in Appendix C.

The province is responsible for KI emergency distribution. IPZ municipalities who are not categorized as designated municipalities, and have not identified radiological emergencies within their Hazard Identification and Risk Assessment, have no obligation to have prepared plans related to nuclear emergencies or KI. The province has sole responsibility for emergency distribution in these regions of

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the IPZ. However, the PNERP (Section 1.10) does define that cooperation and support of these municipalities may be ordered during an emergency. This relationship, and the expectations of municipalities during an emergency, is expanded upon in Section 4.

Distribution of KI entails a comprehensive emergency communication and public awareness and education strategy. This strategy includes a coordinated effort between OPG, designated municipalities, and the province. Various communication products are expanded upon in Section 3.

3. Public Resources Relating to KI

Part of the requirements outlined in REGDOC 2.10.1 [3] is that information pertaining to KI be disseminated to the public by a robust, ongoing, and cyclical public education program. This section outlines websites and information packages that have been made available to the public.

3.1 Public Websites

This section includes a discussion on some of the larger publicly available websites created to disseminate information to the public regarding KI. While awareness of, and the content posted on, these websites may be geographically targeted, any member of the public is freely able to access this information.

3.1.1 Prepare to Be Safe Website

The *Prepare to Be Safe* [38] website is a joint project between Durham Region, City of Toronto, and OPG. The website contains pertinent information on KI, offered in ten[3] different languages, and an online form for businesses and households to order KI (provided they are within the eligible zone). Members of the public are responsible for maintaining their personal supply of KI ordered through this website within the expiration date themselves. KI supplied through *Prepare to Be Safe* is not automatically renewed upon expiration.

The welcome page is shown in Figure 3. The site includes several sections with relevant information to the public, which can be accessed through the menu shown in Figure 4.

[3] *Prepare to Be Safe* is available in Arabic, Chinese, English, Farsi, French, Hindi, Spanish, Tagalog, Tamil, and Urdu.

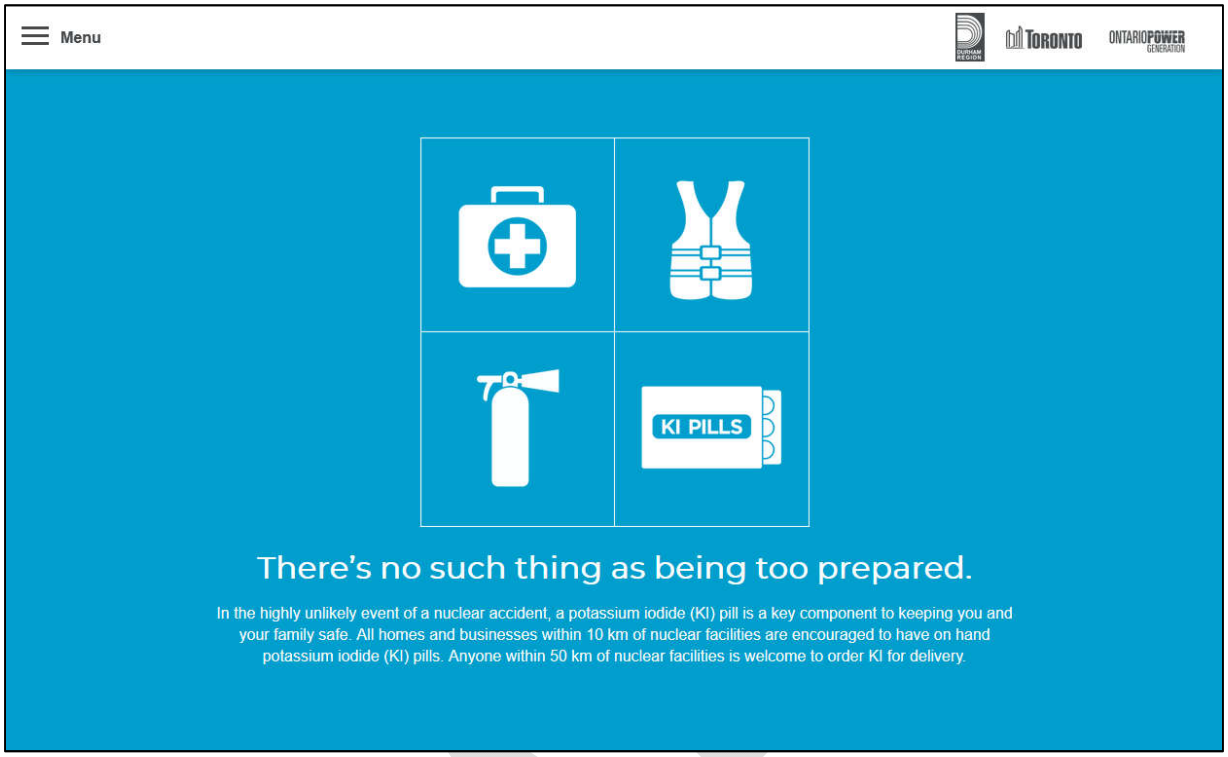


Figure 3 – Prepare To Be Safe: Welcome Page

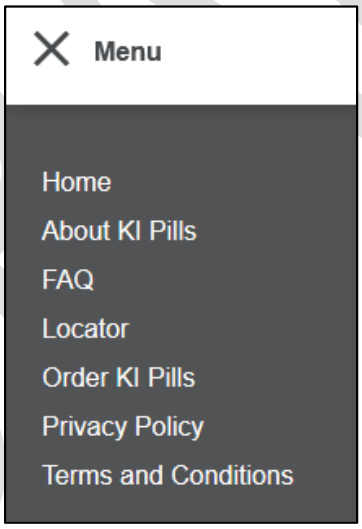


Figure 4 – Prepare To Be Safe: Menu

The Frequently Asked Questions, listed in Figure 5, provide information to most questions the public would have. This FAQ is downloadable in a variety of languages as a PDF [39].

Figure 6 shows the locator tool, which allows members of the public to determine if their address (postal code) is within the IPZ of Pickering or Darlington NGS to qualify for free distribution of KI pills. All businesses and households within the IPZ are eligible to receive a supply of KI, should they request it. Individuals living outside but working within the IPZ may order a personal supply to be delivered to their working address.

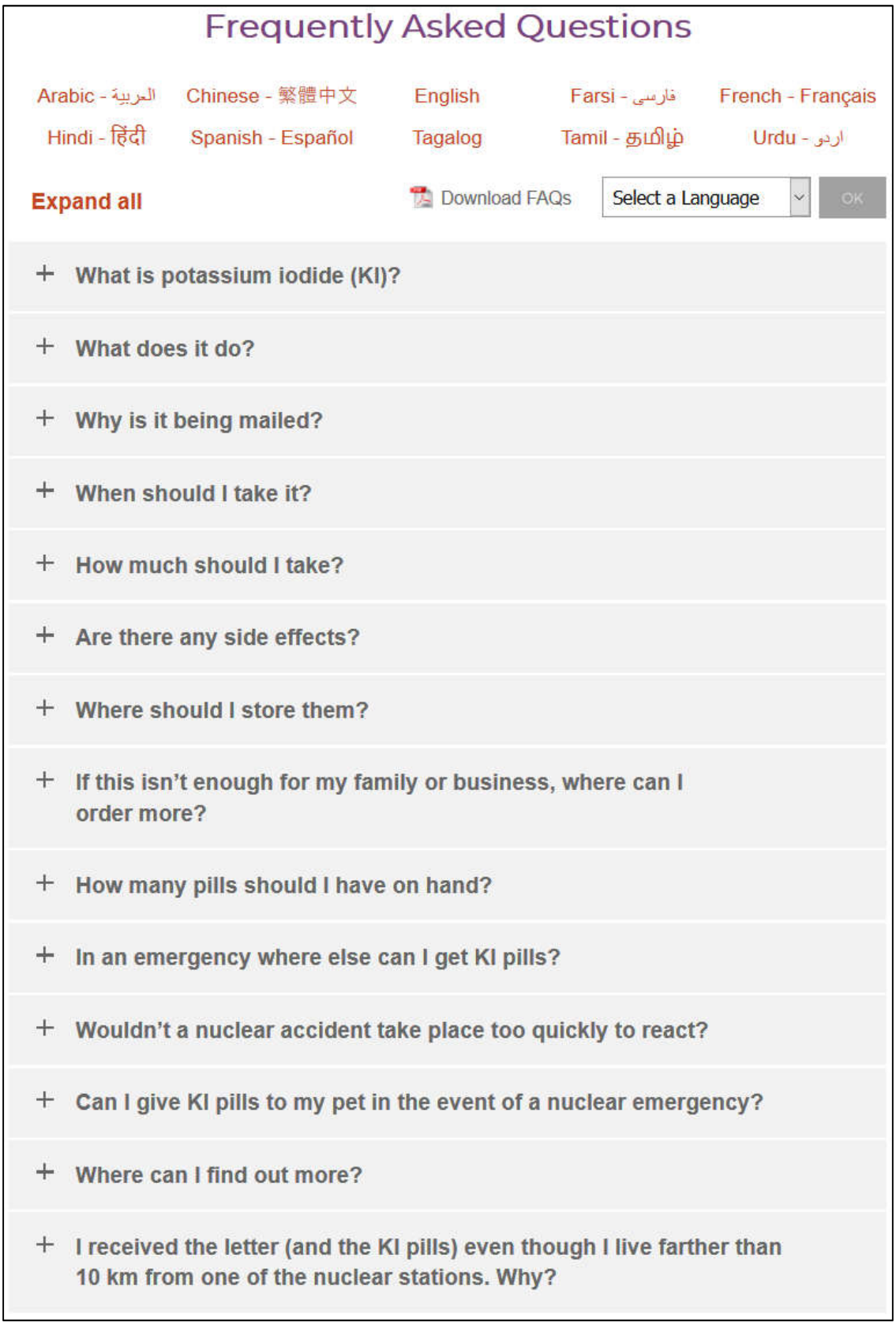


Figure 5 – Prepare To Be Safe: FAQ

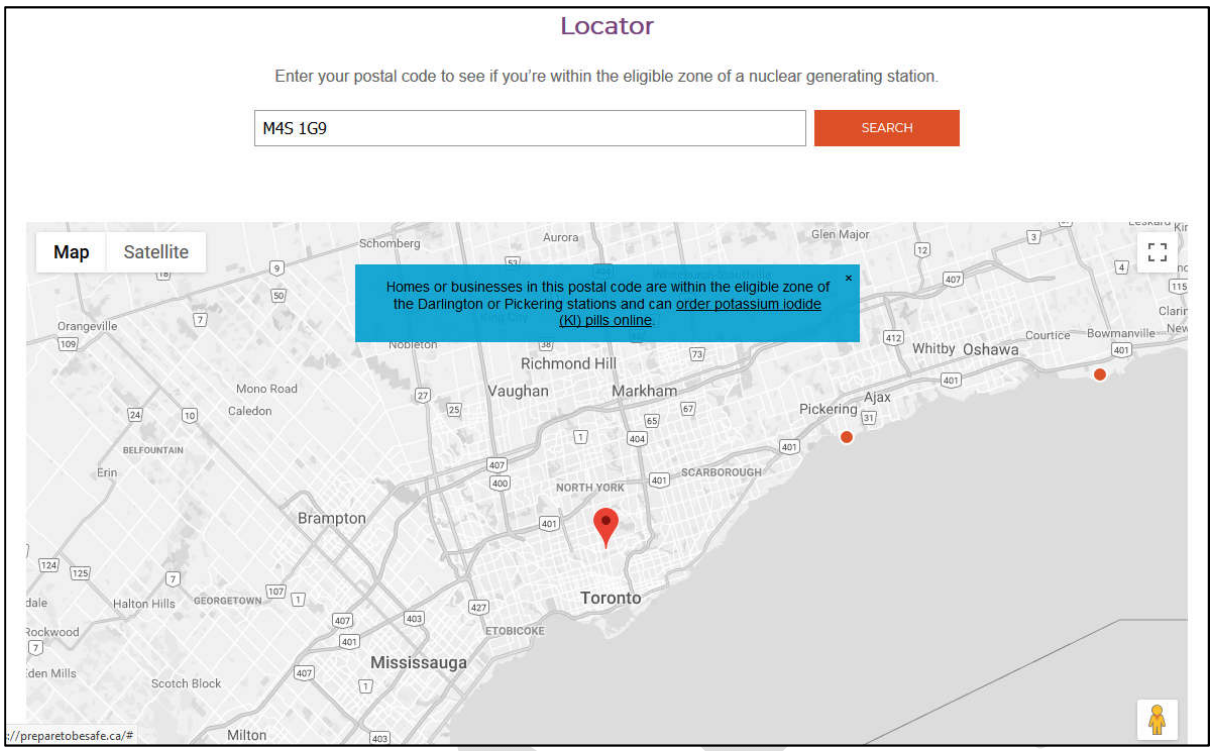


Figure 6 – Prepare To Be Safe: Locater Tool with Ordering Link

3.1.2 Durham Region

The Durham Region website contains a page dedicated to nuclear awareness [40]. The section dealing with KI can be seen in Figure 7.

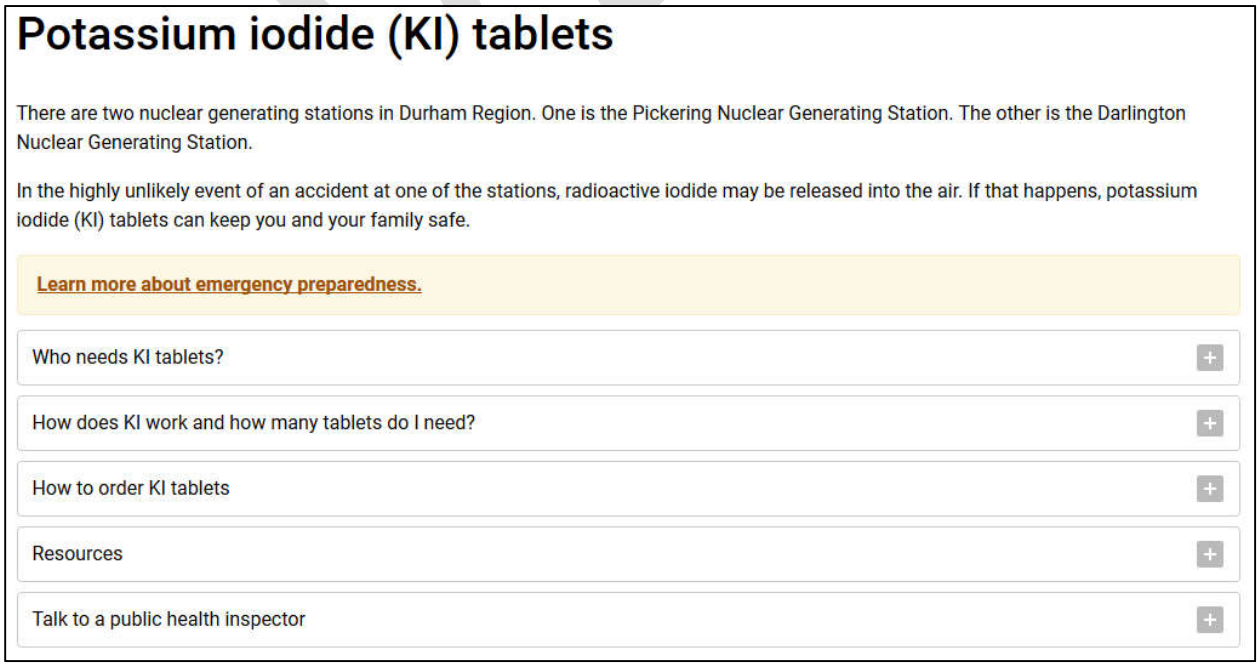


Figure 7 – Durham Region Nuclear Awareness - KI

The menus shown in Figure 7 contain information about KI, how to order it, and links to the MOH, *Prepare to Be Safe*, and EMO websites.

3.1.3 City of Toronto

The *Types of Emergencies* [41] webpage, accessed through the main city of Toronto page, has a section on protective measures. This section is shown in Figure 8 and includes some information on the EPZs, sheltering, and KI use. The webpage refers to *Prepare to be Safe* [38] for more information.

Protective Measures

The specific steps people can take to protect themselves from radioactive materials will be determined at the time of the emergency. They would be announced over television, radio and the internet by the Province of Ontario and implemented with the help of the City of Toronto, Region of Durham and other communities as required.
Protective measures may be needed for people who live, study or work within 10 km of the nuclear station. In the City of Toronto, this means locations east of Morningside Avenue to the border with the City of Pickering, Steeles Avenue to Lake Ontario. This area is called the Primary Zone, and includes the City of Pickering and Town of Ajax.

Protective measures that may be directed by the Province include:

- Leaving the areas within the Primary Zone
- Staying indoors
- Taking a dose of Potassium Iodide but only when directed by the Province

When taken at the right time, Potassium Iodide pills prevent or reduce the absorption of radioactive Iodine into the thyroid gland.

Potassium Iodide pills *do not protect* other parts of the body from any other radiation.

Special care is required if Potassium Iodide pills are given to young children. Please consult your family doctor for more information.

During a nuclear emergency, Potassium Iodide pills will be available at Reception-Evacuee Centres that will be set up at various locations in the Greater Toronto Area.

If you are outside the 10km zone, but within 50km of a nuclear station, you are eligible for free KI pills. Although you will not be receiving KI Pills as part of the eligible zone mailout, you can **order the pills on-line**.

More information is available at **www.preparetobesafe.ca** or by contacting Telehealth Ontario at 1-866-797-0000.

Figure 8 – City of Toronto Types of Emergencies: Protective Measures

3.1.4 MOH

The MOH website hosts the *Potassium Iodide Tablets (KI) Fact Sheet* [42]. This document contains information useful to the public about what KI is for and how it should be used. The fact sheet includes instructions on dosage, where to acquire a supply, and preparing liquid solutions (for those unable to swallow a tablet). The scope of this document is for the EPZs of Bruce NGS, Pickering NGS, Darlington NGS, Chalk River Laboratories, and Fermi 2.

3.2 Community Information and Public Education

Information package and KI pre-distribution kits are made available to the public in all emergency planning zones of Pickering NGS. Additionally, public education campaigns are conducted within designated municipalities to spread awareness of KI.

3.2.1 KI Pre-Distribution Packages

KI is pre-distributed to members of the public living within 10 km (DPZ) of the Pickering NGS in kits that contain information on their use. Similar packages are also available for order from *Prepare to be Safe* [38] to members of the public living within 50 km (IPZ) of the Pickering NGS or Darlington NGS. In

addition to a supply of KI, the kits contain information brochures. The kit shown in Figure 9 contains KI with a shelf life of approximately 12 years (from manufacturer).



Figure 9 – Prepare to be Safe KI Kit

The kit shown in Figure 9 matches the branding of Prepare to be Safe, and contains KI tablets and an information brochure built into the cover.

3.2.2 Public Education and Awareness

Various levels of government and OPG take part in public awareness and education campaigns that target areas of Pickering NGS's EPZs with information relevant to KI. Community information packages, such as the example in Figure 10, are given to members of the public.

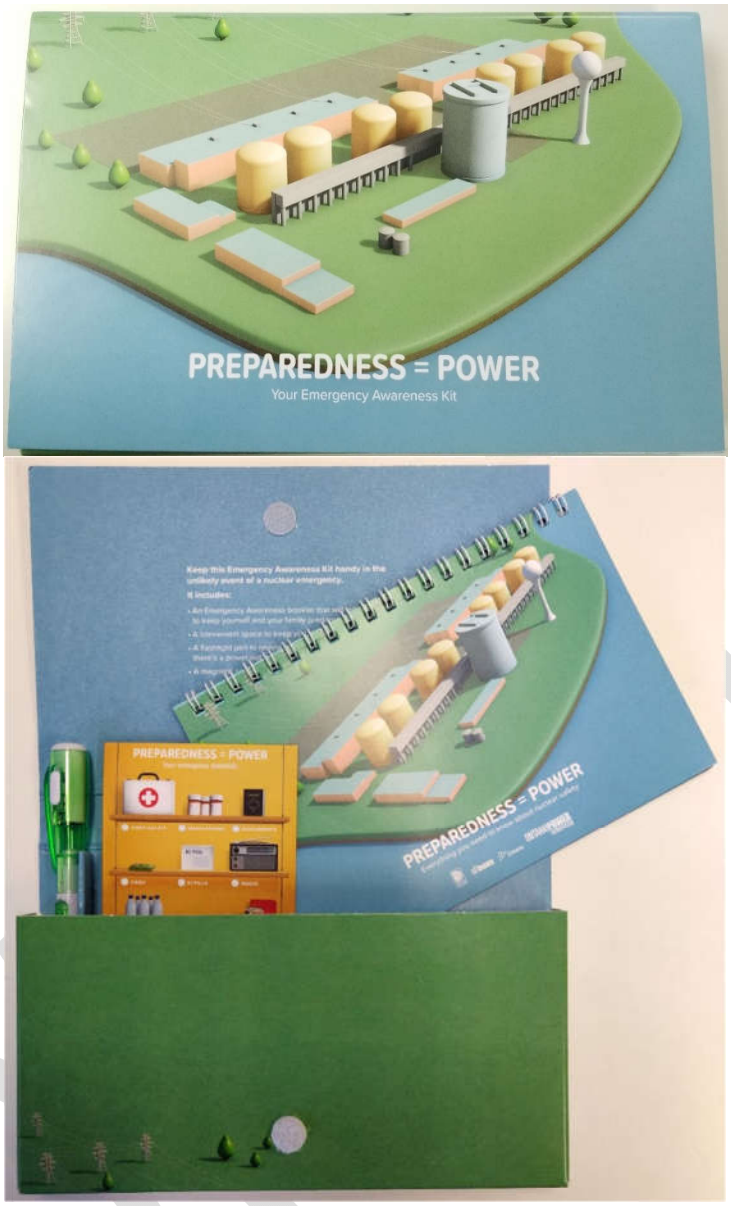


Figure 10 – "Preparedness = Power" Emergency Awareness Kit

The kit shown in Figure 10 includes an information booklet, a box (suitable for holding a supply of KI), and other branded material.

As the host municipality to two nuclear power plants, Durham Region has a detailed public outreach program. A KI tri-fold pamphlet and KI poster (Figure 11) are provided at all 8 municipal offices in the Region, the Ajax and Pickering Welcome Centres, all main libraries, and community centres in the DPZ. Three annual KI public awareness campaigns are held, focussed on the DPZ but extending into the IPZ, through various media (e.g. news releases, print ads, train ads, bus interior ads, social media, and digital display boards). Durham Region has also produced three YouTube videos to raise general awareness about KI – one of which focussed on the availability of KI to the IPZ.



Figure 11 – "New to Durham Region" Poster

The poster shown in Figure 11 includes information suitable for residents of the IPZ interested in ordering their own supply of KI.

4. Concept of Operations for KI Emergency Distribution

This section highlights the existing concept of operations for emergency distribution of KI in the IPZ during a nuclear accident. It does not address other protective actions. Given that such a response is highly dependant on the multiple variables associated with a severe accident, detailed plans are forgone in lieu of a concept of operations strategy – flexibility for a wide variety of possibilities is paramount.

The concept of operations, depicted in Figure 12, was confirmed through detailed discussions with all relevant stakeholders at the KI Pill Working Group workshop, which is summarized in publicly available meeting minutes [43]. The focus is on the offsite response undertaken by the province and the municipalities, however, actions related to KI which are undertaken by other stakeholders are also included.

The four overarching phases shown in Figure 12 are initiating event, staging of KI, emergency distribution of KI, and ingestion of KI. These are expanded on in sections 4.1 through 4.5.

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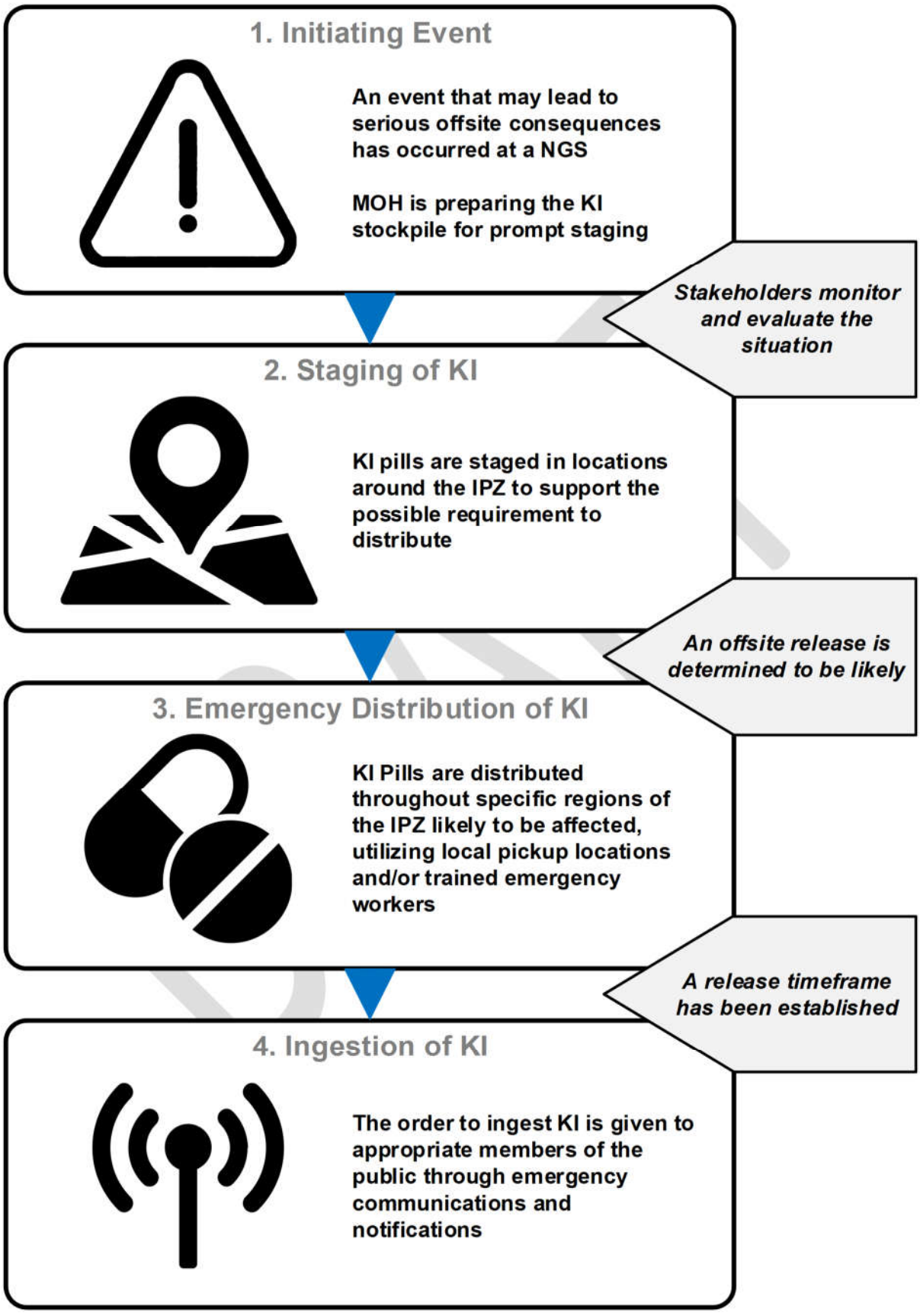


Figure 12 – High Level Concept of Operations for KI Emergency Distribution

4.1 Initiating Event – Notification and Preparation

At the onset of an event, OPG is required to notify the province, through the PEOC, within 15 minutes of initial categorization of an event at the Pickering NGS. Notification will be received by the PEOC via transmittal of an OPG notification form, followed by verbal confirmation. OPG must also notify the CNSC within 15 minutes of Emergency Response Organization (ERO) activation [3].

Based on the event categorization [2, 8] the PEOC will determine the Provincial Response Level and will notify the entire emergency response organization (federal departments, provincial ministries, nuclear facility, and designated municipalities for notification categories above *Reportable Event)*. There is a 15 minute requirement for the Province, through the PEOC, to notify the designated municipalities (i.e. Durham Region and the City of Toronto), of the Provincial Response Level that has been adopted. The MOH will follow up the PEOC notification with its own pre-established communications to relay this notification to Public Health Units (PHU). Upper-tier municipalities (PHUs/CEMCs) will notify lower tier municipalities, according to their notification protocols.

Similarly, depending on the event categorization, the CNSC may send notifications to partners such as Health Canada, Public Safety Canada, and the IAEA.

Offsite organizations will begin to activate their own Emergency Operation Centres (EOCs) commensurate with the provincial response level adopted by the PEOC. Through these EOCs, the organizations will observe and evaluate the situation, following plans highlighted in Section 2. The PEOC will evaluate the offsite consequences as they relate to required protective actions such as KI. An event where protective actions may be required, whether as a result of accident progression or severe initiating event, will result in the adoption of the Full Activation Provincial Response Level.

Public communications will also be categorization dependant. For example, in a reportable event resulting in a Routine Monitoring provincial response level, there may be little to no information released to the public given there are no offsite safety concerns. If appropriate, the response organization communication teams may begin monitoring social media and news releases upon initial notification to address any public inquiries that may arise. In the higher response levels, teams will begin developing communication strategies to assist in coordinating messages with other municipal, provincial, and federal communication teams and disseminating information to the public. Further, the province has the responsibility for disseminating geo-targeted emergency bulletins to notify the affected public of the situation and to instruct them to monitor media for protective actions they may need to take.

Scientific analysis is undertaken by the Scientific Section at the PEOC to determine possible offsite consequences. Based on their determinations, processes to ensure access to KI pills will be undertaken (see section 4.2).

In order to maintain as much timely readiness as possible, the MOH and EMO would begin preparing KI stored at the central stockpile for shipment. This ensures KI is promptly ready, should staging be required.

4.1.1 Emergency Public Alerting System

As required by the PNERP, OPG assists the designated municipalities in the establishment and maintenance of a public alerting system within the AAZ and DPZ.

Alerting within the AAZ is designed to warn practically 100% of the population, whether indoors or outdoors, and irrespective of the time of day or year. “Practically 100%” means that the Public Alert can

be heard by nearly everyone in the 3 km AAZ unless exceptional circumstances provide an impediment (e.g. hearing impairment). DPZ alerting is on an "area-wide basis", which does not presume that 100% of the population in the 10 km DPZ will necessarily receive the alert.

Public alerting takes the form of outdoor alerting by means of sirens for the AAZ and indoor alerting through mass telephone dialing systems for the DPZ (including the AAZ). This mass telephone dialing system is targeted only at land line phones and is not related to the cellular/radio/television linked Alert Ready system.

The public alerting system is not intended to instruct the population to evacuate, only to notify them of an ongoing event. In addition to the alert, the PNERP requires the province to release a simultaneous emergency bulletin utilizing such means as social media, broadcast media, and the Alert Ready system. Emergency bulletins contain specific instructions on what actions the public should take and where to get more information. The information included in an emergency bulletin is detailed in the PNERP and can be found in Table 4. Broadcast of the emergency bulletins should be continuously repeated.

Geographically targeted provincial emergency bulletins will be used to inform the public of actions they must take. The order to ingest KI, as approved by the CMOH, will be sent through these means.

Table 4 – PEOC Emergency Bulletin Contents

Partial PEOC Activation	Full PEOC Activation an emission expected within 36 hours
• Date and time of expected emission • Sectors (by geographical description) which may be affected • Applicable precautionary and protective measures for the affected sectors or area and applicable timings (in the case of a delayed emission it may be appropriate to delay the application of some of them) • Public inquiry phone number(s) and websites	• Date and time of expected emission • Precautionary measures directed in the applicable zone(s) • Protective measures and the affected sectors or zones • Reception Centres which can receive evacuees without accommodation • KI pill ingestion details and availability information, as applicable • Public inquiry phone number(s) and websites

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4.2 Staging of KI

Plant conditions and meteorological data are used to determine, in advance, when a release may occur and the direction it may travel. This allows for time to inform and implement protective actions. Specifically, response authorities such as the province, OPG, CNSC, and Health Canada will conduct assessments within their areas of responsibility, including dispersion and dose modelling. Response authorities will share and coordinate these results to inform situational awareness and protective action decision making.

Forecasting and modeling of an anticipated release will be used to determine which areas of the planning zones might be affected. This will be shared among the various response authorities. The PEOC will continue to provide updates and information to PHUs and CEMCs.

In the event that a release is anticipated or likely, and meteorological conditions are such that areas of the IPZ could be affected, staging of KI pills will be initiated by MOH to ensure KI pills are available for emergency distribution if required.

Logistical and planning considerations for staging KI in the IPZ will be discussed between EMO, MOH, and other relevant response authorities to facilitate timely emergency distribution. The basic concept for the process would involve:

- The MOH informing the Chief Medical Officer of Health (CMOH) that logistical requirements are being arranged for the transportation of KI pills to certain locations within the IPZ.
- The province recommending the IPZ area(s) within which KI pills will be required for potential ingestion purposes. It is expected that distribution of KI pills to the entire IPZ will not be required.
- The province liaising with the municipalities identified as possibly being affected (i.e. within the path of weather patterns) in order to advise of the required staging of KI pills to locations within the municipality.

Public emergency communications will continue to play a key role in the response to an event. Each response authority will have activated their communication teams to respond to public inquiries and disseminate information to the public. Stakeholders are required to communicate information based on their jurisdictional responsibilities and continue to reinforce information disseminated by the province and OPG. In all stages of the response, clear, consistent, and coordinated messaging is a priority for communicating with the public.

Specific protective action information that is directed by the PEOC will be issued through emergency bulletins disseminated to the potentially affected public through provincial alerting mechanisms (see Section 4.1.1)

It is important to highlight that staging will occur before any need to distribute KI pills and that staging of KI does not indicate in any way that ingestion of KI will be required. Staging would be conducted as a precaution and to ensure distribution can occur in a timely manner, if required.

4.3 Emergency Distribution of KI

As the event progresses, the analyses considered in section 4.2 may indicate an anticipated release could occur with offsite consequences for specific areas of the IPZ. This information will be used to determine areas that may require protective actions and which actions might be required.

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Distribution of KI pills in the IPZ will begin when an anticipated release is conservatively predicted by the PEOC Scientific Section to result in offsite consequences in the IPZ.

The province will ensure that staged KI pills are distributed to specific areas of the IPZ where the release is anticipated to travel. The distribution includes the entire population of these specific areas, which captures the vulnerable population (children under 18, pregnant women, and breastfeeding women). Additional distribution arrangements may be in place for facilities that require assistance during an emergency (e.g. long-term health care and hospitals).

The precise means of emergency distribution will depend on event specific factors, and will utilize all available resources. Residents of the IPZ will be provided with the required information on how to retrieve/receive KI pills and information for ingestion through emergency bulletins.

KI emergency distribution in the DPZ will proceed in a similar manner as the IPZ for members of the public who lost, misplaced, or otherwise do not possess a pre-distributed supply.

4.4 Ingestion of KI

The decision-making process that will lead to an order to ingest KI will occur simultaneously with the emergency distribution of KI pills (Section 4.3).

The order to take KI pills will be a recommendation from the PEOC Command Section to the CMOH, based on Scientific Section advice. Ultimately, the CMOH has the authority, in consultation with the PEOC and the appropriate local Medical Officers of Health, to order the ingestion of KI pills.

This order will be broadcast to the affected areas through existing emergency bulletin systems, beginning roughly 6 hours before anticipated exposure. The information provided will include information on the use of KI pills, dosage, and the required timing. As KI efficacy is time sensitive, the order will be given in advance of the ingestion time. Generally, ingestion will be instructed 2 hours before exposure (i.e. release).

4.5 End of Release Event

After a release event has concluded an order will be given to the affected residents that no further KI dose would be required and to stop ingestion. Communications will focus on stopping KI use and further protective actions unrelated to KI.

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5. Conclusion

5.1 KI Emergency Distribution in the IPZ

This document provides clarity on the existing plans and associated responsible authorities for the emergency distribution of KI in the Pickering NGS IPZ.

5.1.1 Role and responsibilities

The roles and responsibilities of each organization are clarified in Section 2, sourced from the various documents and plans of the involved stakeholders. Pre-distribution of KI within the DPZ is well established as the responsibility of the designated municipalities, with the assistance of OPG. Emergency distribution in the IPZ is the responsibility of the province, as outlined in the current documentation.

While the responsible authority is defined clearly in the documentation and plans, the roles and details of implementing this responsibility are not currently fully defined with regard to KI emergency distribution in the IPZ. This is instead expanded on through the high level concept of operations in Section 4.

5.1.2 Public information and communications

The various responsible stakeholders have public awareness and education information systems in place, and the province maintains a strategy for emergency communications during an event. Section 3 details some of the available information the public can turn to for information on KI. Information campaigns are held periodically by OPG and the designated municipalities, particularly Durham Region, to point members of the public to reliable sources and increase awareness of KI.

Information is available on municipal, provincial, and federal websites and documents referenced in this report. Community mailers, advertisements, and other communications campaigns are used to reach members of the public who reside in the DPZ and the IPZ.

5.1.3 Concept of Operations

The concept of operations for the unlikely emergency distribution of KI to locations in the IPZ is outlined in Section 4.

This concept of operations was confirmed through detailed discussions with the relevant stakeholders. It is intended to be as flexible as possible to reflect the wide variety of possible scenarios an unlikely event would include. As such, detailed procedures are not available.

The concept of operations deals with four overarching phases relevant to KI emergency distribution in the IPZ. These phases are initiating event, staging of KI within the IPZ, emergency distribution of KI within the IPZ, and ingestion of KI. Each phase includes actions the offsite authorities will need to undertake in order to move KI to the residents of the IPZ.

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5.2 Next Steps

This document will serve as the summary of work completed for Phase I of the KI Pill Working Group. Subsequent to this, the KI Pill Working Group will proceed to Phase II. As described in the Terms of Reference (Appendix A), Phase II will focus on:

- Feasibility of pre-distribution of KI pills to all schools within the IPZ
- Establishing clear and detailed plans for the distribution of KI pills throughout the IPZ, if necessary.

The following topics were also raised during the Phase I workshop and during development of this Phase I report for consideration during Phase II:

- Public awareness and education in designated and non-designated municipalities
- Pre-staging of the centralized stockpile to municipalities in the IPZ
- Development of a pre existing emergency communications strategy for use by Municipalities and PHUs within the IPZ during an event.

Phase II will proceed at the completion of Phase I, signified by the publication and presentation of this report to the Commission.

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Appendix A KI Pill Working Group Terms of Reference

Canadian Nuclear Safety Commission Potassium Iodide (KI) Pill Working Group

TERMS OF REFERENCE

May 2019

Summary

The Canadian Nuclear Safety Commission (CNSC) held a public hearing from June 25–29, 2018 to consider the licence renewal application from Ontario Power Generation for the Pickering Nuclear Generating Station (NGS). A number of intervenors raised concerns about the distribution of potassium iodide (KI) pills in the event of an emergency, and more specifically, how the vulnerable population (children under 18, pregnant women and breastfeeding women) would obtain these pills.

At the hearing, the CNSC Executive Vice-President and Chief Regulatory Operations Officer made a commitment to the Commission to form a working group to provide clarity on the existing plans and associated responsible authorities to distribute KI pills (in the Ingestion Planning Zone (IPZ), within a 50-km radius) in the event of an emergency at the Pickering NGS. Responsibilities and guidance for planning, preparedness and response regarding iodine thyroid blocking are detailed in the Provincial Nuclear Emergency Response Plan (Master Plan and Implementing Plans).

On January 3, 2019, the Commission made publicly available its detailed Record of Decision for the renewal of Ontario Power Generation's Power Reactor Operating Licence for the Pickering NGS. In the detailed Record of Decision the Commission provides support and direction to the CNSC KI Pill Working Group. The Terms of Reference have been developed in support of fulfilling commitments made to the Commission and direction received from the Commission.

This document details the Terms of Reference for this working group.

1. Mandate

1.1 The mandate of the CNSC KI Pill Working Group (the Working Group) is the following:

- Fulfill the commitment to the Commission to provide clarity on the existing plans and associated responsible authorities for distributing KI pills in the IPZ in the event of an emergency at the Pickering NGS (Phase I); and,
- Fulfill the direction from the Commission in the detailed Record of Decision (Phase II).

The Working Group will work cooperatively and proactively to fulfill its mandate in a timely manner. Upon completion of Phase I, the Working Group will proceed to Phase II. The Working Group will cease to operate following the completion of Phase II.

Strategy to meet mandate

1.2 The strategy for Phase I of the Working Group is to focus on the following:

- Current provincial and federal requirements for the distribution of KI pills;

- Considerations and education concerning KI pill emergency distribution in the IPZ;
- Means of KI pill distribution in relation to other factors associated with a nuclear emergency response; and,
- Availability and scope of public emergency preparedness information related to KI pills.

1.3 The strategy for Phase II of the Working Group is to focus on the following:

- Feasibility of pre-distribution of KI pills to all schools within the IPZ; and,
- Establishing clear and detailed plans for the distribution of KI pills throughout the IPZ, if necessary, following the completion of Phase I.

2. Membership

2.1 The Working Group is composed of representatives from the CNSC, the Office of the Fire Marshal and Emergency Management (OFMEM), the Ontario Ministry of Health and Long-Term Care (MOHLTC) and Ontario Power Generation (OPG), and each organization is a signatory to these terms of reference. The CNSC representatives are from the Directorate of Power Reactor Regulation and the Directorate of Security and Safeguards. The OFMEM, MOHLTC and OPG may select up to two permanent representatives each for the Working Group.

2.2 The Public Health Units from Peel Region, York Region, City of Toronto, Durham Region, Simcoe Muskoka District, Haliburton-Kawartha-Pine Ridge District, and Peterborough County may also select one permanent representative each for the Working Group. These Public Health Units are either located in the IPZ or have assigned roles and responsibilities (i.e., Peterborough) in a nuclear emergency at the Pickering NGS.

2.3 The Emergency Management Coordinators (EMCs) from the Region of Peel, Regional Municipality of York, City of Toronto, Regional Municipality of Durham, City of Kawartha Lakes, and City of Peterborough may also select one permanent representative each for the Working Group. These EMCs are either located in the IPZ or have assigned roles and responsibilities (i.e., City of Peterborough) in a nuclear emergency at the Pickering NGS.

2.4 The OFMEM, MOHLTC, EMCs and Public Health Units will liaise, as necessary, with other EMCs and Public Health Units that fall within the IPZ or have assigned roles and responsibilities in a nuclear emergency at Pickering. The CNSC and OPG will provide support, as needed.

2.5 Health Canada may also select one permanent representative for the Working Group.

2.6 The chairperson is selected from among the CNSC representatives by CNSC senior management. The chairperson's role is to prepare the agenda for Working Group meetings, chair the Working Group meetings, and take responsibility for all organizational and communication issues. The chairperson can delegate their duties to the other CNSC representative at any time.

2.7 Three co-chairs are selected, one each from the OFMEM, MOHLTC and OPG, to serve as the primary contact for organizational issues and communication purposes. Co-chairs can delegate their duties to the other OFMEM, MOHLTC or OPG representatives at any time.

2.8 The chairperson and co-chairs are responsible for inviting any person(s) to participate in or observe meetings of the Working Group.

2.9 A representative of the CNSC serves as secretary for the Working Group. The secretary is responsible for the recording and distribution of meeting minutes, the distribution of all documents related to Working Group meetings, and any communications required in support of the Working Group.

2.10 Each member is responsible for meeting the timelines and objectives agreed to by the Working Group. All members are accountable for their area of responsibility. Members have the authority to negotiate and enlist the help of other staff, as needed. Because good communication is fundamental for success, members must inform the chairperson and co-chairs that a commitment cannot be met as soon as they know or suspect this to be so, and they must negotiate an alternate date or make alternate arrangements. Members are responsible for bringing any risk issues to the attention of the chairperson and co-chairs in a timely manner.

3.0 Meetings

3.1 The Working Group will meet a minimum of once every six weeks. Additional meetings can be held with the consensus of the Working Group. The preferred method for Working Group meetings is face to face, but video and teleconferencing are also options.

3.2 Barring unforeseen circumstances, Working Group members who are unable to attend must notify the chairperson or the co-chair of their absence at least three working days before the meeting. Members have the option to participate by video or teleconferencing.

3.3 The chairperson is responsible for determining the time and place of the meetings. All members of the Working Group assume responsibility for their personal costs to attend.

3.4 The CNSC is responsible for the costs associated with the meeting, such as room rental and any associated hospitality. The Working Group members assume responsibility for the cost of their meals and transportation.

3.5 The objective is to send the agenda to the Working Group members one week before a meeting. Any documents required will be distributed at least three days before the meeting. The secretary of the Working Group will distribute a draft copy of the minutes no later than two weeks after each meeting. Members will have 10 working days to provide comments to the secretary so that the minutes can be prepared for approval at the next meeting. Meeting minutes of the Working Group will be made publicly available following concurrence of the minutes by all working group members.

4.0 Deliverables

4.1 The Working Group is responsible for the following deliverables cooperatively:

- Develop draft terms of reference
- Finalize the terms of reference and distribute them to the responsible authorities of the CNSC, OFMEM, MOHLTC and OPG identified in section 6 for signature
- Prepare the Phase I and II reports to meet the mandate and respective focus, as described in section 1

4.2 CNSC staff are responsible for the following deliverables:

- Post the draft terms of reference on the CNSC website for a 30-day public comment period
- Post the Phase I and II draft reports on the CNSC website for a 30-day public comment period
- Send a letter with the Phase I and II reports notifying Indigenous communities with potential or asserted treaty rights and title of the public review period; and coordinate any meetings with interested communities and working group members
- Produce and present the appropriate Commission member documents in support of the Commission's public meetings on Phase I and II (separate proceedings). Meeting materials will be made publicly available in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*.

4.3 CNSC staff will establish a special committee for the purpose of advising CNSC staff. Composition of the committee will be established by the CNSC. Operating Procedures will be developed by CNSC staff and circulated to members of the special committee for review and concurrence. The Operating Procedures and Meeting Minutes from all meetings will be made publicly available.

4.4 The Working Group will develop a project plan, outlining the deliverables and anticipated timelines.

4.5 CNSC staff will provide progress updates on the completion of all deliverables identified in point 4.1 and 4.2 to the Commission through the status report on power reactors.

4.6 The OFMEM and MOHLTC will provide progress updates on all deliverables identified in point 4.1 and 4.2 to the Ontario Nuclear Emergency Management Coordinating Committee.

5.0 Review of the terms of reference

5.1 The terms of reference are intended to support the effectiveness of the team by providing direction on team organization and work processes. This document can be reviewed and amended as needed with the agreement of all Working Group members. All amendments must be approved by the signatories to these terms of reference.

6. Management oversight

6.1 CNSC senior management will provide high-level strategic direction on systemic opportunities for improvement relating to the Working Group terms of reference, roles and responsibilities, and critical issues.

6.2 The Working Group members are responsible for disseminating any information from their respective senior management to the Working Group and ensuring any issues brought to the Working Group are raised with their senior management.

6.3 The senior management of all signatory parties may also engage directly, as needed.

7. Management approval

I concur with these terms of reference and support the Working Group members and associated responsibilities.

Once these terms of reference have been signed, the Working Group will be enacted.

Ramzi Jammal
Executive Vice-President and Chief Regulatory Operations Officer Canadian Nuclear Safety Commission

Scott Burns
Vice President Security and Emergency Services
Ontario Power Generation

Jon Pegg
Chief of Emergency Management
Office of the Fire Marshal and Emergency Management, Ministry of Community Safety and Correctional Services

Dr. David Williams
Chief Medical Officer of Health
Ministry of Health and Long-Term Care

Appendix B Document Excerpts

B.1 CNSC

The CNSC publishes regulatory documents to clarify expectations defined under the Nuclear Safety and Control Act [18] (NSCA) and define requirements that are included in a Licence Conditions Handbook. These regulatory documents cover the entire spectrum of the CNSC's activities.

B.1.1 REGDOC-2.10.1: Nuclear Emergency Preparedness and Response, Version 2

REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response V2* [3] is part of the CNSC's Emergency Management and Fire Protection series of regulatory documents.

REGDOC-2.10.1 sets out the emergency preparedness requirements and guidance of the CNSC related to the development of emergency measures for licensees and licence applicants of Class I nuclear facilities and uranium mines and mills to satisfy:

- the requirements of subsection 24(4) of the *Nuclear Safety and Control Act*, by demonstrating that the applicant will, in carrying on the proposed activity, make provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed

- paragraph 6(*k*) of the *Class I Nuclear Facilities Regulations* and subparagraph 3(*c*)(*x*) of the *Uranium Mines and Mills Regulations*

Section 2.3.4 of REGDOC 2.10.1 Version 2 defines requirements related to ITB. These requirements are presented in Table 1.

Table 5 – REGDOC 2.10.1 V2, Section 2.3.4

Additional requirements for licensees of reactor facilities with a thermal capacity greater than 10 MW and with designated offsite emergency planning zones.

These licensees shall provide the necessary resources and support to provincial and municipal authorities in implementing the provincial and municipal plans to do the following, or shall do the following:

1. ensure that a sufficient quantity of iodine thyroid-blocking (ITB) agents is pre-distributed, to all residences, businesses and institutions within the designated plume exposure planning zone, together with instructions on their proper administration

2. ensure that a sufficient quantity of ITB agent is pre-stocked and available within the designated ingestion control planning zone; this inventory of ITB agents shall be located so that it can be efficiently obtained by, or provided to, members of the public when required

3. ensure that ITB agents can be obtained by residents of the designated ingestion control planning zone at any time

4. ensure that particular consideration is given to sensitive populations such as children and pregnant women within the designated ingestion control planning zone

5. ensure that the pre-distributed and pre-stocked ITB agents are maintained within expiry date

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6. ensure that the pre-distribution plans are supported by a robust, ongoing, and cyclical public education program

7. ensure that all residences, businesses and institutions within the designated plume exposure planning zone are provided with public emergency preparedness information detailing how they should prepare for a nuclear emergency and what they should do or expect during a nuclear emergency; this information will reinforce the public education program designed to support the pre-distribution of ITB agents

8. ensure that this public emergency preparedness information is readily available to the general public, including online

Guidance

Guidance for all licensees

Licensees may, where possible, leverage existing communication channels (such as those used by local municipalities or those identified in their public information program as per RD/GD-99.3, Public Information and Disclosure).

Licensees should periodically assess the adequacy of public emergency preparedness information.

Additional guidance for licensees of reactor facilities with a thermal capacity greater than 10 MW

For reactor facilities with a thermal capacity greater than 10 MW and with designated offsite emergency planning zones:

The term ITB agent is used generically and includes potassium iodide (KI) tablets.

The pre-distribution of ITB agents should be undertaken by representatives of the health and/or emergency management authorities of the province or region/municipality, with support from the licensee. The pre-distribution of ITB agents should be done in a carefully planned and coordinated manner, to ensure that the public receives the appropriate information and education related to the benefits, risks and usage instructions of ITB agents.

Pre-stocked ITB agents for the designated ingestion control planning zone should be located to facilitate prompt and efficient distribution during an emergency. Recognizable locations with credible persons within the community (such as fire stations, police stations and pharmacies) should be considered in the selection of pre-stocking locations.

The requirements of particular relevance in Table 5 are that ITB agents be pre-distributed in the DPZ, ITB agents are pre-stocked in sufficient quantity in IPZ, and information be readily available to the general public. ITB agent is used generically, but KI tablets are defined as being included as an ITB agent. These requirements would fall to the licensee, as part of their license, and would require coordination with the offsite authority.

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B.2 Health Canada

Health Canada, as the organization responsible for maintaining the *Federal Nuclear Emergency Plan* [5], produces guidance relevant to nuclear emergency response. *Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response* [6] contains details related to the suggested use of KI in Canada. Table 6 provides an excerpt of Section 5, Generic Criteria, including those for KI (Stable iodine thyroid blocking). Table 7 provides an excerpt of Section 7.1, which details KI use and recommended dosages.

Table 6 – Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response, Section 5

5 GENERIC CRITERIA

The bases for implementing protective actions are the generic criteria. If the generic criterion for an action is exceeded, implementation of that action should be considered a priority. Table 2 identifies the generic criteria recommended by Health Canada. Doses include exposure from all pathways (e.g., external irradiation, ingestion, inhalation).

TABLE 2. *Generic criteria. E is effective dose, H thyroid is equivalent dose to the thyroid; H_{fetus} is equivalent dose to the fetus, and $H_p(10)$ is personal dose equivalent at 10mm.*

STRATEGY NAME	PROTECTIVE ACTIONS	GENERIC CRITERIA
Exposure Control	Stable iodine thyroid blocking	50 mSv in the first 7 days ($H_{thyroid}$)
	Evacuation	100 mSv in the first 7 days (E or H_{fetus})
	Sheltering	10 mSv in 2 days (E) (averted dose)
	Temporary relocation	100 mSv in the first year[7] (*E*) or 100 mSv for the full period of in utero development (H_{fetus})
Ingestion Control	Restriction of distribution and ingestion of potentially contaminated drinking water, milk and other foods	3 mSv/y (1 mSv/year for each of the following categories: drinking water, milk and other foods and beverages) (*E*)
Population Monitoring and Medical Management	Population monitoring, internal assessment, and medical follow-up	100 mSv in a month (*E*) or 100 mSv for the full period of in utero development (H_{fetus})
Off-Site Emergency Workers	Restriction of activities for individual workers	50 mSv[8] over the duration of the response ($H_p(10)$ or *E*)

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The generic criteria in Table 2 have been largely adopted from the generic criteria recommended by the IAEA (IAEA 2015a).

…

7 This is an initial value. As the response progresses, this generic criterion should be reduced. See sections 5.1.1 and 7.4.

8 This value may be exceeded under some circumstances, as discussed later in this section.

Table 7 – Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response, Section 7.1

7.1 Stable Iodine Thyroid Blocking

Iodine Thyroid Blocking (ITB) works by saturating the thyroid with stable iodine, thus reducing the uptake of radioactive iodine (radioiodine) and subsequent risk of radiation-induced thyroid cancer. Studies of populations affected by the nuclear accident at Chernobyl indicate that increased incidence of thyroid cancer, especially in children, is the predominant health impact directly attributable to radiation exposure (UNSCEAR 2012). Therefore, ensuring that ITB agents (usually potassium iodide (KI) pills) are readily available to those who might need them is an essential component of an effective protection strategy for scenarios involving radioiodine.

ITB agents are only effective at reducing internal exposure to radioiodine; they offer no protection against external radiation or internal exposure to other radionuclides (ICRP 2009). ITB is most effective when used in conjunction with other protective actions such as sheltering or evacuation

7.1.1 Implementation

ITB agents are used primarily to protect people who are at risk of inhaling airborne radioiodine during or immediately following a release.

The effectiveness of KI in limiting the uptake of radioiodine depends greatly on timing. KI administered immediately before or during a release is approximately 100% effective at blocking uptake of radioiodine by the thyroid. Administration of KI in the first few hours can still be 80% effective at blocking the uptake of radioiodine by the thyroid. The effectiveness of KI continues to decrease with time to about 20% after 24 hours (WHO 1999; NAP 2004).

Radioiodine may also enter the body through ingestion of contaminated food and drinking water, especially milk; however, preventing consumption of contaminated foodstuffs offers more protection (from all radionuclides) and is therefore considered the more appropriate action for limiting radioiodine exposure from ingestion. In situations where uncontaminated substitutes for essential foodstuffs, such as milk for children, are not available, it may be necessary to order extended administration of ITB agents while arrangements are made for alternate food and/or water supplies.

Because of the importance of timing in the effectiveness of ITB, protection strategies must include arrangements for ensuring that individuals have access to KI prior to or within the first few hours of an emergency involving radioiodine. This requires pre-distribution within communities that are most at risk of exceeding the generic criteria for ITB, as determined by the planning basis for the emergency scenario. It is the responsibility of the emergency response authority to decide on the manner and extent of KI pre-distribution, in consideration of site-specific factors, implementation plans for other urgent protective actions and/or regulatory requirements, such as those specified in CNSC REGDOC 2.10.1 Emergency Management and Fire Protection: Nuclear Emergency Preparedness and Response (CNSC, 2016).

Emergency response authorities should ensure that KI tablets are readily available for off-site emergency workers responding to an event involving radioiodine.

7.1.2 Risk/benefit considerations

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Health risks from consuming KI at the recommended dosages and in accordance with instructions provided by public health or emergency management officials are low for most people.

KI is not recommended for people with some pre-existing conditions, such as autoimmune diseases affecting the thyroid. The prevalence of these types of health conditions increases with age. Due to this increased risk of adverse effects coupled with the extremely low risk of developing thyroid cancer after 40 years of age, administration of KI may not be beneficial for this age group (WHO, 1999).

Tincture of iodine is not an alternative to KI. Tincture of iodine is poisonous, and there are significant health risks associated with its consumption. Messaging about stable ITB should clearly differentiate between safe and unsafe sources of stable iodine, and should include warnings against self-medicating.

The pre-distribution of KI also carries both benefits and risks. Benefits include immediate access to tablets in the event of an emergency requiring their use. People do not have to leave their homes or workplaces to receive them, which may place them in a situation of potential exposure or interfere with the implementation of other protective actions. However, people may lose or misplace their tablets and not have them available at the time of the emergency, or they may take them at inappropriate times.

7.1.3 Dosages

KI should be administered at the dosage levels specified by the World Health Organization (WHO, 1999). Public health authorities should ensure that instructions on how KI must be taken are clear and easily understood, as the correct dose of KI will differ according to age. Recommended age-specific dosages are given in Table 5. Administration of KI may be repeated in the event of prolonged or repeated exposure, however, newborns (less than 1 month) and pregnant and breastfeeding women should only receive 1 dose.

Recommended single dosage of KI according to age group

AGE GROUP	RECOMMENDED QUANTITY OF ELEMENTAL IODINE (mg)12	CORRESPONDING DOSAGE OF POTASSIUM IODIDE (KI) (mg)
Adults and adolescents (over 12 years), including pregnant and breastfeeding women	100	130
Children (3–12 years)	50	65
Infants (1 month–3 years)	25	32
Newborns (< 1 month)	12.5	16

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B.3 Ontario Power Generation

As the licensee responsible for Pickering NGS, Ontario Power Generation (OPG) must meet its licence requirements to the CNSC. OPG must maintain fully developed emergency preparedness plans to meet the requirements of REGDOC 2.10.1 [3], including consideration to ITB agents such as KI (Table 5).

B.3.1 OPG Consolidated Nuclear Emergency Plan

The OPG *Consolidated Nuclear Emergency Plan* [17] is not a public document. This plan includes a section on ITB (KI specifically). Table 8 is an excerpt of section 1.3.4 which outlines the protective actions put in place by OPG.

Table 8 – OPG CONSOLIDATED NUCLEAR EMERGENCY PLAN, Section 1.3.4

1.3.4 Thyroid Blocking Agent [B-2] The PNERP requires designated reactor facilities (Pickering and Darlington) procure adequate quantities of stable iodine tablets for their DPZ population. Other operational responsibilities regarding Thyroid Blocking are prescribed in the MOHLTC's Radiation Health Response Plan. In consultation with the designated municipalities, OPG shall procure stable iodine tablets and maintain them within expiry dates. Durham Region and City of Toronto shall detail in their plans how they will facilitate the availability of KI pills, with the support of OPG. Initial distribution of stable iodine tablets to residences, businesses and institutions within the Pickering and Darlington DPZ's was completed in 2015. KI pills continue to be stocked in DPZ institutions and emergency centres. The program established and maintained by OPG and the designated municipalities ensures continued availability to residents of the DPZ and Ingestion Planning Zone (IPZ) and that information is available to the general public, including online. [B-2] [B-4]

Section 1.3.4 primarily outlines how OPG meets the requirements set out in REGDOC 2.10.1 [3]. This includes stockpiling of KI, pre-distribution in the DPZ within expire dates, and availability. OPG reports that pre-distribution was completed in 2015. The plan further points to meeting the requirements and responsibilities of the PNERP [2] and the Radiation Health Response Plan [19].

Relevant to the roles and responsibilities of KI distribution, the OPG nuclear emergency plan states that Durham Region and City of Toronto shall detail in their respective plans how KI availability will be facilitated.

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B.4 Province of Ontario

The Province of Ontario, as the offsite authority during a nuclear emergency in their jurisdiction, has the ultimate responsibility of ITB protective actions. The two provincial organizations relevant to KI distribution are the Emergency Management Ontario (EMO) and the Ministry of Health (MOH).

B.4.1 EMO

Emergency Management Ontario is responsible for the province of Ontario's Emergency response plans.

B.4.1.1 PNERP Master Plan

Ontario's *Provincial Nuclear Emergency Response Plan (PNERP) – Master plan* [2] contains detailed information on the responsibilities and expectations of stakeholders related to Emergency Preparedness and response, including KI. Table 9 and Table 10 contain excerpts of the PNERP – Master plan.

Table 9 – PNERP – Master Plan, Section 5.5

5.5 Activation of Emergency Plans

5.5.1 This PNERP shall be activated for a nuclear or radiological emergency when required by the Fire Marshal and Chief of Emergency Management or designate on behalf of the Minister of Community Safety and Correctional Services.

5.5.2 The emergency response plans of all other organizations (see Annex I) should be immediately activated as soon as they receive notification that the PNERP has been activated. Their level of activation (see below) should also align with that of the PNERP unless specified otherwise.

5.5.3 To enable an appropriately graduated response to a nuclear emergency, the activation response level shall provide for either partial or full activation, as outlined below.

5.5.4 Partial Activation

This level of activation is unique to a nuclear emergency and is appropriate to the situation where protective and operational measures are not immediately required, but may become necessary if the situation deteriorates. Partial activation of emergency response plans should permit detailed monitoring and assessment of the situation, as well as the ability to quickly go to full activation. As such, partial activation shall include the following:

a) Provincial and Municipal EOCs to be fully staffed;

b) Ministry Emergency Operations Centres and the Unified Transportation Coordination Centre to be staffed to the level appropriate for the situation, in order to monitor and assess the situation on a continuous basis and to implement associated plans as considered appropriate;

c) The local Emergency Information Centre to function on a continuous basis with an appropriate staffing level;

d) Other emergency centres to be readied to a level where they can become fully operational without undue delay when required and all other emergency response personnel to be placed on standby.

5.5.5 Full Activation

Full activation is appropriate when it is expected that protective and operational measures to mitigate the emergency are necessary immediately or, may be necessary in the near future. Full activation requires:

a) all emergency centres to be fully staffed and operational, unless specifically exempted by the appropriate jurisdiction authority

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b) all members of the Emergency Response Organization to immediately report to their places of duty, unless specifically exempted by the appropriate jurisdiction authority

5.5.6 The detailed actions for, and response to the activation response level can be found in the following chapters and shall be further detailed in the relevant Implementing Plans as well as the emergency response plans and procedures of those organizations required to respond to a nuclear or radiological emergency.

Table 9 defines the activation levels of the POEOC in the event of a nuclear emergency. This is relevant to the Concept of operations defined in Section 4.

Table 10 – PNERP – Master Plan, Section 6.5.2

6.5.2 Iodine Thyroid Blocking

a) General

i. Iodine Thyroid Blocking involves the ingestion of potassium iodide (KI) pills to prevent the uptake of radioactive iodine by the thyroid gland during a radioactive release.

ii. Iodine Thyroid Blocking shall be directed by the CMOH as appropriate in coordination with the PEOC and the local Medical Officer of Health and is normally undertaken during the early or intermediate phase.

iii. Iodine Thyroid Blocking provides protection against just one radioisotope present in a radioactive release, radioiodine. As a result, this measure is optimally used in combination with other protective measures, such as sheltering-in-place or evacuation, in order to protect the whole body from all radioisotopes.

iv. KI pills should be ingested 2-6 hours prior to or just after exposure to radioiodine in order to optimize protection from radioiodine.

v. A single KI dose lasts approximately 24 hours and should be taken daily until the risk of significant exposure to radioiodine no longer exists. Note: certain populations i.e., pregnant or breastfeeding women, and infants <1-month-old should only take one dose of KI.

vi. KI pill ingestion should be replaced, as a protective measure against radioiodine, by the implementation of ingestion control measures once the radioactive release has ceased.

vii. Iodine Thyroid Blocking should not normally be necessary in a radiological event involving detonation of a Radioactive Dispersal Device (RDD) due to the expected absence of radioiodine.

b) Responsibility

i. The CMOH, in coordination with the PEOC and the local Medical Officer of Health shall direct the use of KI as described in the RHRP's Potassium Iodide Guidelines Annex.

ii. Reactor facilities (except Fermi 2), pursuant to their responsibilities to assist off-site authorities under the Regulations of Class I Facilities (Nuclear Safety and Control Act) and operating licence requirements, shall provide the necessary resources and support to provincial and municipal

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authorities to ensure that the ITB related requirements of the PNERP and municipal plans are completed.

iii. The MOHLTC shall procure, in advance, adequate quantities of Potassium Iodide (KI) pill, for use by local authorities of the Fermi 2 Detailed Planning Zone and Ingestion Planning Zone populations during a nuclear emergency.

iv. The MOHLTC shall provide support to local authorities for the Fermi 2 Detailed Planning Zone and Ingestion Planning Zone populations to ensure that the ITB related requirements of the PNERP and municipal plans are completed.

v. Designated Municipalities and local authorities for the Fermi 2 Detailed Planning and Ingestion Planning Zones should perform periodic reviews of the local populations to assess the adequacy of their ITB distribution programs.

vi. Designated Municipalities for the Pickering, Darlington, Bruce and CRL reactor facilities, and local authorities for the Fermi 2 Detailed Planning and Ingestion Planning Zones, shall detail in their plans the means by which the availability of KI pills is facilitated for any resident of the Detailed Planning and Ingestion Planning Zones, including sensitive populations who may wish to possess a supply in advance of an emergency. This shall include:

- The pre-distribution of KI pills together with instructions on KI administration to Detailed Planning Zone residences, businesses, institutions and for emergency centres (Emergency Worker, Reception and Evacuation Centres).
- The appropriate information and education related to the benefits, risks and usage instructions of KI pills.

vii. vii. Other matters related to Iodine Thyroid Blocking (ITB) with stable iodine (KI), including the provision of guidance and advice to health stakeholders and local organizations, are detailed in the RHRP's Potassium Iodide Guidelines Annex.

Appendix 4

1.0 The Office of the Fire Marshal and Emergency Management (OFMEM) shall:

1.1 Preparedness

g) Liaise with MOHLTC to develop and maintain a strategy for the distribution of KI pills within the IPZ as necessary during an emergency.

Responsibility "vi" [2] (Table 10) specifically points to the designated municipalities as being responsible for detailing in their plans the means by which KI availability is facilitated to the DPZ and IPZ. The designated municipalities for Pickering NGS are Durham Region and City of Toronto, as previously noted in section B.3.1.

Appendix 4 [2] (Table 10) further states that EMO will liaise with MOH to maintain a strategy for the distribution of KI in the IPZ.

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B.4.1.2 PNERP Implementing Plan

The *Provincial Nuclear Emergency Response Plan (PNERP) – Implementing Plan for the Pickering Nuclear Generating Station (PNGS)* [8] details how the province of Ontario will implement the master plan and contains specific responsibilities related to ITB. Table 11 is an excerpt of the initial provincial and municipal response and activation levels. Table 12 is an excerpt of the default protective measures which contain consideration for ITB. Table 13 is an excerpt of section 5.3.3 of the PNERP – Implementing Plan.

Table 11 – PNERP – Implementing Plan, Table 4.2: Initial Provincial and Municipal Response.

INITIAL NOTIFICATION	INITIAL PROVINCIAL RESPONSE	INITIAL MUNICIPAL RESPONSE
REPORTABLE EVENT	ROUTINE MONITORING 1. Provincial Emergency Operations Centre (PEOC) shall notify the municipal contact point(s), reactor facility operator, and others as appropriate, and shall monitor the situation. 2. PEOC Scientific staff is consulted, if appropriate. 3. If and when appropriate, Emergency Information Section (EIS) staff issues news release(s)	Emergency response staff remain in contact with the PEOC, and monitor event.
ABNORMAL INCIDENT	ENHANCED MONITORING 1. PEOC should adopt Enhanced Monitoring and shall inform the municipal contact point(s), reactor facility operator, and any other organizations affected. 2. External notifications to Michigan, New York, Ohio and Quebec are made. 3. PEOC to set up a duty team consisting of operations staff, scientific staff, reactor facility operator representative(s), EIS staff, and others as required. 4. If and when appropriate, EIS staff shall issue news release(s). 5. Provincial staff are notified to remain available to report in for duty.	Emergency response staff monitor event, preferably from Municipal Emergency Operations Centres (EOCs).
ON-SITE EMERGENCY (No emission occurring)	PARTIAL ACTIVATION 1. PEOC should adopt partial activation response (for details, see **Section 4.6.3**), and shall initiate the appropriate internal and external notifications (**Section 4.3** and **Section 4.4** respectively), including the municipal contact points and the host communities. 2. If a reactor emission is expected to occur in 36 hours or less, PEOC should consider adopting full activation response and consider the need to implement the immediate measures per General Emergency below.	1. Issue notification placing municipal Emergency Response Organization on standby. 2. Municipal EOCs fully staffed. 3. Emergency Information Centres (EICs) to be established. 4. Other emergency centres readied to become operational without undue delay.

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	3. PEOC shall be fully staffed. Consideration shall be given to issuing an emergency bulletin (**Section 6.4**), news release or both. 4. Ministry EOCs and Unified Transportation Coordination Centre (UTCC) to be established and appropriately staffed	
ON-SITE EMERGENCY (Emission Ongoing or expected within 12 hours)	FULL ACTIVATION 1. PEOC should notify and require the municipal contacts to activate the public alerting system (**Section 6.2**). 2. PEOC should adopt full activation (**Section 4.6.4**), and shall initiate the appropriate internal and external notifications (**Section 4.3** and **Section 4.4** respectively), including the host community. 3. PEOC shall issue the appropriate emergency bulletin (**Section 6.4**). 4. PEOC shall issue operational directives implementing the following operational measures, unless there are good reasons for modifying this response, for: a) Sheltering (**Section 5.3.4**) in the Automatic Action Zone. b) Suspension of road and rail traffic through the Automatic Action Zone. c) Clearance of all boaters in Lake Sector P23. 5. PEOC shall assess the situation for further action. 6. PEOC shall issue further emergency bulletins, as appropriate (**Section 6.4**). 7. EIS staff shall issue news releases, as appropriate. 8. UTCC and Ministry EOCs shall be established.	1. Initiate public alerting. 2. Issue notification activating municipal Emergency Response Organization. 3. Municipal EOCs, EICs and other centres to be activated and operational. 4. Implement operational directives, as issued by the PEOC.

Table 12 – PNERP – Implementing Plan, Table 4.3: Default Protective Measures.

CONDITION OF STATION SYSTEMS	EXAMPLES	Issue Immediate Operational Directives DEFAULT PROTECTIVE MEASURES
A. Intermediate to severe core damage with an accompanying loss of the *containment* function.	*Either*: 1. Failure of reactor shutdown, or 2. LOCA and failure of ECI, or 3. LOCA causing early flow stagnation in a core pass. *Combined with either:* a) Large hole in the containment envelope (e.g., airlock doors open, multiple airlock seal failures), or b) An	1. **Evacuation** of the *Automatic Action Zone*, all other *Detailed Planning Zone* sectors likely to be affected by the emission, and the area beyond the *Detailed Planning Zone* likely to be affected by the emission up to a distance of 20 km from the reactor. 2. **Iodine Thyroid Blocking**: All evacuees from the *Detailed Planning Zone* to ingest a KI dose. 3. **Personal Monitoring**: All evacuees from the *Detailed Planning Zone* to proceed to a facility for *personal monitoring* or to self-decontaminate at destination.

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	emission pathway bypassing containment.	4. **Sheltering**: All sectors likely to be affected by the emission, which are not immediately evacuating, to shelter. Also, all sectors and areas adjacent (in the same ring) to sectors and areas being evacuated *should shelter-in-place*.
B. Intermediate level of core damage and a loss of the filtered pathway.	*Either*: 1. LOCA and failure of ECI, or 2. LOCA and failure of emergency coolant recovery. *Combined with either:* a) Containment envelope impairment resulting in loss of pressure control, or b) Impairment of the FADS, including a reduction in filter efficiency.	1. **Evacuation** of the *Automatic Action Zone* and all other *Detailed Planning Zone* sectors likely to be affected by the emission. 2. **Iodine Thyroid Blocking**: All evacuees to ingest a KI dose. 3. **Personal Monitoring**: All evacuees to proceed to a facility for *personal monitoring* (ongoing emission only) or to self-decontaminate at destination. 4. **Sheltering**: All sectors likely to be affected by the emission, which are not immediately evacuating, to shelter. Also, all sectors adjacent (in the same ring) to those being evacuated *should shelter-in-place*.

Table 13 – PNERP – Implementing Plan, Section 5.3.3

5.3.3 Iodine Thyroid Blocking

a) It is the responsibility of the PNGS operator to procure adequate quantities of KI pills for the Detailed Planning Zone population (PNERP Master Plan, Section 6.5.2).

b) Designated Municipalities shall detail in their plans the means by which they facilitate:

i. Availability of KI pills for Detailed Planning Zone institutions and for emergency centres (Emergency Worker, Reception and Evacuation Centres and MDUs).

ii. Availability of KI pills for any members of the Detailed Planning Zone population who may wish to possess a supply.

c) Other operational responsibilities regarding iodine thyroid blocking (stocking, distribution and administration) are described in the Radiation Health Response Plan, as prepared by MOHLTC.

d) The Chief Medical Officer of Health shall decide when to administer KI in consultation with the PEOC Commander.

Section 5.3.3 (Table 13) details requirements for procurement and distribution of KI in the DPZ. Item d) details the responsibility of the CMOH to decide when to administer KI. The implementing plan points to the Radiation Health Response Plan [19] for further operational responsibilities.

The designated municipalities are referenced as requiring details in their plans to facilitate KI availability.

B.4.2 MOH

The Ministry of Health administers documents related to the health of Ontario residents such as response plans to various events relevant to health.

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B.4.2.1 Radiation Health Response Plan

The *Radiation Health Response Plan (RHRP)* [19] provides guidance to the health sector at provincial and local levels across Ontario. The plan refers to ITB and KI in general terms. Excerpts of this plan are shown in Table 14, Table 15, and Table 16.

Table 14 – RHRP, Section 3.3.2

3.3.2 Ministry of Health and Long-Term Care (MOHLTC)
The MOHLTC is responsible for leading and coordinating the health response, and maintaining health services during an RN incident.[9] Preparedness tasks performed by the MOHLTC to maintain the response capability in normal times include: … • Providing guidance and coordination to designated municipalities on stocking, distribution, and administration of potassium iodide (KI).

Section 3.3.2 [19] (Table 14) outlines that the role of the MOHLTC with respect to KI distribution is to provide guidance and coordination to designated municipalities.

Table 15 – RHRP, Section 5.1.2

5.1.2 MOHLTC Emergency Management Response Structure
… The PEOC is responsible for decisions regarding the implementation of precautionary and protective actions. The MOHLTC will provide advice and guidance to PEOC on those decisions. The MOHLTC will provide advice and guidance to PEOC on those decisions. The MOHLTC is responsible for deciding when to administer potassium iodide for iodine thyroid blocking (ITB). Guidance on precautionary and protective actions, protective action levels (PALs) and the way they are applied is provided in Appendix C. Guidelines on the use of potassium iodide (KI) for ITB are provided in Annex 1.

Section 5.1.2 [19] (Table 15) outlines the structure and role of the MOH. The MOH provides advice and guidance to the Provincial Emergency Operations Centre (PEOC) on decisions related to protective actions (the PEOC's responsibility). However, the MOH is responsible for deciding when to administer KI.

Table 16 – RHRP, Section 5.2.8

5.2.8 Iodine Thyroid Blocking
Iodine thyroid blocking is the method by which the thyroid gland's ability to absorb radioiodine is prevented or reduced through the ingestion of the stable iodine compound, potassium iodide (KI), before or shortly after exposure to radioiodine. Iodine thyroid blocking is one of a number of protective measures available to deal with the effects of an emergency at a nuclear facility involving radioiodine. This measure will always be implemented in conjunction with either evacuation or sheltering for the public; with restrictions on entering affected areas; and for emergency workers entering affected areas. NOTE: Iodine thyroid blocking using KI is only effective against radioiodine, which is only one of the many potential radionuclides that may be released in an accident at a nuclear facility or a nuclear blast. Iodine thyroid blocking is not effective against other radionuclides, and would not be advised for radiological incidents where radioactive iodine is not detected. Evacuation before emissions have started is the most effective protective

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measure in the event of a nuclear emergency because it protects the whole body from all radionuclides and all exposure pathways.

For more information on iodine thyroid blocking during a nuclear facility incident, please refer to the KI Guidelines in Annex 1.

Section 5.2.8 [19] (Table 16) deals specifically with ITB and KI. There are no responsibilities specified. *Potassium Iodide (KI) Guidelines* [9] is referred to as a source of additional information.

B.4.2.2 Potassium Iodide (KI) Guidelines

The *Potassium Iodide (KI) Guidelines* [9] provides more detail on the use of KI and ITB for health providers and local organizations within the planning zone of a NGS. Pertinent excerpts are shown in Table 17, Table 18, and Table 19; which includes the roles and responsibilities, and details on procurement, stocking, and distribution. Details on the target populations and considerations for the use of KI are included in Table 20 and Table 21

Table 17 – Potassium Iodide (KI) Guidelines, Section 3

3. Roles and Responsibilities for Administering KI

Section 5.11 of the Provincial Nuclear Emergency Response Plan, Master Plan 2009 (PNERP) outlines the responsibilities related to KI:

- Pursuant to nuclear installation responsibilities to assist offsite authorities under the Regulation of Class I Facilities (Nuclear Safety and Control Act), nuclear installations (except Fermi 2) shall procure, in advance, adequate quantities of KI pills, for the Primary Zone population for use during a nuclear emergency.
- Designated municipalities[5] shall detail in their plans the means by which they will facilitate the availability of KI pills for Primary Zone institutions and for emergency centres (Emergency Worker, Reception and Evacuee Centres).
- Designated municipalities for the Pickering, Darlington, and Bruce Power nuclear facilities shall detail in their plans the means by which they will facilitate the availability of KI pills for any member of the Primary Zone population who may wish to possess a supply.
- The MOHLTC will ensure that KI is available for the Town of Amherstburg, should there be an event at the Fermi 2 facility in Michigan.
- Other operational responsibilities regarding ITB (stocking, distribution, and administration) are prescribed in the Radiation Health Response Plan (RHRP), as prepared by the MOHLTC.
- The decision to administer KI will be taken by the Chief Medical Officer of Health for Ontario (CMOH).

Section 3 [9] (Table 17) refers to the responsibilities defined in the PNERP [2] which can be found in section B.4.1.1 of this document. The DPZ is equivalently referred to as the Primary Zone, and responsibilities for the Secondary Zone (IPZ) are not considered. This document predates the current PNERP. Responsibility, as per the PNERP, falls to the designated municipalities for the distribution of KI.

Table 18 – Potassium Iodide (KI) Guidelines, Section 4 (4.1-4.2)

4. Procurement, Stocking, and Distribution

4.1 Procurement

As noted in section 3, nuclear installations (except Fermi 2) are responsible for procuring adequate quantities of KI for the Primary Zone population. The MOHLTC ensures KI availability for Amherstburg in case of an

emergency at Fermi 2. In both cases, the procurement is done in consultation with the municipality to ensure adequate numbers for the Primary Zone population.

4.2 KI Inventory

The designated municipality will calculate the required quantity of KI stock to cover the Primary Zone, and provide this information to the appropriate nuclear installation (or the MOHLTC for Amherstburg). Considerations to inform calculation should include the number of residents, businesses, and institutions within the Primary Zone for all target populations (see section 2 for additional planning considerations). This data should be updated whenever the KI inventory expires and is replaced. The following information is to be provided with the tablets[9]:

- What the tablets are for
- When to take the tablets
- How to ingest the tablets
- Who should take the tablets and the priority populations
- How to give fractional doses for children, infants, and neonates
- Maximum number of dosages for certain groups
- Contraindications (medical conditions which indicate that stable iodine should not be taken)
- Adverse effects
- Under what conditions one should consult a physician
- Expiry date

4.2.1 Record Keeping & Reporting

The municipality should maintain records of pre-distributed KI inventories stored in institutions. Regular reviews should be carried out with the assistance of the nuclear installation (or the MOHLTC for Amherstburg) to ensure stocks are adequate in quantity and quality.

On an annual basis, the MOHLTC will contact each municipality to gather information on KI, including the amounts, expiry dates, number dispensed from pharmacies, general uptake, and the types of locations to which it has been pre-distributed.

Sections 4.1 and 4.2 [9] (Table 18) discuss procurement and KI inventory controls. The NGS is responsible for procuring KI, in consultation with the municipality to ensure adequate supply. 4.2 details considerations in calculating required quantities and information that should be included with each supply (e.g. expiry date, when/who/how to ingest the pills, etc.).

Table 19 – Potassium Iodide (KI) Guidelines, Section 4 (4.3)

4.3 Distribution Strategy

The effectiveness of ITB depends on the time KI is taken relative to exposure. Once the CMOH provides the direction to take KI, it must be made available to the public in order to maximize effectiveness. Therefore, the distribution strategy should strive for availability of KI in as many locations as possible. Within the Primary Zone, pre-distribution of KI to key public institutions may be a supportive tactic for ensuring prompt availability.

Municipalities are responsible to include in their plans the process by which they will facilitate the availability of KI tablets for the general public and institutions in the Primary Zone, and also for Emergency Worker Centres and Evacuee and Reception Centres. Part of this planning should consider any regulations around dispensing of natural products such as KI, and as appropriate, any standards of practice from relevant professional regulatory colleges.

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The following subsections are meant to provide guidance for pre-distribution of KI to ensure access to those most vulnerable, and allow for quick distribution in the event of an emergency. These suggestions are not exhaustive, as municipalities should store at locations deemed strategically necessary, and tailor their plans to the specific characteristics of the location and population around local nuclear installations.

4.3.1 Pre-distribution to the Public

Municipalities need to ensure that KI tablets are made available to all residents, businesses, and institutions in the Primary Zone who may wish to possess a supply as part of their preparation for a nuclear emergency. Clear instructions should be issued with the tablets, and the public should be made aware on a regular basis of their importance and how to obtain them.

Residents of the Primary Zone should be encouraged to have a supply of KI for their family at home. KI needs to be ingested shortly before or after exposure to help protect against the negative health effects of radioiodine. Having an at-home supply can facilitate timely administration, for that reason any public education and awareness campaigns should emphasize these facts.

4.3.2 Public Education

Public education for people in the Primary Zone is an important aspect of a local KI program. Members of the public should be provided with basic information on the benefits and risks associated with using KI and the importance of having an at-home supply. They should be made aware that KI only protects the thyroid from internal exposure to radioiodine and that it only be taken at the direction of the Province. Methods for promoting these messages can include newspaper ads, letters to physicians and residents, distribution through pharmacies, press releases, social media, information brochures, special KI pick-up days, or joint education materials with the nuclear power plant. This information will assist individuals in making informed decisions on KI use.

4.3.3 Locations of Stocks

KI tablets should be pre-distributed by the municipality to the following types of institutions within the Primary Zone in quantities sufficient for people who live or work in this zone for the indicated number of days (in parentheses):

- Schools (one day)
- Daycares (one day)
- Nursing homes and Long-Term Care Homes (three days)
- Hospitals (three days)
- Prisons and Detention Centres (three days)
- Police and Fire Departments, Emergency Medical Services (three days)

It is the responsibility of the institution to properly maintain these stocks by ensuring:

1. Tablets are stored according to product information and kept in an accessible location.
2. The appropriate environment is maintained.
3. There are processes to ensure staff members have knowledge of the stock.

During a nuclear emergency, reception and evacuee centres must have stocks of KI tablets to distribute to persons passing through or staying at the centre who do not have their own supply. Municipal authorities are expected to make prior arrangements for this purpose.

Emergency Worker Centres must also have stocks of KI tablets for the use of emergency workers during an emergency. As mentioned in section 3, it is the responsibility of the municipal authorities to detail in their plans the means by which they will facilitate this.

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Section 4.3 [9] (Table 19) details the distribution of KI. Primarily this section explains the time sensitivity of KI use (see Section 1.4) and the need to pre-distribute within the DPZ. The importance of education is a focus, specifically for members of the public who may possess their own supply. Institutions within the DPZ are specified for pre-distribution (schools, daycares, nursing homes, hospitals, police, etc.). Emergency response institutions or institutions where mobility may be a challenge should possess 3 days of stock, others a single day supply is sufficient.

Table 20 – Potassium Iodide (KI) Guidelines, Section 5.1

5.1 Target Populations

KI administration is considered to be a practical and effective protective measure for the general public in an emergency. The risks and benefits of taking KI should be considered on an age-specific basis.

Newborns and children are especially vulnerable to radioiodine. There are three reasons for this sensitivity. First, the small size of their thyroids means they receive a higher radiation dose per unit intake of radioiodine. Second, they have a higher yearly thyroid cancer risk per unit dose than an adult. Third, they have a longer time span for cancer to occur.[11]

Based on data from Chernobyl, the risk of thyroid cancer from exposure to radioiodine appears to be inversely related to age. This data suggests that individuals over 40 years of age are unlikely to require ITB. It is also important to note that elderly people are at a lower risk of developing radiation-induced thyroid cancer, and also may be at higher risk of experiencing adverse effects from KI ingestion.

For those with a history of thyroid dysfunction (such as Graves' disease, goitre, and autoimmune thyroiditis), additional consideration should be given as this is an influential factor in increasing the risk of KI adverse effects.

Priority Populations – The following populations are at highest risk for negative health effects to the thyroid from radioiodine, and therefore will benefit the most from ITB. They must be targeted for priority ITB in the event of a nuclear emergency:

- Newborns (< 1 month)
- Infants (1 month – 3 years)
- Children (3 – 12 years)
- Adolescents (12 – 18 years)
- Pregnant women or women who are breastfeeding
- All workers responding within the Primary Zone or within the zone where public evacuation, sheltering or KI is considered

During ITB, consideration should also be given to assessing for any possible contraindications.

For the adult population, evidence suggests that the benefit of KI decreases with age (>40). Individuals should consider their own risks and benefits for their need for ITB. Unless they have a contraindicated condition, no person in the Primary Zone or otherwise affected by the emergency should ever be denied KI if they request it.

[11] WHO, 2011.

Table 20 details the target populations for KI administration.

Table 21 – Potassium Iodide (KI) Guidelines, Section 5.3 - 5.5

5.3 Use of KI for Persons over 40

For adults over 40, the scientific evidence suggests that ITB is not recommended or required unless doses to the thyroid are expected to exceed levels that would threaten thyroid function, which is about 5 Gy. Doses at such a high level are unlikely to occur far away from an accident site. Also, the risk of radiation-induced thyroid cancer

in persons over 40 is extremely low and decreases with age, while the risk of side effects from taking KI increases with age as the incidence of thyroid diseases is higher[14].

Despite the aforementioned evidence, persons over 40 in the Primary Zone or otherwise affected by the emergency should not be denied KI if they request it, unless they have a contraindicated condition. In practice, the target populations mentioned in section 5.1 must always receive KI first.

Persons over 40 should receive information about the risks of KI for their age group and then decide for themselves whether to take it or not.

5.4 Administration of a KI Liquid Solution to Children, Infants, and Others Incapable of Swallowing a KI Tablet

It is important that KI is administered to infants and children since they are at highest risk from the effects of exposure to radioiodine. The dose to the thyroid from radioiodine in a given situation will be higher in this group because of the smaller size of the gland. Persons unable to swallow a KI tablet, and children receiving a fractional dose, may require a KI liquid solution. For instructions on preparing a KI liquid solution, please see Appendix 1.

5.5 Risks & Other Concerns of KI

The risk of side effects from taking a dose of KI for ITB is extremely low for all age groups[15] and the overall benefit of ITB outweighs the risk of side effects. Nevertheless, the possibility of such effects, though rare, requires that ITB be: reserved only for situations where it is absolutely necessary; only be taken when directed by the Province; and be taken for a short time frame, i.e., one or two doses. There is an increased risk of side effects for people with thyroid disorders such as auto-immune thyroiditis, Graves' disease, and nodular goitre. Such disorders are more commonly seen in adults and the elderly and are rare in children. Rare side effects in other parts of the body, such as gastrointestinal effects or hypersensitivity reaction, may occur but are generally mild.[16]

Thyroidal side effects may result from KI administration, especially in people with iodine deficiency. Thyroidal side effects of stable iodine include iodine-induced thyrotoxicosis, which is more common in older people and in iodine-deficient areas. In addition, iodide goitre and hypothyroidism are potential side effects more common in iodine-sufficient areas.[17]

People who are sensitive to iodine, have an existing or previous thyroid disorder, or any other concerns, should consult their doctor prior to taking KI.

5.5.1 Clinical Conditions that Contraindicate Administration of KI

People with these conditions should not take KI, and need to be protected by other precautionary and protective measures on a case-by-case basis and under medical advice. These conditions include[18]:

- Hypersensitivity to iodine. This is a very rare disorder that should not be confused with the more common hypersensitivity to contrast agents which contain iodine used in certain radiological examinations.
- Dermatitis herpetiformis, a chronic skin condition associated with an increased risk of iodine hypersensitivity.
- Hypocomplementaemic vasculitis, an uncommon inflammation of the vascular walls, which can occur in certain immunological disorders and is associated with an increased risk of iodine hypersensitivity.
- Myotonia congenital, an extremely rare congenital defect involving muscle stiffness.

5.5.2 Pregnant Women

Pregnant women must be among the first to be protected by taking KI during an emergency. A woman's thyroid gland is metabolically more active during pregnancy, and the amount of radioiodine taken up is increased in comparison to other adults. The fetal thyroid gland can be exposed to radioiodine through the placenta, but can also be protected with KI taken by the mother.

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Pregnant women should take only one single dose of KI due to the risk of blocking the fetal thyroid function with excess stable iodine.[19]

Once the nuclear emergency is over, pregnant women should inform their doctor that they have taken KI so this can be added to their medical records, and the thyroid function of the newborn baby can be evaluated.[20]

5.5.3 Breastfeeding Women

When instructed by provincial authorities, breastfeeding women should take the recommended adult dosage for their own protection and potentially to reduce the radioiodine content of the breast milk, but not as a means to deliver KI to infants. The amount of KI provided through breast milk is not enough to protect the thyroid of an infant exposed to radioiodine. Therefore, in addition to the KI taken by the breastfeeding woman, the baby should also be given KI at the recommended dosage. Unless otherwise instructed, breastfeeding women should take only one single dose of KI because the stable iodine component of breast milk may also pose a risk of hypothyroidism in nursing neonates. If repeat dosing of the mother is necessary, due to continuing severe irradiation, the nursing neonate should be monitored as recommended below.[21]

5.5.4 Newborn Babies (< 1 month)

The World Health Organization recommends that newborn babies should take only one single dose of KI. Taking more than one dose increases their risk for developing hypothyroidism. If not treated, hypothyroidism can cause brain damage.[22] A consultation with a pediatrician within the first week after administration of KI is advisable. Neonates who have taken KI must be monitored by their healthcare provider for the potential development of hypothyroidism by measurement of thyroid stimulating hormones (TSH) and free thyroxine (FT4). Thyroid hormone therapy should be instituted in cases in which hypothyroidism develops.[23]

[14] WHO, 1999.
[15] During the Chernobyl accident, the incidence of severe side effects from a single dose of stable iodine was less than 1 in 10 million in children and less than 1 in a million in adults. WHO, 1999.
[16] WHO, 1999.
[17] U.S. HHS, 2001
[18] WHO, 2011.
[19] WHO, 2011.
[20] WHO, 2011.
[21] U.S. HHS, 2001.
[22] CDC, 2012.
[23] U.S. HHS, 2001 & WHO 2011

Table 21 details the administration of KI for certain populations and the risks associated with KI.

B.5 Municipalities

Of special interest are the designated municipalities for Pickering NGS, City of Toronto and Durham Region. Other municipalities are within the IPZ and play a roll in preparing for the distribution of KI. Lower-tier municipalities conform to the upper-tier municipal plans where appropriate.

B.5.1 The Emergency Management and Civil Protection Act

The EMCPA [37] defines the requirements of various levels of government with respect to emergency management in the province of Ontario. Table 22 is an excerpt of Section 5 of the act; this section defines the relationship between lower-tier and upper-tier municipalities with respect to emergency planning. Relevant to KI distribution is that the lower-tier municipalities, such as in Durham Region, shall conform to the upper-tier municipalities plan (e.g. the DNERP).

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Table 22 – Emergency Management and Civil Protection Act, Section 5

Conformity with upper-tier plan
5 The emergency plan of a lower-tier municipality in an upper-tier municipality, excluding a county, shall conform to the emergency plan of the upper-tier municipality and has no effect to the extent of any inconsistency and, for the purposes of this section, The Corporation of the County of Lambton shall be deemed to be an upper-tier municipality. 2002, c. 17, Sched. C, s. 10 (3).

B.5.2 Durham Region

Durham region is home to two NGSs. It maintains a nuclear emergency plan and several cities within Durham region maintain their own emergency response plans.

B.5.2.1 Durham Region Risk-Specific Plan – Durham Nuclear Emergency Response Plan (DNERP)

The *Durham Region Risk-Specific Plan – Durham Nuclear Emergency Response Plan (DNERP)* [23] is a supporting document to the *Durham Region Emergency Master Plan* [22], it details the specific consideration of a nuclear emergency. Table 23 shows an excerpt of section 4.9, which details ITB.

Table 23 – DNERP, Section 4.9

4.9 Thyroid Blocking
In the event of a serious accident at a nuclear station, radioactive material may escape, including radioactive iodine. If radioiodines are inhaled, they are absorbed by the thyroid gland. Thyroid blocking is the prevention or reduction of radioiodine absorption by the thyroid gland through the ingestion of a stable iodine compound, potassium iodide (KI), thereby 'blocking' further uptake of radioiodine. OPG is required to procure adequate quantities of Potassium Iodide (KI) pills for the 10 km zone populations around the Darlington and Pickering NGS, pre-distribute KI to all homes and businesses within 10km, and make available to anyone within 50km who may wish to possess it. Durham Region Health Department has a plan to facilitate the availability of KI for Primary Zone institutions such as schools, child care centres, and Health care facilities for emergency centres. The order to taken *(sic)* KI will be made by the Chief Medical Officer of Health for the Province. Procedures in Durham Region for the administration of KI and the approved dose are contained in Potassium Iodide (KI) Distribution Nuclear Support Function.

Section 4.9 [23] (Table 23) summarizes the use of ITB agents and the requirements of their distribution as defined by the PNERP [2] and REGDOC 2.10.1 [3]. It states that Durham Region has a plan to facilitate the availability of KI for DPZ. IPZ distribution is not mentioned beyond stock of KI being made available by OPG. The KI related NESF [20] is pointed to as containing procedures for the administration of KI.

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B.5.2.2 Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution

The *Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution* [20] is pointed to through the DNERP [23] as the detailed KI distribution plan and procedure. The document contains procedures, maps, roles & responsibilities, and other information related to KI distribution implementation. The NESF details distribution in advance of an event, not during an emergency. Table 24 shows an excerpt of section 7 detailing the objectives of the Durham Regional Health Department and the Durham Emergency Management Department.

Table 24 – Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution, Section 7

OBJECTIVES

In order to fulfill the requirements set out in the PNERP and the CNSC's REGDOC 2.10.1 regarding the distribution of KI tablets, the Durham Region Health Department, OPG, Toronto Office of Emergency Management, DEMO and provincial authorities will collaborate to ensure that an effective and successful strategy is implemented for the pre-distribution and sustainability of KI tablets to Durham Region residences and businesses prior to December 31, 2015, and before April 2019 for institutions and first responders within the PZ of both PNGS and DNGS. This plan will also discuss how KI tablets will be made available to SZ residences who wish to obtain a supply.

DURHAM REGION HEALTH DEPARTMENT (DRHD)

1. Support OPG's strategy for the availability and provision of KI tablets for all residents located within the PZ of the PNGS and the DNGS.
2. Support OPG's strategy for the availability and provision of KI tablets for businesses located within the PZ of the PNGS and the DNGS.
3. Support OPG's strategy for the availability and provision of KI tablets for residents located within the SZ of the PNGS and the DNGS, that desire to obtain supplies of KI tablets.
4. Support OPG's strategy for an effective public awareness campaign, three times per year, regarding the availability of KI tablets within the PZ and SZ of the PNGS and the DNGS.
5. Support OPG's strategy for an effective process that will ensure the provision of KI tablets to new residents (aka. "New addresses") and to new businesses within the PZ of the PNGS and DNGS.
6. Support OPG's strategy to ensure that sufficient quantities of KI tablets are pre-stocked, maintained within expiry dates, and ready for prompt distribution within the SZ. Note: MOHLTC and Office of the Fire Marshal and Emergency Management (OFMEM) are responsible for the SZ prompt distribution process.
7. Support OPG's strategy to ensure pre-distributed KI tablets are maintained within expiry dates.
8. Durham Region Health Department will ensure the pre-distribution of KI tablets for PZ institutions including schools, child care centres, long-term care facilities, retirement homes, hospitals and youth detention centres. Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution Oct-17 11
9. Durham Region Health Department will ensure the pre-distribution of KI tablets for first responders (Durham Regional Police Service (DRPS), Ontario Provincial Police (OPP), Royal Canadian Mounted Police (RCMP), Region of Durham Paramedic Services and local Municipal fire services).
10. Durham Region Health Department will manage enquiries related to KI tablets and KI distribution in Durham Region in a timely manner.

…

DURHAM EMERGENCY MANAGEMENT OFFICE (DEMO)

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1. Support the strategy to ensure that all residences, businesses, institutions and first responders within the SZ are provided with public emergency preparedness information detailing how they should prepare for nuclear emergency and what they should do or expect during a nuclear emergency.
2. Support provincial authorities by ensuring that public emergency preparedness information is readily available, including online, to the general public.
3. Ensure that the Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution complies with the Region's Emergency Master Plan, DNERP, and other Emergency Support Functions (ESF), Risk-specific Plans, as well as, relevant Regional, Provincial and Federal emergency management legislation and guidance documents.

Section 7 [20] (Table 24) details the objectives of various organizations with respect to KI distribution. The implementation of these objectives is expanded on in detail throughout the document. The note, "MOHLTC and Office of the Fire Marshal and Emergency Management (OFMEM) are responsible for the SZ prompt distribution process", which also appears elsewhere in the document, refers the implementation of IPZ KI distribution to the province.

Table 25 shows an excerpt of Section 8 detailing IPZ and DPZ distribution.

Table 25 – Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution, Section 8

ROLES AND RESPONSIBILITIES

…

<u>Primary Zone Distribution</u>

Residential, Businesses and Designated Pharmacies

- Support OPG with the development and implementation of a multi-faceted approach for the distribution of KI tablets to residences and businesses within the PZ of the PNGS and the DNGS. This could include participation in public awareness campaigns, media interviews / releases, editorial meetings, maintaining website and social media presence, providing assistance via the Environmental Helpline, and distribution of educational materials.
- Support OPG with sustaining the availability of KI tablets within the PZ. This could include maintaining the designated pharmacy program and assisting clients with ordering KI tablets via the preparetobesafe.ca website (Appendix 3).
- Collaborate with DEMO and Corporate GIS staff to provide accurate population/census data to OPG for the PZ of the PNGS and DNGS as required.
- Consult with the MOHLTC regarding KI tablet dosage and health information i.e. MOHLTC fact sheet, that would be provided to the public, as needed.
- Collaborate with MOHLTC, OPG, Health Canada and other government agencies in the event of a product recall.
- Ensure to maintain the availability of unexpired and undamaged KI tablets at designated pharmacies within the PZ of the PNGS and the DNGS: Pickering PZ - Pickering Medical Pharmacy, Liverpool Pharmacy and Bay Ridges Pharmacy; Darlington PZ - Courtice PharmaSave and Global Drug Mart Remedy's Rx. This would include ongoing communication with each pharmacy to ensure maintenance of distribution records and existing stocks.
- Ensure to provide each pharmacy with a supply of KI pamphlets for distribution to the public as needed.

Institutional and First Responders

- Develop a plan to distribute KI tablets to institutions and first responders in the PZ.
- In consultation with Corporate Information Services – GIS, acquire a list to accurately identify all qualifying institutions and first responders.

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- Receive the required supply from OPG and stockpile the quantity of KI tablets for a coordinated distribution to all institutions and first responders.
- Distribute the required amount of unexpired KI tablets to PZ institutions – Boards of Education (including private schools), child care centres, long-term care facilities, retirement homes, hospitals, and youth detention centres, through communications with individual institutions to obtain an accurate count of client/patient and staff and provide number to OPG.
- Distribute the required amount of KI tablets to PZ first responders – Durham Regional Police (including OPP and RCMP), Region of Durham Paramedic Service and local municipal fire services. Nuclear Emergency Support Function (NESF) – Potassium Iodide (KI) Distribution Oct-17 15
- Create and complete a distribution record for each institution and first responder and enter that information into a database.
- Collaborate with OPG for collection of expired/damaged KI tablets from institutions and first responders.

Secondary Zone Distribution: Residential Availability

- Support OPG's preparetobesafe.ca strategy for the availability of KI tablets for residents of the SZ that desire to obtain a supply. This could include assistance by Health Department staff and Helpline staff for clients experiencing difficulty with the online ordering process or those who do not have an email address or access to a computer. Assistance may also be required by clients that require confirmation that their order has been registered in OPG's KI tablets order system. Health Department staff would also be able to provide information and clarification about KI, the KI distribution program in Durham Region, or to refer the client where necessary.

…

Section 8 [20] (Table 25) details the pre-distribution of KI in the DPZ to residents, businesses, designated pharmacies, and first responders. IPZ distribution is mentioned, but no detailed implementation plans are included beyond how residents may request it through the available public website [38].

B.5.2.3 Ajax

The *Town of Ajax Emergency Response Plan* [24] is Ajax's all-hazard plan. The plan does not specify details on nuclear emergencies. Instead, section 1.1 (Table 26) refers to the DNERP [23] of section B.5.2.1.

Table 26 – Ajax Emergency Response Plan, Section 1.1

1.1 Purpose

…

In the event of a nuclear emergency, the Town of Ajax would refer to and be part of the Durham Nuclear Emergency Response Plan.

B.5.2.4 Clarington

The *Clarington Emergency Plan* [25] is Clarington's all-hazard emergency plan. This plan contains sections relevant to nuclear and ITB. An excerpt of section 5.8 is shown in Table 27.

Table 27 – Clarington Emergency Plan, Section 5.8

5.8 Thyroid Blocking

5.8.1 In the event of a serious accident at a nuclear station, radioactive material may escape, including radioactive iodine. If radioiodines are inhaled, they are absorbed by the thyroid gland. Thyroid blocking is the

prevention or reduction of radioiodine absorption by the thyroid gland through the ingestion of a stable iodine compound, potassium iodide (KI) pills.

5.8.2 OPG is required to procure adequate quantities of Potassium Iodide (KI) pills for the 10 km zone populations around the Darlington and Pickering NGS.

5.8.3 Durham Region must have a plan to facilitate the availability of KI for Primary Zone institutions (e.g. schools, child care centres, Health care facilities), for emergency centres as well as for members of the public who may wish to possess a supply in advance of an accident.

5.8.4 The decision to administer KI will be taken by the Chief Medical Officer of Health for the Province.

5.8.5 Procedures in Durham Region for the administration of KI and the approved dose are contained in the DRNERP: Potassium Iodide (KI) Distribution Procedures.

Section 5.8 [25] contains the same information as the DNERP [23], shown in section B.5.2.1 of this document. Clarington refers to the DNERP procedures for the administration of KI.

B.5.2.5 Oshawa

The City of Oshawa Emergency Response Master Plan [26] is the all-hazard plan maintained by the City of Oshawa. The plan does include references to nuclear, but ITB and KI are not within its scope. An excerpt of section 1.2 can be found in Table 28.

Table 28 – City of Oshawa Emergency Response Master Plan, Section 1.2

1.2 Scope

1.2.1 Oshawa's Master Emergency Plan (the Plan) addresses the emergency management problems that any number of hazards could create for the City. It includes actions by Oshawa to assist Durham Region in support of emergency operations in other communities. The scope also includes guidance for the department heads for the development of departmental plans. In addition, it gives recovery-planning considerations.

This plan does not address nuclear emergencies at either Darlington or Pickering Nuclear Generating Stations. Nuclear emergencies are covered in The City of Oshawa Nuclear Emergency Response Plan.

The Master plan refers to a specific nuclear document, the *City of Oshawa Nuclear Emergency Response Plan* [27].

B.5.2.6 Pickering

The City of Pickering's all-hazard emergency plan is the *Community Emergency Management Plan* [28]. This plan contains general information on nuclear emergencies and the importance of ITB and KI. An excerpt of Section 9 can be found in Table 29.

Table 29 – Community Emergency Management Plan, Section 9

Section 9

Nuclear Emergency Management

Nuclear Emergency Management is based on the same concepts that are contained in this Plan. However, nuclear events vary from other community emergencies because from the commencement of a situation, a nuclear event is under the control of the Province of Ontario. The Province then directs the Region of Durham, who in turn directs the City of Pickering in the provision of local emergency services. Nuclear Emergency Management is governed by the following nuclear specific plans:

- Provincial Nuclear Emergency Response Plan
- Durham Nuclear Emergency Response Plan

A series of supporting plans and procedures also provide direction such as the Province's Joint Traffic Control Plan, Joint Information Centre Operating Procedures, Radiation Triage Plan, Durham Regional Police Traffic Control Plan, Emergency Worker Protection Plan, etc. and the Region's Nuclear Emergency Notification Procedure, Emergency Work Centre Procedures, Potassium Iodide Distribution Procedures, etc.

Unique Aspects of Nuclear Emergency Management

…

7. Protective actions, like the distribution of Potassium Iodide Pills, are unique to nuclear emergency management.

…

Pickering Emergency Management and Civil Protection Activities during a Nuclear Emergency

…

10. Distribute Potassium Iodide pills to City staff.
11. Assist Durham Public Health with the distribution of Potassium Iodide pills to citizens.

Section 9 [28] (Table 29) details nuclear emergency specific considerations, including ITB. The PNERP [2] and DNERP [23] are pointed to as governing plans. Activities 10 and 11 indicate some responsibility of Pickering emergency management to distribute KI to staff and assist in the distribution to citizens. Durham Region (specifically Durham Public Health) is referred to as the lead on distribution of KI to the public.

B.5.2.7 Other Municipality/City Specific Plans

The municipalities of Brock [29], Scugog [30], Uxbridge [31], and the Town of Whitby (plan not found through our searches) do not specifically consider nuclear emergencies as part of their all-hazard plans. These municipalities would automatically conform to the DNERP as required by the EMCPA.

B.5.3 City of Toronto

The City of Toronto is a designated municipality within the PNERP with regard to Pickering NGS.

B.5.3.1 Toronto Nuclear Emergency Response Plan

The *Toronto Nuclear Emergency Response Plan (TNERP)* [21] is City of Toronto's nuclear specific plan. Excerpts of this plan can be found in Table 30, Table 31, and Table 32.

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Table 30 – TNERP, Section 2.3

2.3 Protective Measures

The protective measures available for minimizing the radiation hazard in a nuclear emergency include entry control (restricting the public from entering specific areas), sheltering (staying indoors), evacuation (leaving the area when directed), thyroid blocking (consumption of KI pills made available to members of the Pickering Primary Zone), the use of protective equipment and self-decontamination (cleaning oneself of any exposure to the "dust"). Each of these measures are defined in the **Nuclear/Radiological Glossary, Annex C**, of the Implementing Plan for The Pickering Nuclear Generating Station. The operational use of these measures is prescribed in appropriate sections of this plan as well as in procedures and checklists.

Section 2.3 [21] (Table 30) of the TNERP lists protective measures, which includes ITB. The PNERP - Implementing Plan [8] is pointed to for further information on protective measures.

Table 31 – TNERP, Part of Section 4.5.4

4.5.4 Immediate Protective Measures

…

d) Thyroid Blocking

The decision for thyroid blocking will be made by the MOHLTC, in coordination with the PEOC. KI pills are pre-stocked at the Emergency Worker and Reception-Evacuee Centres in the City of Toronto. Once notified of the need for thyroid blocking, the City of Toronto will notify staff located in the Primary Zone using the procedures defined below.

When the City is notified of a nuclear emergency, it will only implement protective actions that are directed by the Province. If and when the Chief Medical Officer of Health issues direction to the public to ingest a dose of KI, the City will undertake the following actions to notify or confirm that staffs working in the Pickering Primary Zone are informed to take this protective measure, if they so choose

The Toronto Emergency Operations Centre (EOC) will inform the following organizations of provincial direction to ingest KI

- Parks, Forestry & Recreation
- Transportation Services
- Toronto Water
- Toronto Zoo
- Toronto Library
- Toronto Police Service
- Toronto Paramedic Services
- Toronto Fire Services
- Toronto Transit Commission
- Toronto Hydro
- Toronto Public Health

Once notified by Toronto EOC of provincial direction to ingest KI, each of the organizations listed above will utilize pre-established procedures to communicate provincial direction to their respective workplaces and staff who may be located or working in the Primary Zone.

If provincial direction to ingest KI is issued after normal working hours, each of the above organizations with 24/7 operations will provide their contact information to Toronto Office of Emergency Management (OEM) for notification purposes.

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Section 4.5.4 [21] (Table 31) lists immediate protective actions; ITB is detailed in subsection "d". This section states the responsibility of deciding if and when to use KI is that of the province (MOH and CMOH). The City of Toronto will notify and confirm staff are aware of the directive to ingest KI, if they so choose. There is no inclusion of preparations for distributing KI to members of the public.

Table 32 – TNERP, Section 4.8

4.8 Thyroid Blocking
The decision to implement the administration of KI will be taken by the Chief Medical Officer of Health [CMOH].
The City of Toronto will follow the outline procedures detailed under the Protective Measures under Full Activation (Section 4.5.4).

Section 4.8 [21] (Table 32) reiterates the role of the CMOH in deciding to implement KI administration.

B.5.4 The Regional Municipality of York

York Region is not a designated municipality as it does not fall within the DPZ of Pickering NGS. The majority of York Region falls within the IPZ of Pickering NGS.

The Regional Municipality of York Emergency Plan and Annexes [33] is York Region's all-hazard emergency response plan.

B.5.5 Peel Region

Peel Region is not a designated municipality, as it does not fall within the DPZ of Pickering NGS. The eastern most extreme of Peel Region falls within the IPZ of Pickering NGS

The *Region of Peel Emergency Plan* [34] is Peel Region's all-hazard emergency response plan.

B.5.6 Kawartha Lakes

The City of Kawartha Lakes is not a designated municipality, as it does not fall within the DPZ of Pickering NGS. The south-western most extreme portion of the City of Kawartha Lakes falls within the IPZ of Pickering NGS.

The City of Kawartha Lakes Emergency Management Program - City Emergency Plan [35] is City of Kawartha Lakes' all-hazard emergency response plan.

B.5.7 Simcoe County

Simcoe County is not a designated municipality, as it does not fall within the DPZ of Pickering NGS. The town of Bradford West Gwillimbury resides on the north western edge of the IPZ.

The Town of Bradford West Gwillimbury Emergency Response Plan [36] is Bradford West Gwillimbury's all-hazard emergency response plan.

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Appendix C Pre-Distribution of KI Pills in the Pickering NGS IPZ

C.1 Ki Pill Order Statistics

Ontario Power Generation maintains a KI (Potassium Iodide) pill pre-distribution program for the communities, businesses, and residences in the vicinity of Ontario Power Generation's Pickering and Darlington Stations. The pre-distribution program sustains the 2015 initial KI pill direct delivery arrangement for residents and businesses within 10 km of the stations, and provides opportunity for access to KI pills to residents and businesses up to 50 km from the stations. The KI pill inventory for the pre-distribution program is maintained separately from the emergency inventory that is pre-deployed to the MOH, EMO, Durham Region, City of Toronto, OPG, emergency reception and emergency worker centres.

The sustaining pre-distribution elements include:

- Designated pharmacies within the DPZ
- New Neighbours Program for residences and business within the DPZ
- preparetobesafe.ca website for businesses and residences within IPZ of Pickering or Darlington Stations

The New Neighbours program provides KI Pills for residences and businesses in the DPZ which have new or changed addresses that are registered through Canada Post. From 2015 through 2019 KI Pills were distributed to these addresses three times a year. Starting in 2020, KI Pills are distributed to these addresses on a monthly basis.

The *Prepare to Be Safe* website [38] serves as a platform for KI pill Frequently Asked Questions (FAQs), and provides a means for businesses and residents within 50 km of the Pickering and Darlington Nuclear stations to request KI pills by entering a valid delivery postal code. Orders are processed from the website via request, and delivered as an individual blister-package of 20 pills for residents and small businesses; and 200-pill bottles for larger (100+ employees) businesses and institutions.

Since the website's implementation in 2015, the order demand for the 4-year period through to 2019, including New Neighbours data, is represented in Figure 13.

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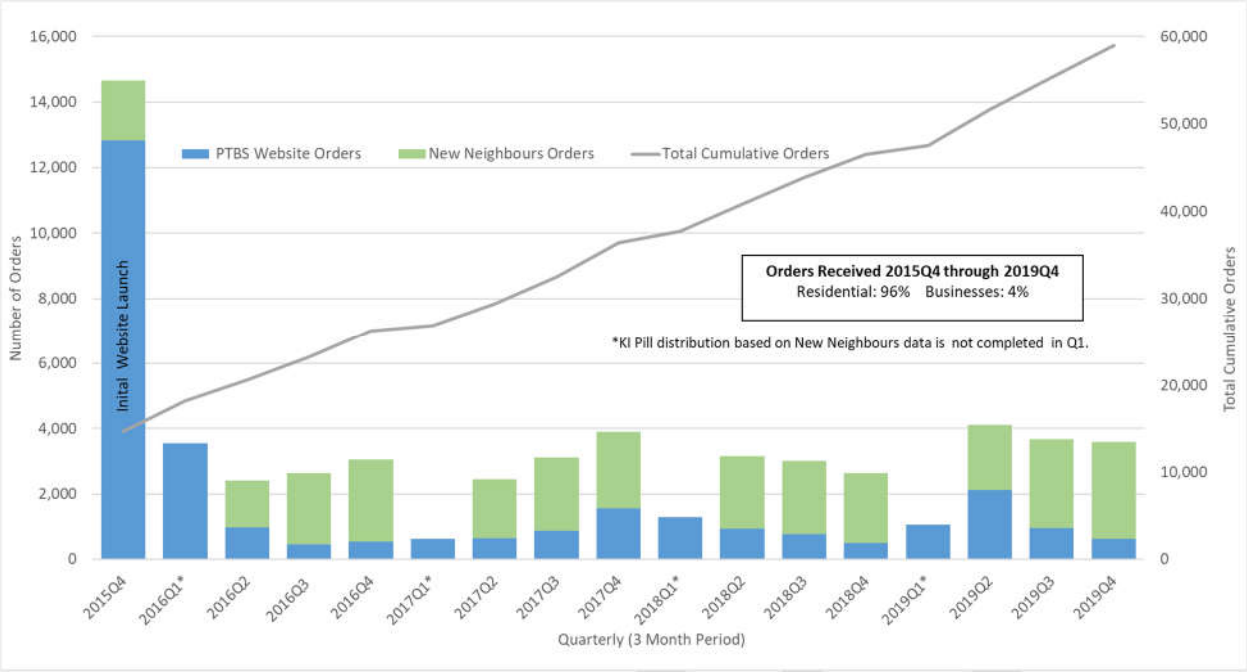


Figure 13 – KI Pill Pre-distribution for Pickering and Darlington, 2015 through 2019

On January 12th, 2020, there was an unintended activation of the Ontario Alert Ready System [44], erroneously stating an emergency had occurred at the Pickering Nuclear Station.

Among the consequences of the false alert was unprecedented activity on the preparetobesafe.ca website in the period following the false Alert Ready message.

For the 3-month period ending March 30, 2020, website requests from businesses and residents totalled 65 236 orders, the most significant period being January 2020 with more than 63 000 KI order requests. The monthly average website orders from 2015 through the end of 2019 was 571 residential order requests. Business orders averaged 23 requests per month in the period 2015 through 2019.

Figure 14 and Figure 15 detail the January 2020 Residential and Business Orders, respectively, as requested via preparetobesafe.ca. Order count refers to the total cumulative number of orders.

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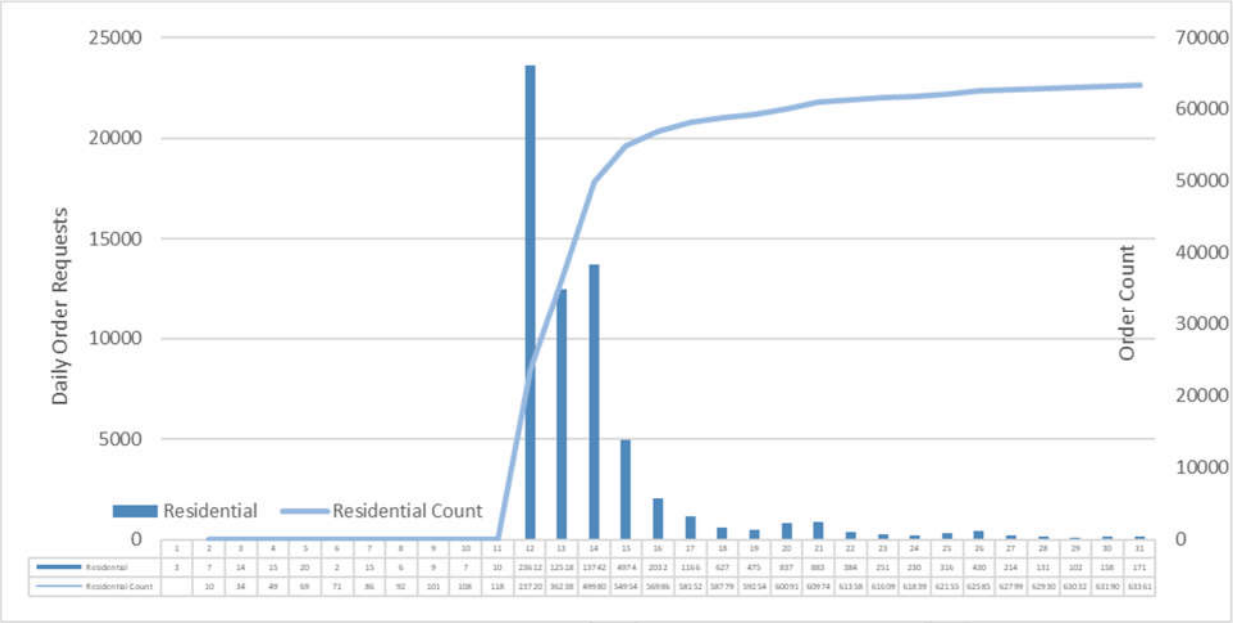


Figure 14 – Residential-January 2020 preparetobesafe.ca Order Requests

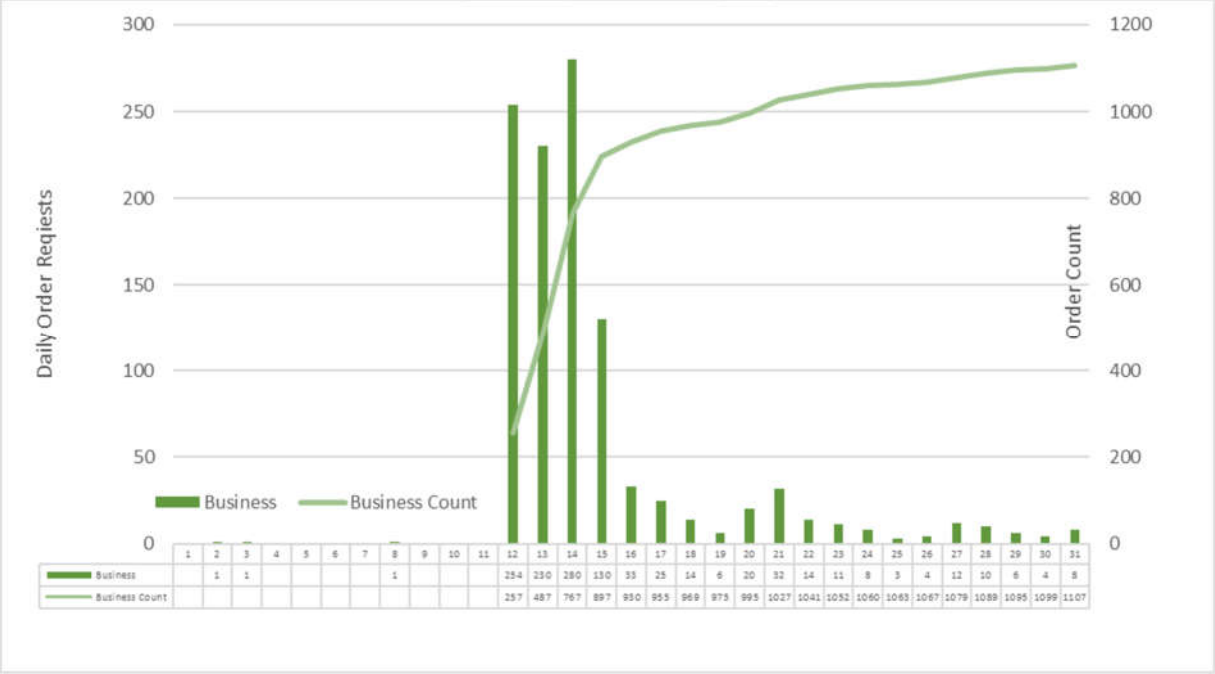


Figure 15 – Businesses-January 2020 preparetobesafe.ca Order Requests

The process and infrastructure supporting the preparetobesafe.ca website maintained inventory equivalent to one-year of demand. Approximately 15 000 packages of 20 pills (residential package) were on-hand on January 12th, 2020 at the KI distribution facility.

Note that the emergency inventory of KI Pills allocated to the Province of Ontario, OPG, and municipalities is maintained independent of the pre-distribution programs, and is not accessed to fulfill preparetobesafe.ca order requests.

Business order requests for the 200-pill bottle denomination were filled from on-hand inventory.

Distribution for the residential and business order requests received from the January 12th event were fulfilled by mid-July 2020.

Prior to the demand associated with the January 12th alert message, delivery was targeted for 6 weeks from receipt of the website request. As the unprecedented demand consumed on-hand non-emergency inventory, actions were implemented to:

- Re-package available vendor inventory into 20-pill blister pack denominations
- Source alternate suppliers
- Re-package OPG contingency inventory into 20-pill blister pack denominations
- Place a significantly sized priority order with vendor to fulfill projected demand and restore contingency margins

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C.2 KI Pill Order Geography

Figure 16 through Figure 21 show the geographic distribution of KI orders made through the *Prepare to Be Safe* website [38] within the Pickering and Darlington NGS IPZs. These maps do not include other distribution formats, such as pharmacies and the new neighbours program. Each figure depicts the new order addresses for a particular calendar year and is not cumulative with previous years.

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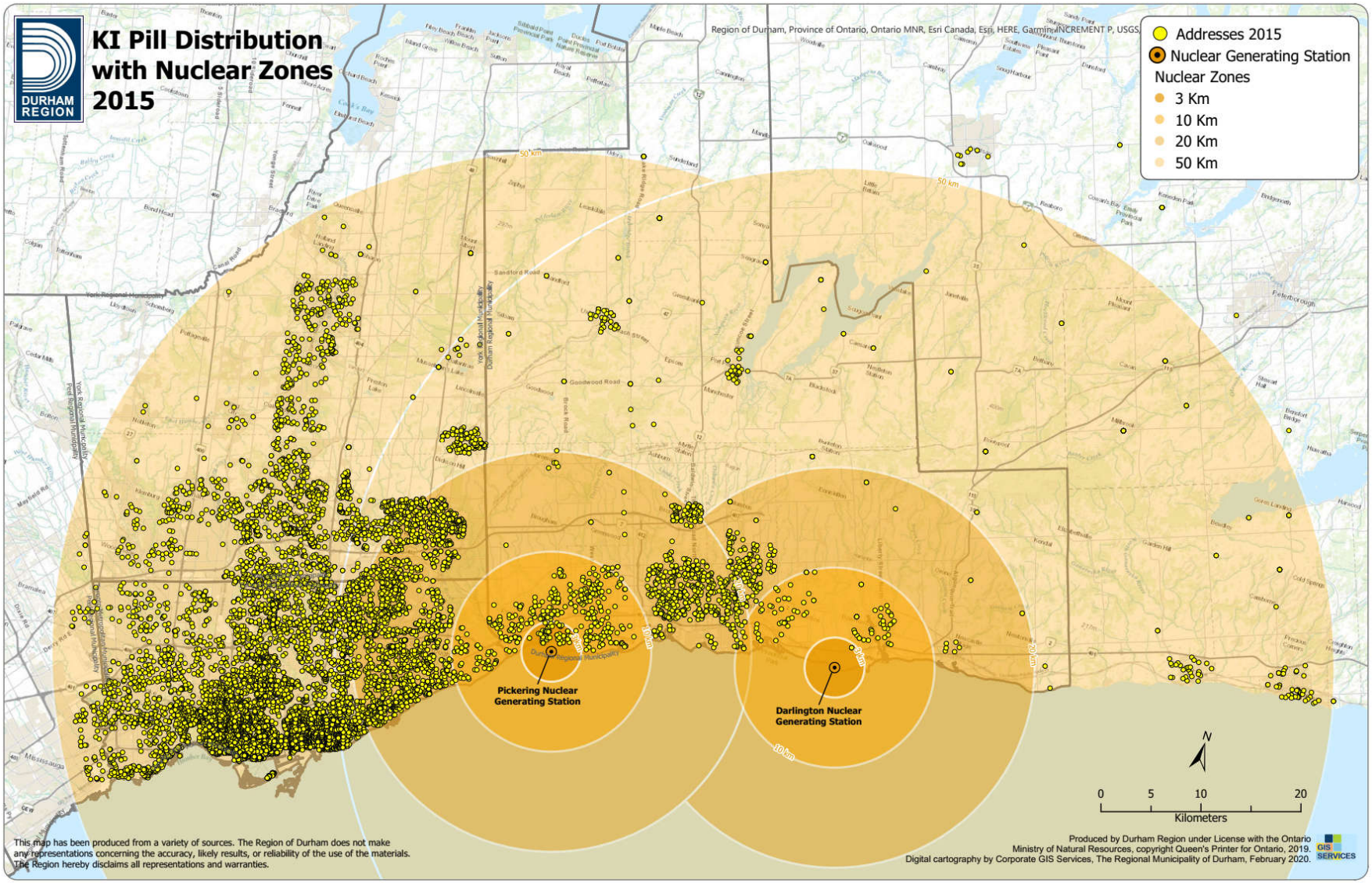


Figure 16 – Geographic Distribution of KI Orders in 2015

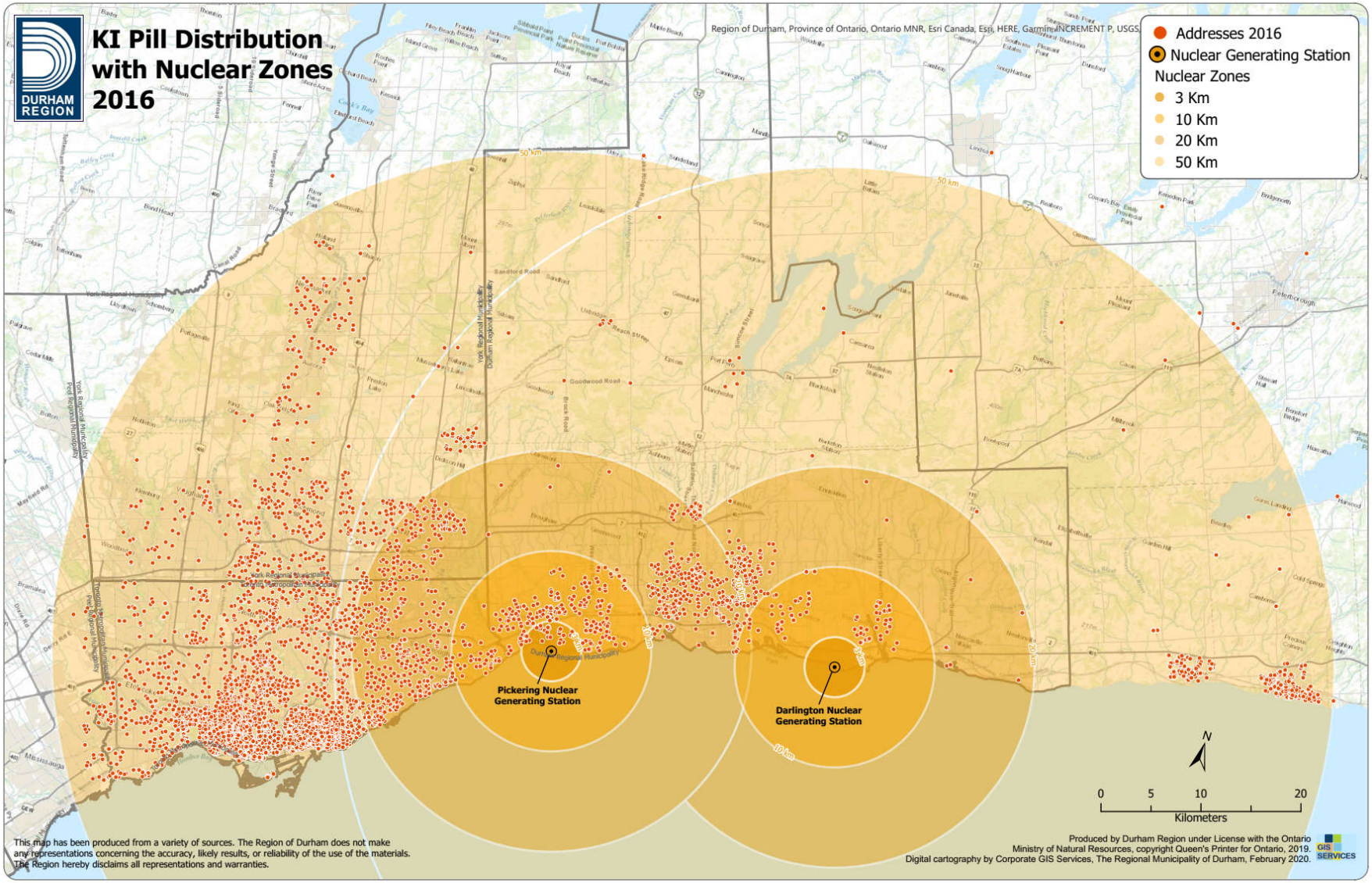


Figure 17 – Geographic Distribution of KI Orders in 2016

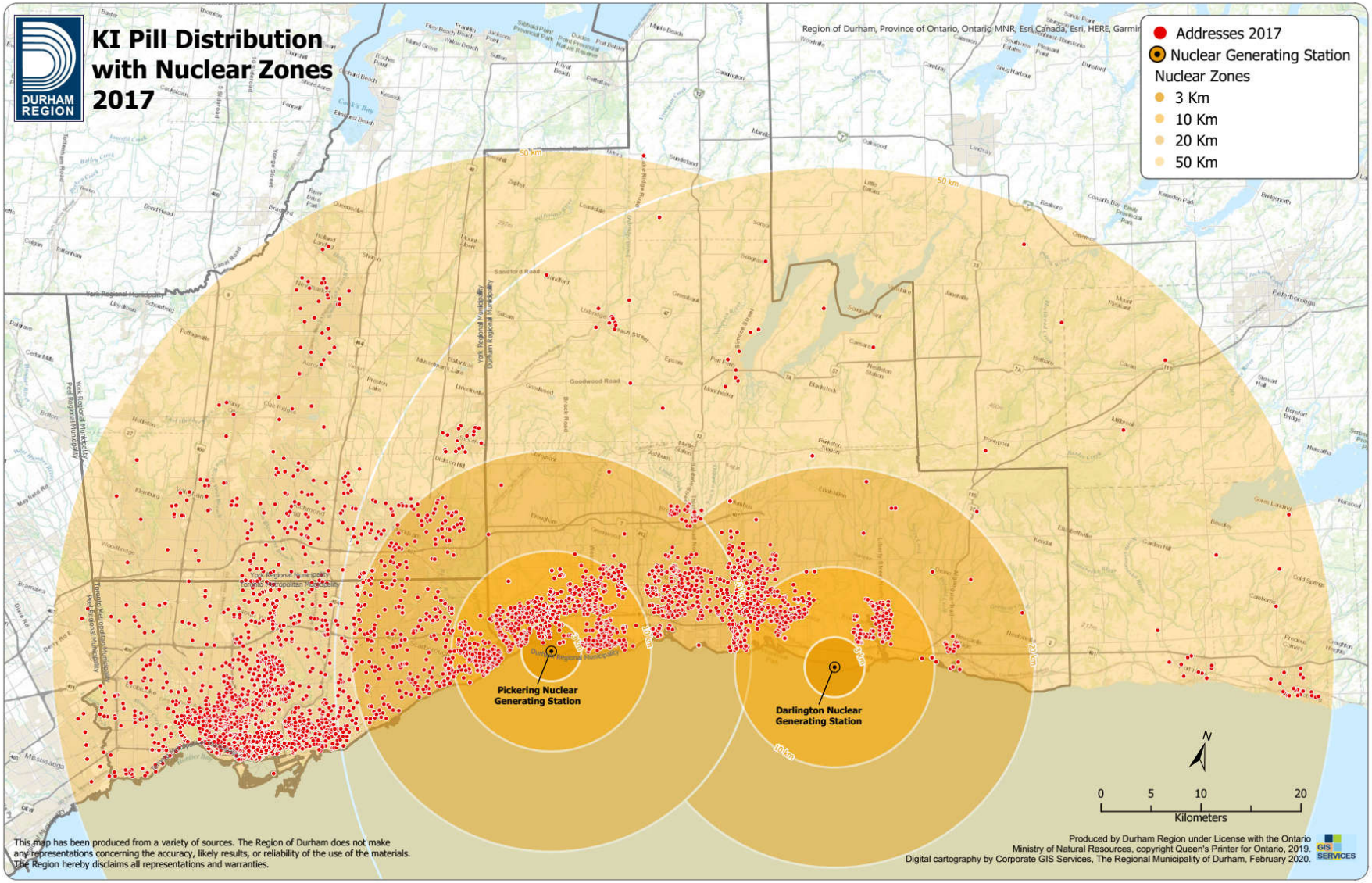


Figure 18 – Geographic Distribution of KI Orders in 2017

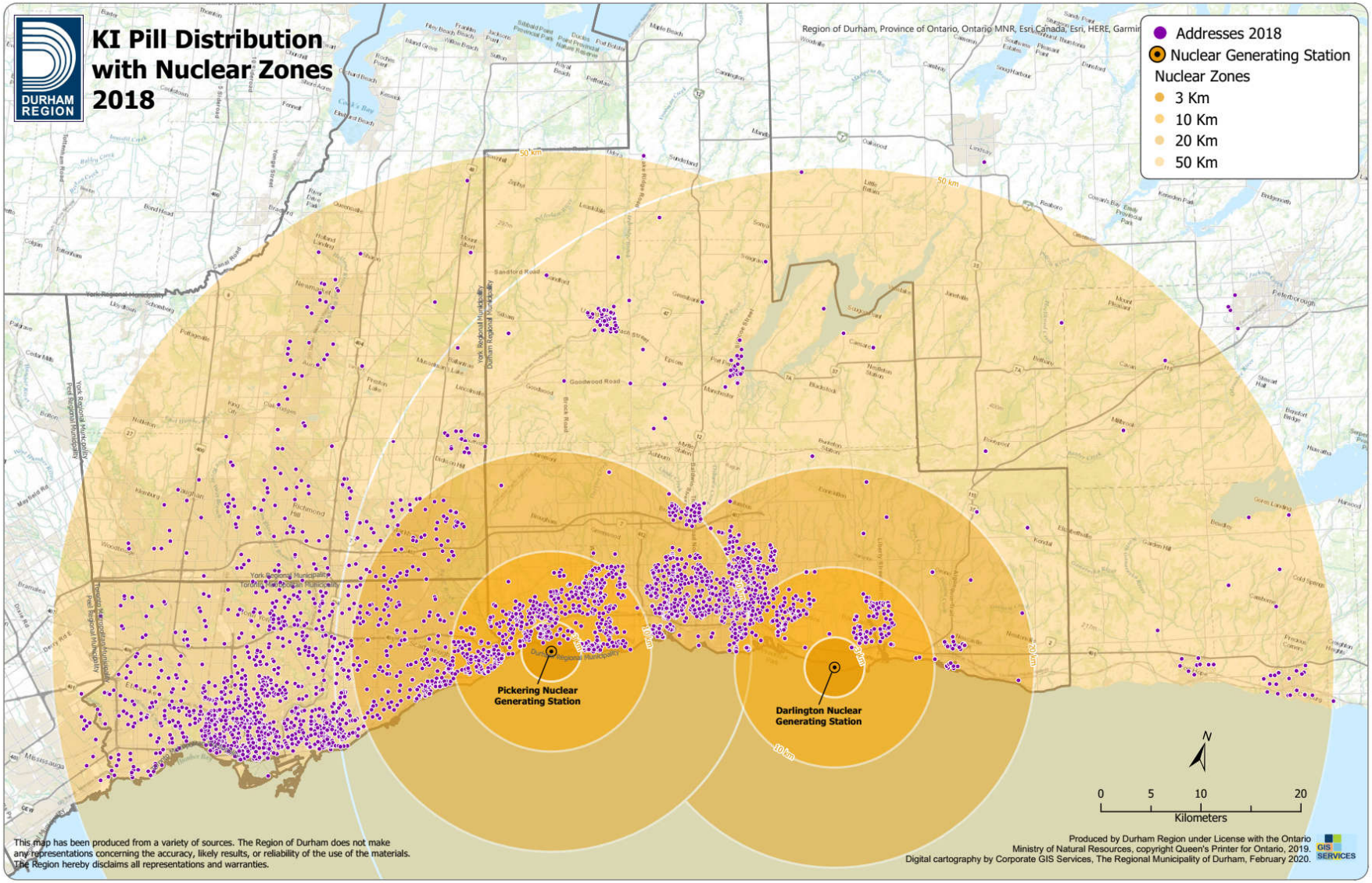


Figure 19 – Geographic Distribution of KI Orders in 2018

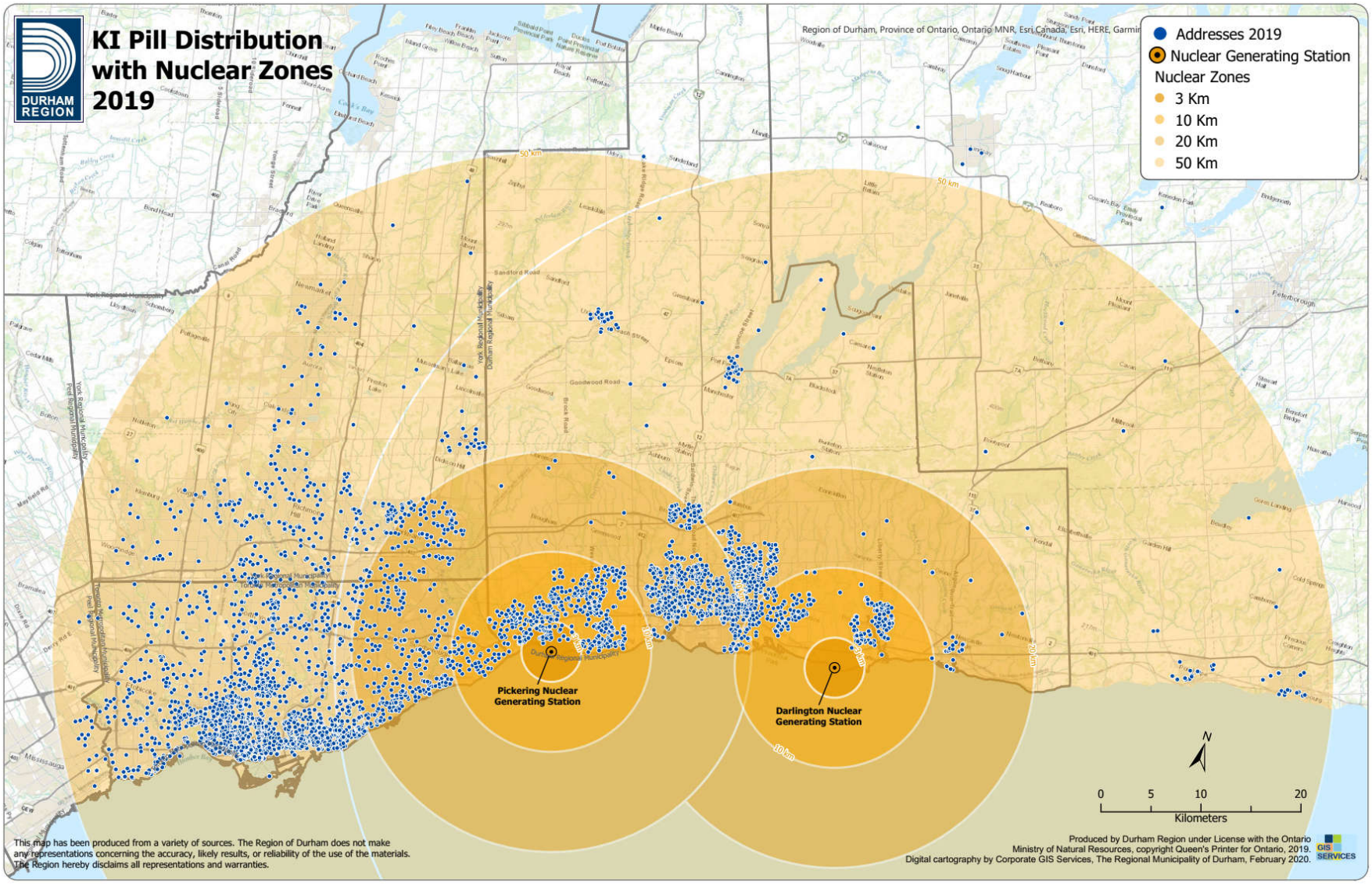


Figure 20 – Geographic Distribution of KI Orders in 2019

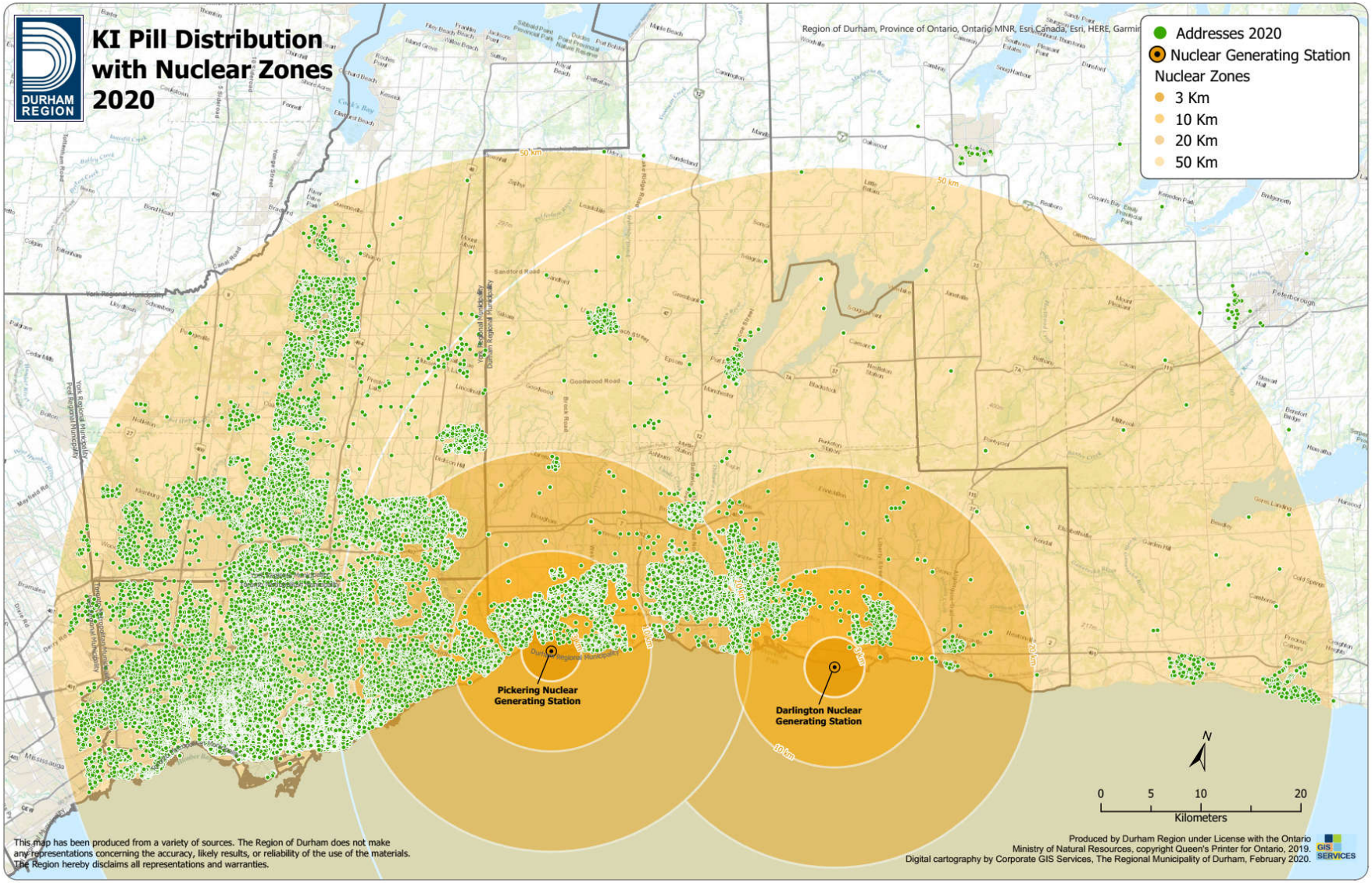


Figure 21 – Geographic Distribution of KI Orders in 2020 (as of February)

Appendix D Current National and International Practices

The International Atomic Energy Agency (IAEA) and the World Health Organization (WHO) have published recommendations for response actions in the rare event of a nuclear emergency, such as potassium iodide (KI) distribution [15, 10, 14, 45]. However, requirements and preparedness for countermeasures differ nationally and internationally. KI ingestion as a countermeasure is normally combined with other countermeasures such as sheltering and evacuation.

This appendix is not intended to be an exhaustive list of all KI practices, but is intended to show the variety of requirements set or practices carried out by different countries and regions. Some governments and or facilities have chosen to pre-distribute KI whereas others have decided not to pre-distribute.

D.1 Canada

Federal Requirements

The Canadian Nuclear Safety Commission's REGDOC-2.10.1 [3], Nuclear Emergency Preparedness and Response, Version 2 (2017) outlines that a sufficient quantity of KI pills must be pre-distributed to all residences, businesses and institutions within the designated plume exposure planning zone (also referred to as the Detailed Planning Zone (DPZ)). A sufficient quantity of KI pills must be pre-stocked and available within the designated ingestion control planning zone (also referred to as the Ingestion Planning Zone (IPZ)) to facilitate distribution when required. Residents of the designated ingestion control planning zone must be able to obtain KI at any time.

D.1.1 Ontario

Provincial requirements

The Ontario Provincial Nuclear Emergency Response Plan (PNERP) [2] outlines that the Chief Medical Officer of Health directs iodine thyroid blocking (ITB) or KI ingestion in consultation with Provincial Emergency Operations Centre (PEOC) and local Medical Officers of Health. KI pills along with instructions on administration must be pre-distributed to the DPZ (3-10 km) (residences, businesses, institutions and for emergency centers). Designated municipalities shall detail in their plans the means by which the availability of KI pills is facilitated for their residents within the DPZ and IPZ (out to 50 km). As the IPZ includes the Contingency Planning Zone (CPZ) (10-20 km) KI pill requirements for the CPZ are consistent with those stipulated for the IPZ.

Bruce Nuclear Generating Station

KI is pre-distributed to all residents and businesses within 10 km by mail. KI is pre-distributed to all schools within 50 km of the Nuclear Generating Station (NGS) (52 schools). KI is pre-distributed upon request to residents and businesses within 50 km, individuals outside the 10 km zone but within the 50 km zone received a safety guide, vouchers and details on KI pick-up locations [46].

Pickering*/Darlington Nuclear Generating Stations*

KI is pre-distributed to all residents, schools and business within 10 km by mail. KI is pre-distributed upon request for residents and individuals working within 50 km. KI can be requested through the Prepare to be Safe website [38].

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Other

Windsor and Essex County and the municipality of Chatham-Kent fall within the 10-mile EPZ and/or secondary planning zones for the Enrico Fermi 2 NGS (Fermi 2), in Michigan, and the Davis-Besse NGS and the Perry NGS, in Ohio. KI pick-up sessions were held for populations within the EPZ (10 miles). More recently, KI was made available by request for individuals living in the secondary planning zone (up to 80 km) within Canada (Windsor and Essex County and the Municipality of Chatham-Kent) [47, 48].

D.1.2 New Brunswick

Point Lepreau Nuclear Generating Station

KI is pre-distributed to all residents, schools and businesses within 20 km. A warden service provides a visible presence in the community and assists in disseminating safety information and KI to the public [49].

D.2 Europe

Below are some examples of KI distribution practices within European countries.

D.2.1 France

Federal requirements state that potassium iodide (KI) must be distributed in the 20 km EPZ. Each inhabitant within a 20 km radius receives a letter with an explanation about KI (how to use it and when) and a voucher to withdraw KI at the nearest pharmacy. Only pharmacists are allowed to distribute KI, except in the event of a nuclear emergency. The pharmacist must provide information on KI use. Newcomers receive information about the potential nuclear hazard from the mayor's office and receive a voucher to obtain KI. Each institution or facility (i.e. schools, hospitals, hotels, campgrounds, and businesses) within the 20 km EPZ has a proper stockpile of KI. Additionally, each NGS has a stockpile for employees, contractors, and visitors. The army would distribute KI during an emergency. The central army pharmacy manages a stock of KI in the event of an emergency [50].

D.2.2 Switzerland

KI is pre-distributed to all homes, businesses and public institutions within 50 km of each NGS. The Federal Council expanded the pre-distribution zone from 20 km to 50 km in 2014. Beyond 50 km, KI pills are available commercially from pharmacies [51].

D.2.3 United Kingdom

Operators and local authorities are required to develop onsite and offsite emergency plans, respectively. The local authority offsite plan should be prepared for the area defined by the Office of Nuclear Regulation for each nuclear site. The Director of Public Health for regions with licensed nuclear sites are responsible for ensuring that there are appropriate arrangements for the prompt distribution of KI and for authorising their administration. National Health Services are responsible for the extendibility of plans [52]. While some plants do not pre-distribute or have stopped pre-distributing KI, there are plants that do. For example, KI is pre-distributed to residents and workers within 2.4 km of the Hunterston B Power Station and within 3 km of the Torness Nuclear Power Station [53, 54].

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D.2.4 Finland

Licensee must have KI available for its workers. Licensee must pre-distribute KI to the public in permanent and leisure accommodations, and workplaces within the precautionary action zone (5 km). Pre-distributing within the precautionary action zone is done through mail. KI is stocked in all schools in the country and is available in all pharmacies [55].

D.3 United States of America

The federal government recommends that KI is stockpiled for radiological emergencies for distribution to emergency workers and institutionalized persons. KI is to be considered for the public within the 10-mile (~16.1 km) EPZ. The decision on use of KI is left to the State and local governments. KI is to be made commercially available. The United States Nuclear Regulatory Commission (NRC) provides funding for the purchase of the State's supply of KI for populations living within the 10-mile EPZ. Twenty-five states (Alabama, Arizona, California, Connecticut, Delaware, Florida, Illinois, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, Washington, West Virginia and Wisconsin) have received potassium iodide tablets from the NRC [56].

Below are some examples of KI distribution practices within the United States.

D.3.1 Illinois

A downloadable voucher is distributed to populations within the 10-mile EPZ. The voucher is redeemable for a two-day supply of KI at local pharmacies [57].

D.3.2 California

A downloadable voucher is distributed to individuals living or working within the Protective Action Zones (approximately 15-mile radius of a NGS). The voucher is redeemable for a two-day supply of KI at local public health clinics [58].

D.3.3 Florida

Authorities are required to have KI readily available for residents within the 10-mile EPZ. In an emergency, initial distribution will focus on the 10-mile EPZ. As more personnel and resources become available, KI will be available for others [59].

D.4 Japan

Following the Fukushima Daiichi nuclear power plant accident, the Japanese government revised the Nuclear Emergency Response Guidelines such that local public authorities are to construct a system enabling the distribution of KI to local residents in advance in the Precautionary Action Zone (approximately 5 km from nuclear facility). Japan previously planned to distribute KI only during an emergency and only if a 100 mSv threshold was reached [60].

DRAFT

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

February 14, 2019

via email: cnsc.consultation.ccsn@canada.ca

Re: CELA's Comments on the Canadian Nuclear Safety Commission's KI Working Group draft Terms of Reference

To whom it may concern:

The Canadian Environmental Law Association (CELA) welcomes the opportunity to provide comments on the Canadian Nuclear Safety Commission's (CNSC) consultation on the draft Terms of Reference ("TOR") for the Potassium Iodide Pill Working Group (herein "KI Working Group").

We commend efforts by the CNSC to strengthen emergency preparedness, especially to vulnerable populations who are most at risk following a nuclear accident. The federal standard recognized in the CNCS's RegDoc 2.10.1 requires "…that particular consideration is given to sensitive populations such as children and pregnant women within the designated ingestion control planning zone." CELA submits that this statement must be interpreted in such a way that equal levels of protection are provided to all individuals within the Ingestion Protection Zone (IPZ). As currently implemented, vulnerable populations such as children, do not have consistent levels of protection across the province of Ontario. In our view, this discrepancy must be remedied through the outcomes of the KI Working Group. As currently drafted, the Working Group's Terms of Reference do not accomplish this objective.

While KI pills are already stockpiled in all schools within 50 km of the Bruce Power nuclear generating station, this standard has not been applied to the schools within the same radius of OPG's Pickering and Darlington nuclear power plants, where stockpiling in schools only occurs out to 10km. CELA reiterates its full support for the proactive stockpiling of KI in all schools within 50 km of any nuclear power plant.

CELA's recommendations to the CNSC are set out below. These comments build on CELA's related concerns about the sufficiency of emergency planning and preparedness, as highlighted in our recent submissions to the CNSC for the relicensing hearings of the Bruce and Pickering nuclear stations.

About Us

CELA is a non-profit, public interest law organization. For nearly 50 years, CELA has used legal tools to advance the public interest, through advocacy and law reform, in order to increase environmental protection and safeguard communities across Canada. CELA is funded by Legal Aid Ontario as a speciality legal clinic, to provide equitable access to justice to those otherwise unable to afford representation.

CELA has engaged in detailed research and advocacy related to the improvement of public safety and environmental protection by seeking improvements to nuclear emergency preparedness.

CELA frequently participates in legal proceedings involving the interpretation, implementation, and enforcement of statutes relate to environmental protection and often intervenes in its own right in proceedings involving issues of public importance and environmental significance. CELA has a lengthy history reviewing the sufficiency of emergency preparedness in the context of nuclear power plants[1] and has also been actively involved in discussions and consultations regarding the Province of Ontario's revised Provincial Nuclear Emergency Response Plan.[2]

Recommendations on the Draft Terms of Reference for the KI Working Group

1. Amend the Working Group's purpose to reflect commitments made at public hearings

CELA submits that the draft Terms of Reference do not reflect the commitment made by the CNSC during the Pickering Nuclear Generating Station (NGS) relicensing hearing to form a working group with the express aim of providing the Commission with a plan on how to implement emergency measures to vulnerable populations within the 50 km ingestion planning zone. Instead, the TOR characterizes the purpose of the Working Group as providing "clarity" with regards to existing plans.[3]

The commitment as made by Executive Vice-President and Chief Regulatory Operations Officer Ramzi Jammal to the Commission members at the Pickering NGS relicensing hearing was as follows:

> […] CNSC staff is recommending we establish a working group that encompasses CNSC staff, OPG, the Ministry of Health and the Chief Health Officer, and then other stakeholders in order to provide the Commission with a plan on the implementation of the requirement of 2.10.1, RD-2.10.1, and that we will be updating you with respect to the progress so that it will be clear to the responsible authority to deliver the KI pills when it is needed and then we will provide the Commission with the answers (emphasis added).[4]

We therefore recommend the following:

Recommendation No. 1 The background or preamble to the TOR should be updated to reflect the original intent and commitment of the CNSC. Rather than providing "clarity with respect to existing plans," the purpose of the Working Group must be "to devise a plan to implement" RegDoc 2.10.1

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[1] Canadian Environmental Law Association, "Publications: Emergency Planning around Canadian Nuclear Plants," online: http://www.cela.ca/test-emergency-planning-around-canadian-nuclear-plants

[2] CELA, "Re: Discussion Paper on Planning Basis Review and Recommendations and List of Proposed Changes to the PNERP 2009" (28 July 2017), online: http://www.cela.ca/sites/cela.ca/files/EmergencyPlg.pdf

[3] CNSC, "Draft Terms of Reference," Background

[4] CNSC, "Pickering Hearing Transcript - June 24, 2018" p 316 - 317

section 2.3.4. This statement could also be added as a function of the Working Group in section 1 or in the deliverables outlined in section 5.

2. Expressly reference civil society in the inclusion of the Working Group's "special committee"

CELA has received an invite to be part of a special committee, known as the Advisory Committee to the KI Working Group, pursuant to section 4.3 of the TOR. To our knowledge, no other civil society organizations have been invited.

In lieu of the CNSC's commitment to include civil society in this process, we ask that it be made an express commitment within the terms outlined in section 4.3. This recommendation is in line with statements made during the 2018 meeting on the Regulatory Oversight Report for Nuclear Power Plants ("NPP ROR"), when Mr. Jammal confirmed to CNSC President Velshi that civil society organizations could be members of the advisory committee. Mr. Jammal explained that "there will be an advisory committee separate from the working group that will allow other interested parties" to participate.[5]

In our view, the membership of the Working Group's Advisory Committee should be comprised of the public intervenors who appeared before the CNSC during the Pickering relicensing hearing and per Mr. Jammal's commitment, comprised of civil society. Thus, as the membership of the advisory committee includes non-civil society members, such as Bruce Power, we request that the CNSC publicly provide a disposition of comments or meeting minutes related to decision-making about the committee's membership.

Recommendation No. 2: The membership of the KI Working Group's Advisory Committee must include members of the public and civil society organizations for reasons of transparency and accountability. Section 4.3 should be updated to expressly reference (1) the Advisory Committee and its members, (2) the mandatory inclusion of civil society within its membership, (3) the role and function of the Advisory Committee, and (4) how decision-making will be shared among the Advisory Committee and Working Group. We also request that a disposition of comments or meeting minutes related to decision-making about the committee's membership be made publicly available.

3. Establish a timeline to guide stockpiling of KI pills in schools

Despite the TOR's setting of deadlines for administrative duties, such as the frequency of Working Group meetings (s 3.1), when the agenda must be sent (s 3.5), and drafts posted for public comment (s 4.2), it is silent on a deadline or timeframe guiding the stockpiling of KI pills in schools.

In order to ensure goal-oriented action by the Working Group, it is necessary to set a deadline by which KI stockpiling in schools could occur. As Dr. Robert Kyle, Commissioner for the Medical Officer of Health

[5] CNSC, "Public meeting transcript – November 8, 2018," online: http://nuclearsafety.gc.ca/eng/the-commission/pdf/2018-11-08-Meeting-e.pdf, p 131

with the Durham Region Health Department noted in the recent Pickering NGS relicensing hearing, the focus over the next year will be on replacing the current stock of KI pills whose shelf life is expiring[6] in time for the start of 2019 school year.

Recommendation No. 3 To ensure goal-oriented action, section 4.0 of the TOR should be updated to include a timeline for the stockpiling of KI pills in schools.

4. Effective TOR must be collaboratively developed

In order to be effective, the TOR must be collaboratively developed. Despite repeated requests from CELA to be involved in the drafting of the TOR[7], preliminary input was not sought.

As early as November 8, 2018, Mr. Jammal commented at the NPP ROR meeting that the working group was "starting to take form" and "some terms of reference … have been started."[8] On January 11, 2019, CELA was further informed at a meeting of the Durham Nuclear Health Committee that OPG had an "active role in the KI Working Group" and the Office of the Fire Marshall and Emergency Management (OFMEM) noted that they would be "getting together [with the CNSC] to look at those comments" received from this consultation.[9]

As such, we are concerned that OPG and the OFMEM whose involvement was sought in the drafting of the TOR, has resulted in their role as *de facto* gatekeepers and compromised the transparency of this process. We therefore request:

Recommendation No. 4 The CNSC should provide a public disposition of comments made by OFMEM and OPG in the making of the draft Terms of Reference.

5. Public awareness should be expressly stated within scope of TOR

In the Pickering NGS relicensing decision, it is noted that CNSC staff 'strongly support' efforts to enhance emergency preparedness public awareness campaigns beyond the current 10km Detailed Planning Zone (DPZ).[10] CELA was also informed by OFMEM at the DNHC meeting on January 11, 2019 that the availability of emergency planning information beyond the DPZ was among the issues being considered by the KI Working Group.[11] Therefore, CELA recommends the following:

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[6] CNSC, "Pickering Hearing Transcript - June 28, 2018," p 56
[7] *See* CELA, "Comments on CNSC Regulatory Oversight Report for Nuclear Power Plants," online: http://www.cela.ca/comments-cnsc-generating-sites
[8] *Supra* note 6, p 130
[9] Personal notes, Kerrie Blaise (11 Jan 2019)
[10] Record of Decision (20 Dec 2018) "Application to Renew the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station, para 505
[11] *Supra* note 10

Recommendation No. 5 The Background section of the TOR should reiterate the Commission's acknowledgement that public awareness needs to be extended beyond the DPZ. Section 1.1 of the TOR should also be amended to expressly acknowledge that the scope of the Working Group includes the strengthening of public awareness regarding nuclear emergency preparedness within the IPZ.

6. The TOR should specify its guiding principles and values

The TOR should include a section titled "Guiding Principles and Values" which specifies Working Group's research ethics and foundational principles. To ensure the meaningful implementation of these principles, they must be followed in a publicly, justifiable way. For instance, proclamations of transparency are hollow if reasons in support of decisions are not made publicly available. Furthermore, insufficient public disclosure can impede the depth of public participation and diminish accountability.[12]

Recommendation No. 6 CELA recommends the inclusion of the following principles and accompanying meanings as a new section in the TOR:

> ***Transparency*** The Working Group commits to providing a public disposition of comments based on discussions with its membership and the reasons which informed the members' decisions in formats which are easily publicly accessible and intelligible.
>
> ***Publicly accessible*** The Working Group shall ensure all documents related to its mandate are publicly available on the CNSC consultation website and that documents are posted within 7 days of a meeting.
>
> ***Best Interests of the Child*** To the maximum extent possible, the Working Group commits to prioritizing the best interests of the child[13] in the administration of the Working Group's purpose and implementation of accompanying measures.

7. The TOR should include a "Methods" section

CELA requests the TOR provide further details related to the methods the Working Group will employ in reaching decisions. We request the inclusion of a "Methods" section which outlines:

- The type of data and sources which be relied upon in reaching conclusions
- Indicators used to guide and measure performance
- Factors used to assess success or verification of mandate

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[12] Access Info, "Opening Up Decision Making," online: https://www.access-info.org/decision-making-transparency

[13] *United Nations Convention on Rights of the Child,* 12 November 1989, UNTS 1577

Recommendation No. 7: A new section titled “Methods” should be included which sets out the data and sources relied upon during decision-making, and the indicators used to guide deliverables and Working Group outcomes.

CONCLUSION

Thank you for this opportunity to provide comments on the draft Terms of Reference for the KI Working Group.

Truly,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION



Kerrie Blaise, Legal Counsel



Community Safety Guide, KI distribution enhancing emergency preparedness in Grey, Bruce and Huron

2025-03-20

A regular initiative to enhance emergency preparedness practices in Grey, Bruce and Huron Counties is progressing as Bruce Power updates its Community Safety Guide and prepares for distribution of potassium iodide (KI) tablets.

The guide, designed in partnership with The Municipality of Kincardine, neighbouring counties and health units, is set to arrive at homes throughout all three participating communities in the coming months. In addition, improvements to the 'Be prepared' website, distribution of potassium iodide (KI) tablets within a 10-kilometre radius of the Bruce Power site, and upgrades to public emergency notification tools are also planned.

"It's important that Municipality of Kincardine residents and our neighbouring communities are given information they can keep handy," said Shane Watson, Community Emergency Management Coordinator, Municipality of Kincardine. "Being prepared for a range of potential emergencies is key. While a nuclear event is extremely unlikely, having this information all in one package alongside more likely occurrences such as severe weather helps people feel confident in knowing what to do in all situations.

"The comprehensive guide helps residents familiarize themselves with emergency phone numbers, create a fire escape plan, know how to deal with severe weather, and what to pack in their 72-hour emergency grab-and-go kit. Preparedness and information are paramount when it comes to emergency response."

The guide also contains a voucher for residences and businesses within 50 kilometres of Bruce Power who would like to pick-up KI tablets from participating local pharmacies, to keep in their homes and offices. While this is an option available to residents within these counties, it's important to note that these tablets are stored around the region and could

easily be accessed if ever required.

“Distribution to residences and businesses within 10 kilometres of Bruce Power began in January and should be complete this spring,” said Jeff Steven, Bruce Power’s Division Manager, Emergency and Protective Services.

Residents and businesses within 10 kilometres of Bruce Power can expect a package mailed to their home address that will have an updated package of KI to replace their soon to expire package that was issued in 2015. Also enclosed in this package is a copy of the safety guide along with information on emergency preparedness for the region and how to safely dispose of the previously stored KI.

“Although it’s highly unlikely that KI tablets would ever be needed, we also want to reassure people that they’re readily available within the region,” Steven said.

More information about emergency preparedness in Grey, Bruce and Huron counties can be found on-line at www.bepreparedgreybrucehuron.com.

About Bruce Power

Bruce Power is an electricity company based in Bruce County, Saugeen Ojibway Nation Territory, Ontario. We are powered by our people. Our 4,200 employees are the foundation of our accomplishments and are proud of the role they play in safely delivering clean, reliable nuclear power to families and businesses across the province and cancer-fighting medical isotopes around the world. Bruce Power has worked hard to build strong roots in Ontario and is committed to protecting the environment and supporting the communities in which we live. Formed in 2001, Bruce Power is a Canadian-owned partnership of TC Energy, OMERS, the Power Workers’ Union and The Society of United Professionals. Learn more at www.brucepower.com and follow us on Facebook, Twitter, LinkedIn, Instagram, and YouTube.

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Canadian Nuclear Safety Commission (CNSC) Annual Report 2021–22

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Message from the President



I am pleased to present the 2021–22 Annual Report of the Canadian Nuclear Safety Commission (CNSC), outlining how we protected the health, safety, security of persons and the environment, and met our international obligations. I am grateful for the opportunity to convey information to parliamentarians and Canadians about the important work of the CNSC and its successes and challenges over the past fiscal year.

2021 marked 75 years of nuclear safety and security regulation in Canada, making the CNSC one of the most mature nuclear regulators in the world. Our diamond anniversary gave us an opportunity to celebrate our rich history of keeping Canadians and the environment safe. We have overcome many challenges over the last 75 years, and this past year was no exception. Among the challenges we faced – and overcame – this year were adapting to the ongoing COVID-19 pandemic, meeting the needs of Canada's energy sector as it responds to the climate change crisis, and responding to the appalling situation in Ukraine and its unique implications for nuclear energy.

Throughout the war in Ukraine, CNSC staff have been at the forefront of engaging with Government of Canada officials and our international colleagues to share information and analyses to respond to potential threats. In March, we acted immediately following the shelling of an administrative building at one of Ukraine's nuclear power plants, quickly sharing information about risks with our international colleagues, other federal departments and, most importantly, Canadians. The conflict points to the need for a strong, effective international nuclear regulatory regime. We worked closely with the International Nuclear Regulators Association to share technical information on nuclear safety and coordinate assistance to the International Atomic Energy Agency (IAEA) and Director General Rafael Grossi's efforts to enhance safety. In the coming years, enhancing the robustness and transparency of the international regime will be an important priority for us in order to ensure that risks are mitigated. The war also highlights the importance of being able to communicate science and risks to the public quickly and transparently, even if such risks are not immediate to Canadians.

March 2022 marked 2 full years of remote work for CNSC staff because of the COVID-19 pandemic. I am heartened that the CNSC has been able to adapt and thrive during this time of global uncertainty. We have shown that the CNSC is not only an organization that is capable of change, but one that rises to the most challenging situations. We have been unwavering in our commitment to ensuring safety throughout this time, including our ongoing regulatory oversight of the complex refurbishments at the Bruce and Darlington nuclear generating stations. Innovation in the production of medical isotopes also continued to be a key area of focus, with the Commission granting licence amendments to Ontario Power Generation to produce molybdenum-99, which is used in diagnostic imaging, and to Bruce Power to produce lutetium-177, which is used in cancer treatments.

In July 2021, Bruce Power reported elevated levels of uptake of hydrogen and its isotopes in the pressure tubes of 2 of its units that were shut down at the time. The levels were higher than anticipated, posing a potential risk to the continued safe operation of those units. We held special public Commission hearings to understand the science and facts, established the External Advisory Committee on Pressure Tubes, and provided open, timely and transparent communications to the public to keep them informed of the situation. The CNSC directed Bruce Power to assess the fitness for service of its other reactors to ensure that continued operation of the units is allowed only once it is established that it can be done safely. The CNSC also issued formal notices to all nuclear power plant licensees in Canada, requiring

timely review and reporting on the continued safe operation of pressure tubes.

In 2021–22, we continued to show leadership through our readiness to enable the innovation necessary to meet climate goals. In December 2021, Ontario Power Generation announced the technology it has selected for the first grid-scale small modular reactor (SMR) in Canada and in a G7 nation. We are ready to receive a construction licence application for the Darlington site, which is expected before the end of 2022. We have been preparing to regulate this technology for years, and we continue to build upon our relationships with other nuclear regulators to collaborate and share best practices, experiences, and knowledge that will enhance international nuclear safety, security and non-proliferation. We actively support the IAEA's initiative on the international harmonization and standardization of SMRs to make sure that we are supporting the safe development and deployment of these technologies globally.

Nuclear waste management was another area of focus this past year. Canadians are showing increasing interest in the future of nuclear waste management. Part 1 of the Commission hearing for the Canadian Nuclear Laboratories application for a licence to construct a near surface disposal facility in Deep River, Ontario, was held in February 2022 and focused on the final environmental assessment report and licensing application. This project, if approved, would see the construction of the first engineered facility for the disposal of low-level radioactive waste in Canada.

As part of a new study on governing nuclear waste in Canada, I had the opportunity to share with the House of Commons Standing Committee on Environment and Sustainable Development how the CNSC carries out its critical role in regulating radioactive waste management. The CNSC has been actively engaged in Natural Resources Canada's modernization of the Radioactive Waste Policy Framework, which aims to shape Canada's national policies and strategies on radioactive waste, aligning them with international standards and best practices. The Office of the Auditor General's Performance Audit of Nuclear Waste Management – Low and Intermediate Levels, which was launched in July 2021, included reviewing the CNSC's regulatory role. We look forward to the audit's recommendations and to the report that will be tabled in the fall.

I want to close on a note about our employees, who continued to demonstrate resilience, professionalism and dedication in all they do. This year, we further strengthened our commitment to making the CNSC a place where everyone feels respected, safe, and able to reach their true potential. While we still have much to do, we made significant progress on diversity, equity and inclusion by implementing new aspirational 3-year employment equity hiring goals, implementing a new policy to help us all identify and prevent workplace violence, and establishing several employment equity groups. As co-chair of the International Gender Champions Impact Group on Gender Equality in Nuclear Regulatory Agencies, I am very pleased at our progress over this past year to greatly expand membership and fuel momentum across the globe for gender equity. Lastly, we completed our Reimagine the Workplace Initiative, which highlights the vision and principles that will guide the approach to our future post-pandemic hybrid work model. Everyone's mental health and well-being are of utmost

importance, so giving employees the choice of where to work is just one more way that we can provide flexibility and support to our staff.

I invite you to read the CNSC's 2021–22 Annual Report to gain a better understanding of how we continue to navigate these challenging times. This report reinforces that we are well served by our organizational priorities, which have guided our efforts over the past year.

Rumina Velshi
President

Results at a glance

THE CNSC'S 4 STRATEGIC PRIORITIES	
TO HAVE A MODERN APPROACH TO NUCLEAR REGULATION	The CNSC is committed to a modern approach to nuclear regulation using science- and evidence-based, risk informed, and technically sound regulatory practices that consider scientific uncertainties and evolving expectations.
TO BE A TRUSTED REGULATOR	The CNSC continuously strives to be a trusted regulator, recognized as independent, open and transparent, and as a credible source of scientific, technical and regulatory information.
TO MAINTAIN OUR GLOBAL NUCLEAR INFLUENCE	The CNSC will continue to leverage and influence global nuclear efforts, relevant to Canadian interests and activities, to enhance international nuclear safety, security and non proliferation.
TO BE AN AGILE ORGANIZATION	The CNSC will take the necessary steps to ensure that it is an agile organization – one that is flexible and inclusive, with an empowered and equipped workforce able to quickly adapt to an evolving operating environment.

The commitment to the CNSC's core responsibility of nuclear regulation, the fulfillment of the organization's mandate, and the achievement of its departmental results for 2020–21 and beyond are delivered through the CNSC's 5 programs. The programs include the Nuclear Fuel Cycle Program, Nuclear Reactors Program, Nuclear Substances and Prescribed Equipment Program, Nuclear Non-Proliferation Program, and Scientific, Regulatory and Public Information Program (plus Internal Services) and are guided by 4 strategic priorities.

The CNSC is committed to a **modern** approach to nuclear regulation using science- and evidence-based, risk-informed, and technically sound regulatory practices that consider scientific uncertainties and evolving expectations.

In 2021–22, the CNSC:

- continued to make progress on key areas of responsibility in Canada's Small Modular Reactor (SMR) Action Plan [1]
  - international collaboration is one such area, putting the CNSC at the forefront on the global stage in terms of advancing international



harmonization, which is essential for the safe and successful broad deployment of SMRs globally

- began the technical review of Global First Power's documentation in support of its application for a licence to prepare a site for an SMR at the Chalk River Laboratories site, making the CNSC a lead nuclear regulator for SMRs
- moved forward with preliminary licensing activities for emerging technologies, completing Phase 1 of the vendor design review of Moltex Energy's 300 Megawatts SMR
- worked on establishing agile regulatory practices and clear regulatory requirements that are risk-informed, and on ensuring that it has the capacity, capability and readiness to regulate such technologies and their use
- remained actively engaged in the modernization of Canada's radioactive waste policy and closely monitored policy developments to ensure that the necessary updates to its regulatory framework are made efficiently
- leveraged its newly created Innovation and Research Hub, a centralized and dedicated function to explore and provide a strategic lens for new and emerging technologies, in order to effectively regulate licensees and applicants
- undertook an assessment of the regulatory framework, led by its Disruptive, Innovative and Emerging Technologies (DIET) Working Group, which concluded that the framework is largely technology-neutral
- conducted an international benchmarking initiative with funding from the Treasury Board of Canada Secretariat's Centre for Regulatory Innovation

- the initiative, led by the DIET Working Group in partnership with Kinectrics Inc., concluded that the CNSC's regulatory framework is ready to license fusion technologies and that a few modifications should be considered to enhance clarity

Modernizing the inspection program in response to COVID-19

The ongoing COVID-19 pandemic continues to impact the CNSC's inspection plans. As a result, the CNSC continues to recalibrate its mix of onsite and remote inspections. In the first year of the global health crisis, the CNSC established a framework for conducting remote oversight activities and inspections, which included working with licensees to ensure remote access to site information systems. In 2021–22, the CNSC formalized its hybrid inspection approach by undertaking a self-assessment of its inspection process. This assessment will allow the CNSC to ensure that its approach is consistent, while providing opportunities for continuous improvement and flexibility. The CNSC continues to share best practices and lessons learned on the topic of remote inspections with other regulators.

With the pandemic restricting the ability to complete all inspection plans for 2020–21, the CNSC thoroughly reviewed any deferred inspections and ensured that any risk-significant inspections were included in the inspections plans for 2021–22.



The CNSC continuously strives to be a **trusted** regulator, recognized as independent, open and transparent, and as a credible source of scientific, technical and regulatory information.

In 2021–22, the CNSC:

- made progress on implementing its trust-building strategy, centered on the following key activities:
  - transforming stakeholder engagement with plans to engage stakeholders early and in 2-way dialogue
  - demonstrating the CNSC's independence by developing a public registry to include application information and exchanges between CNSC employees and regulated entities
  - modernizing Commission proceedings by reviewing how participation could be enhanced
- took a proactive approach to communicating about the Bruce Power discovery of higher than predicted measurements of hydrogen equivalent in some of its pressure tubes; the aim was to provide Canadians with nuclear reactor safety information and reduce the impacts of sensationalism in social and traditional media by:
  - posting videos on social media explaining the discovery and the regulatory implications
  - creating plain language web content to explain pressure tubes and the implications of the discovery, including posting all relevant safety information on a single web page
  - working with members of the media to provide technical briefings and interviews, correct misinformation, and advise of Commission proceedings
  - encouraging members of the public and Indigenous Nations and communities to participate in and watch publicly webcast Commission proceedings
- actively worked to advance reconciliation and forge a shared path forward with Indigenous Nations and communities; specifically, in 2021–22, the CNSC:
  - continued to provide funding through its Participant Funding Program to enhance the participation of Indigenous Nations and communities in regulatory processes
  - continued to formalize long-term engagement with Indigenous Nations and communities with an interest in nuclear facilities across Canada
  - developed a CNSC-specific approach and completed multiple rights impact assessments in relation to major nuclear projects in collaboration with Indigenous Nations and communities
  - conducted early engagement and relationship building for new major projects, including proposed SMRs
  - developed and signed multiple project-specific terms of reference for consultation and collaboration with Indigenous Nations and communities
  - continued to collaborate with Indigenous Nations and communities on the CNSC's Independent Environmental Monitoring Program
  - continued to host events and offer training opportunities for CNSC staff and management to enhance Indigenous cultural awareness
  - finalized the CNSC's Indigenous Knowledge Policy Framework [2]



Chief Kelly LaRocca (seated) and Councillors Jeff Forbes and Laura Colwell of the Mississaugas of Scugog Island First Nation (MSIFN), and Clare Cattrysse, Director of Indigenous and Stakeholder Relations, recently signed terms of reference for long-term engagement. The agreement [3] will enhance collaboration and build a stronger relationship between the MSIFN and the CNSC. This key initiative is part of the CNSC's broader priority of working closely with Indigenous Nations and communities to build trust and establish long-term relationships in the spirit of partnership and reconciliation.



The CNSC leverages and influences **global** nuclear efforts, relevant to Canadian interests and activities, to enhance international nuclear safety, security and non-proliferation.

In 2021–22, the CNSC:

- participated with other nuclear regulators in the 2021 IAEA Fukushima conference to reflect and build on lessons learned from the Fukushima-



CNSC President Rumina Velshi, Executive Vice-President and Chief Regulatory Operations Officer Ramzi Jammal and Interim Vice-President and Chief Communications Officer Liane Sauer at the 2021 IAEA Fukushima Conference.

Daiichi power plant accident; President Velshi chaired a session titled Ensuring the Safety of Nuclear Installations

- supported improvements to safety standards through the chairmanship of the International Atomic Energy Agency's (IAEA's) Commission on Safety Standards (CSS), which has taken a more strategic approach to developing standards, including a better integration of committees involved in the preparation and review processes for safety standards
- continued to work on the consultancy on the applicability of IAEA safety standards to advanced reactors, which will set the groundwork for planning and conducting refinements of the IAEA safety framework
- led efforts on the harmonization of regulatory practices and requirements and continued to be active in various international fora while collaborating with like-minded regulators to achieve efficiency and effectiveness in the review of SMR technical assessments
- supported the CSS in prioritizing and establishing harmonized international standards for SMRs that are technology-neutral, commensurate with the risks presented, and minimally sufficient for the needs of all countries
- contributed to the IAEA's and the Nuclear Energy Agency's efforts to share lessons learned from the pandemic and participated in a Working Group on Inspection Practices workshop related to inspections during the pandemic, with the CNSC identifying ways to engage and collaborate with international partners
- continued to work with counterparts through memoranda of cooperation (MOC); for example:
  - the CNSC and the United States Nuclear Regulatory Commission published 2 joint reviews [4] on SMR technologies, with a third joint review underway
  - through the MOC with the United Kingdom's Office for Nuclear Regulation, numerous workshops were held to promote knowledge and information exchanges on themes such as proponent engagement and the pre-licensing and licensing processes

The CNSC continues to take the necessary steps to ensure that it is an **agile** organization – one that is flexible and inclusive, with an empowered and equipped workforce able to quickly adapt to an evolving operating environment.



In 2021–22, the CNSC:

- completed the Reimagine the Workplace Initiative, which looked at the CNSC's future workplace; managers and employees will work together to create hybrid work practices that prioritize personal well being and maximize team connection, collaboration and innovation
- launched the Women in Science, Technology, Engineering and Math (WISTEM) coaching and mentoring programs:
  - the mentoring program provides structure and support that enables individuals to form and grow successful mentoring relationships
  - the coaching program empowers women by giving them the opportunity to develop through both individual and small-group coaching
- broadened its connections with universities and schools in the area of STEM, including formalizing its outreach program and piloting a CNSC–university collaborative model to encourage more women to undertake academic research in STEM – these initiatives also serve to support the Government of Canada's contribution to the United Nations' 2030 Agenda for Sustainable Development, [5] specifically Goal 5 (Achieve gender equality and empower all women and girls)
- continued its important work under Project Athena, the organization's strategic review. A workshop was held with the Executive Team to determine the actions that will help position CNSC for the future. In addition, over 600 staff suggestions received as part of this project were reviewed and served to inform ongoing or new work. This project began in 2019 in anticipation of future changes to the nuclear industry that will likely have an impact on the CNSC's regulatory work.

For more information on the CNSC's plans, priorities and results achieved, see the "Results: what we achieved" section of this report.

Results: what we achieved

CORE RESPONSIBILITY: NUCLEAR REGULATION

THE CNSC'S DEPARTMENTAL RESULTS

1. The environment is protected from releases from nuclear facilities and activities.
2. Canadians are protected from radiation resulting from nuclear facilities and activities.
3. Nuclear material and substances, facilities and activities are secure and used for peaceful purposes.
4. Canadians, including Indigenous peoples, have meaningful information about, and the opportunity to participate in, the nuclear regulatory process.

Nuclear regulation

The CNSC regulates the development, production and use of nuclear energy and substances to protect the health, safety, security of persons and the environment; implements Canada's international commitments on the peaceful use of nuclear energy; and disseminates objective scientific and regulatory information to members of the public. The CNSC maintains a regulatory framework and conducts licensing (including environmental protection reviews), compliance verification and enforcement. The CNSC is committed to building and maintaining the confidence of the public and Indigenous peoples through transparent, open and inclusive regulatory processes.

Departmental result 1

The environment is protected from releases from nuclear facilities and activities.

Departmental result 2

Canadians are protected from radiation resulting from nuclear facilities and activities.

For the CNSC to achieve its planned results, risks must be identified, monitored and controlled across all nuclear facilities and activities by CNSC inspectors, who conduct compliance verification activities for nearly 1,700 licensees across various sectors.

In 2021–22, the CNSC maintained regulatory oversight of the refurbishment of the Darlington and Bruce nuclear generating stations. In both cases, the refurbishment work is progressing according to schedule, with regular compliance inspections being performed as planned.

- At Unit 6 of the Bruce Nuclear Generating Station, the steam generators have been replaced and the calandria tube installation is underway.
- At Unit 3 of the Darlington Nuclear Generating Station, the removal phase of the refurbishment has been completed and the installation phase has commenced, with calandria tubes now being installed.

Please visit the Darlington Nuclear Generating Station page [6] and Bruce A and B Nuclear Generating Stations page [7] on the CNSC website for more information on the progress of these projects.

In 2017, Ontario Power Generation (OPG) announced that Pickering Nuclear Generating Station Units 1, 4, and 5 to 8 would end commercial operation by December 31, 2024. The operation of any of those reactor units beyond that date will require Commission authorization. In December 2021, OPG informed the CNSC that it intends to request Commission authorization to operate Pickering Units 5 to 8 until December 31, 2025. OPG's formal request is expected in late 2022 and will be heard by the Commission at a public hearing. CNSC staff will review OPG's safety case for this request and will make recommendations to the Commission.

In addition to maintaining regulatory oversight of major projects like refurbishments at nuclear generating stations, the CNSC works to protect the health of Canadians by regulating the nuclear industry and ensuring that nuclear substances are used safely and only in ways that promote good health, such as their use in the medical industry. This work serves to support the Government of Canada's contribution to the United Nations' 2030 Agenda for Sustainable Development, [5] particularly Goal 3, which focuses on good health and well-being.

Moreover, in 2021–22, the CNSC continued with environmental assessments (EAs) begun under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). These included the EAs and licensing technical assessments for Canadian Nuclear Laboratories' proposed decommissioning projects: the decommissioning of the Nuclear Power Demonstration reactor in Rolphton, Ontario, and the decommissioning of Whiteshell Reactor #1 at Whiteshell Laboratories in Pinawa, Manitoba. The CNSC also completed the EA and licensing documentation technical review for the siting and construction of a near surface disposal facility at the Chalk River Laboratories (CRL) site in Deep River, Ontario.

Furthermore, the CNSC continued the EAs under CEAA 2012 for the 2 proposed uranium mines in northern Saskatchewan (Denison Mines' Wheeler River project which leverages the in-situ recovery mining method and NexGen Energy Ltd.'s Rook I project, a conventional underground mine and a uranium mill), as well as Global First Power's proposed micro modular reactor project at the CRL site.

To ensure consistency in licensing and compliance verification, the CNSC's regulatory framework and environmental assessment requirements must be clear and understood by licensees. The regulatory framework consists of laws [8] passed by Parliament, regulations, and licences and regulatory documents that are used to regulate Canada's nuclear industry. In 2021–22, the CNSC published 8 regulatory documents. [9] Regulatory documents clarify the CNSC's requirements and may contain practical guidance to licensees and applicants on how to meet the CNSC's regulatory requirements. Such guidance can include information on possible approaches to the design of nuclear facilities, the design and implementation of required management and operational programs, and forms for applying for licences or reporting information to the Commission.

The CNSC Laboratory plays an important role in the CNSC's Independent Environmental Monitoring Program [10] (IEMP), which helps verify that the public and the environment around CNSC-regulated nuclear facilities are not adversely affected by releases to the environment. The IEMP complements the ongoing compliance verification program and involves taking samples from public areas around nuclear facilities. These samples are measured and analyzed to determine the amount of radiological and hazardous substances and compared to guidelines. The CNSC will continue to post IEMP sample data and resulting conclusions on its website. [10]

In addition, the CNSC Laboratory received ISO/IEC 17025:2017 accreditation in 2021–22, the current international standard used to evaluate testing and calibration laboratories. This made the CNSC Laboratory the first in Canada, and the only federal government facility, to receive accreditation for the calibration of working measurement standards and survey instruments for gamma measurement. The accreditation, under certificate number 2016-05, [11] was granted by the Standards Council of Canada [12] and the National Research Council of Canada's Calibration Laboratory Assessment Service. [13] To obtain accreditation, the CNSC Laboratory was required to demonstrate its ability to produce precise and accurate test and calibration data and to show the technical competence of staff with respect to the calibration of working measurement standards, gamma survey meters, and personal electronic dosimeters.

Evaluation of recent medical isotope–producing initiatives

Medical isotope–producing initiatives were another area of focus for the CNSC in 2021–22, with plans underway at the Darlington and Bruce sites to make modifications to allow the plants to produce isotopes.

Specifically, OPG has been granted a licence amendment by the Commission authorizing the production of molybdenum-99 (Mo-99) at the Darlington Nuclear Generating Station. Mo-99 – and more precisely, its decay product, technetium-99 (Tc-99m) – is widely used by the medical industry for diagnostic imaging. OPG is also pursuing a licence amendment to authorize the production of cobalt-60 (Co-60) and is expected to submit an amendment application in 2022–23. Co-60, which is currently produced in other CANDU reactors in Ontario, is used in a variety of medical and industrial applications.

Bruce Power has been granted an amendment to its licence to allow for the production of lutetium-177 (Lu-177) at Unit 7 of the Bruce Nuclear Generating Station. The use of Lu-177 in radiation therapy has produced high response rates in the treatment of prostate cancer. There are also potential uses for Lu-177 in the treatment of other types of cancers, such as neuroendocrine tumours. The Lu-177 isotope production system has been installed, and various commissioning activities and equipment checks are underway.

Departmental result 3

Nuclear material and substances, facilities and activities are secure and

used for peaceful purposes.

Through the *Nuclear Safety and Control Act* (NSCA), the CNSC implements Canada's international commitments on the peaceful use of nuclear energy. The CNSC implements regulatory programs to ensure that CNSC licensees and Canada at large meet the obligations arising from Canada's international safeguards agreements with the IAEA. Safeguards conclusions drawn by the IAEA assure Canadians and the international community that all nuclear materials in Canada are used for peaceful purposes. In 2021–22, the CNSC:

- engaged with the IAEA through the Canadian Safeguards Support Program on safeguards-by-design for small modular reactors for selected Canadian vendors; efforts continue towards finalizing the practical arrangements for Canadian licensees and the full implementation of the IAEA's revised State-level approach for Canada
- conducted technical licensing assessments and made licensing decisions on applications for the import and export of nuclear substances, prescribed equipment and prescribed information, in accordance with the *Nuclear Non-proliferation Import and Export Control Regulations* [14] and the *General Nuclear Safety and Control Regulations* [15] – a total of 975 import and export licensing decisions were made by the CNSC under these regulations

The exports of significant nuclear items are made subject to nuclear cooperation agreements (NCAs). [16] These are treaty-level agreements designed to minimize the proliferation risk associated with international transfers of nuclear items. The CNSC implements the terms and conditions of NCAs through administrative arrangements [16] with its regulatory counterparts in partner countries. The CNSC also implements a licensing and compliance program to ensure that imports and exports of nuclear substances, prescribed equipment and prescribed information (technology) meet regulatory requirements. This allows the CNSC to meet Canada's nuclear non-proliferation [17] policy and international obligations and commitments. In 2021–22, the CNSC:

- provided technical and operational leadership and support to various initiatives for advancing Canada's international strategic objectives in security, safeguards, non-proliferation, and emergency management and planning
- continued to prepare for and provide support to the Tenth Non-Proliferation Treaty Review Conference, which was postponed and will now be held from August 1 to 26, 2022

Being prepared in the event of an emergency is an essential part of being a responsible nuclear regulator. Because nuclear emergency preparedness and response is a shared responsibility in Canada, the CNSC has a comprehensive emergency preparedness program in place and works with nuclear operators; municipal, provincial and federal government agencies; first responders; and international organizations to ensure readiness. The CNSC established the Potassium Iodide (KI) Pill Working Group and Advisory Committee in 2019 to provide clarity on the existing plans and associated responsible authorities for the distribution of KI pills in the Ingestion

Planning Zone in the event of an emergency at the Pickering Nuclear Generating Station. In January 2022, the CNSC presented Phase I of the KI Pill Working Group Terms of Reference [18] to the Commission . Phase I identifies, among other things, the current provincial and federal requirements for the distribution of KI pills

One way to ensure that the CNSC evaluates its state of readiness to meet worldwide best practices is by participating in international reviews. The Emergency Preparedness Review (EPREV) is a service offered by the IAEA through which a team of international experts appraises a Member State's level of emergency preparedness for nuclear and radiological emergencies. As a follow-up to the 2019 EPREV mission [19] to Canada, in 2021-22 the CNSC participated in the Synergy Challenge, [20] led by New Brunswick Power and the Government of New Brunswick. The exercise involved over 40 government agencies and tested the Point Lepreau Nuclear Generating Station, first responders, municipalities, and provincial, federal and international government agencies to verify their ability to respond to a simulated nuclear emergency initiated by a cyber event.

Nuclear security is a major consideration in all CNSC activities. The CNSC is responsible for enforcing Canada's *Nuclear Security Regulations* [21] (NSR) and works closely with nuclear operators, law enforcement and intelligence agencies, international organizations and other government departments to ensure that nuclear materials and facilities are adequately protected. Cyber security remains an important and evolving issue for key stakeholders of nuclear facilities, including design authorities, operating utilities and regulatory bodies. The CNSC is responsible for ensuring strengthened oversight in this area. In 2021–22, the CNSC:

- issued 2 discussion papers related to modernizing the nuclear security regulatory framework, which were tabled for public consultation from April to July 2021
- held a series of consultation sessions with over 150 participants, including members of the public, environmental non-governmental organizations, industry, Government of Canada partners, and representatives from various provincial governments
  - the sessions included a walkthrough of the regulatory amendment process and highlighted the proposed amendments to the NSR
  - as a result of the sessions, the CNSC is now developing a proposed regulatory amendment package that takes into account the feedback received; the amendments are expected to be pre-published in the *Canada Gazette, Part I*, for further consultation between the Government of Canada and Canadians

Departmental result 4

Canadians, including Indigenous peoples, have meaningful information about, and the opportunity to participate in, the nuclear regulatory process.

IN 2021–22, THE CNSC

Paid out **$1,043,744.58** to **95 recipients**, the majority being **Indigenous Nations and communities.**

The CNSC is a proactive regulator that supports participation by members of the public and Indigenous Nations and communities in the CNSC's regulatory processes. Public hearings and meetings are open to the public, are sometimes held in the community and are always webcast live on the CNSC's website. In addition, the CNSC offers funding through its Participant Funding Program (PFP) to help support the participation of Indigenous Nations and communities, members of the public, and stakeholders in bringing valuable information to the Commission. This is recognized internationally as a best practice to emulate. Learn more about the PFP [22] and watch a short CNSC video [23] about it by visiting the CNSC website.

IN 2021–22, THE CNSC

Had over **1,500 participants** across **36** "Meet the Nuclear Regulator" sessions.

The CNSC welcomes input from the public and Indigenous groups on draft regulatory documents that are open for consultation on Let's Talk Nuclear Safety. [24] Each regulatory document open for public comment is made available for a specified period of time (at least 30 days). At the end of the consultation period, CNSC staff review all input and comments are posted for feedback on the CNSC website. The consultation section [25] of the CNSC website provides up-to-date information on current consultations for regulatory initiatives, and the necessary information and guidance on how to participate. In 2021–22, the CNSC posted 4 regulatory documents for public consultation, and 30 people provided comments.

Through "Meet the Nuclear Regulator" sessions, CNSC experts offer the public an opportunity to learn about how to participate in the licensing process, to build understanding of and public confidence in Canada's nuclear regulation. To participate in an upcoming "Meet the Nuclear Regulator" or webinar session, [26] visit the CNSC website.

IN 2021–22, THE CNSC

Held **over 220 meetings** with **45 Indigenous groups** representing **over 90 different Indigenous Nations and communities**.

Furthermore, the CNSC frequently participates in community outreach and engagement activities and responds to media calls and public information inquiries. As an agent of the Crown, the CNSC has an important responsibility to engage and consult with interested Indigenous groups and is committed to developing long-term positive relationships with these communities. The CNSC strives to improve its outreach and engagement strategies by incorporating feedback from all stakeholders and Indigenous Nations and communities. For example, because of a request from various Indigenous Nations and communities, the CNSC developed an approach to rights impact assessment (RIA) processes in collaboration with each

community and as a result, now has completed several RIAs. In 2021–22, the CNSC:

- began updating its web content, changing its templates and refining usability as per international standards and best practices, allowing for better public communication and stronger alignment with modern accessibility and user needs
- expanded the use of the Let's Talk Nuclear Safety [24] platform to facilitate public engagement and education through an "Ask Me Anything" event about tritium
- to promote transparency, consulted with federal, provincial and municipal governments to share best practices on the use of the software underpinning the Let's Talk Nuclear Safety [24] platform

IN 2021–22, THE CNSC

Posted **1,854 times** on social media channels and **engaged** with the public through these platforms **32,477 times.**

Disseminating information is part of the CNSC's mandate, but that information also has to be accessible and understood. One goal of the CNSC's social media platforms – YouTube, [27] Facebook, [28] LinkedIn [29] and Twitter [30] – is to provide technical information in plain language that explains complicated nuclear science in simple terms. The CNSC continues to dedicate resources to its social media engagement, not only to share information, but also to answer questions from followers, often with the assistance of a subject-matter expert.

RESEARCH AND SUPPORT PROGRAM: $2,532,199

$659,250 invested in **20** research contracts

$1,809,949 invested in **36** contribution agreements

$63,000 put towards **6** grants

The CNSC maintains research initiatives and programs to ensure that it keeps abreast of new scientific information, develops its own knowledge base and shares its research findings with stakeholders and scientists in Canada and abroad. The organization offers the public a comprehensive list of relevant scientific and technical information [31] on its website. Topics can be searched according to the CNSC's 14 safety and control areas (SCAs), [32] which are used to assess, evaluate, review, verify and report on regulatory requirements and performance. The SCAs are presented in a comprehensive framework and grouped into 3 primary functional areas: management; facility and equipment; and core control processes.

The CNSC funds an external research program to obtain knowledge and information needed to support its regulatory mission. The outcome of these research activities helps the CNSC understand and address new or emerging safety issues, gain third-party perspectives on nuclear science, and share scientific knowledge with the nuclear industry and the public at large. For more information on the outcomes of this program, visit the CNSC's website. [33]

IN 2021–22, THE CNSC

Responded to **974 public information inquiries** and **78 media inquiries**, posted **16 feature articles** to its website and disseminated **56 new publications**.

The CNSC, as well as licensees, continue to make progress in ensuring documents and reports are made readily available online to members of the public, including documents submitted for Commission proceedings, which can be found on the CNSC's website. [34] Specifically, in 2021–22, the CNSC:

- further increased the release of information that supports regulatory activities and decisions, and made scientific reports, documents and data more accessible and easier to use by posting them on the facility web pages on the CNSC website [35] as well as on the Government of Canada's Open Science and Data Platform [36]
- sought feedback from the public and from Indigenous Nations and communities on regulatory oversight reports (RORs), which identified efficiencies for future reporting
  - some of the changes already implemented included the use of plain language summaries, the addition of a section on Indigenous consultation and engagement, and the piloting of an easy to read and focused dashboard to complement the RORs
  - an updated approach was proposed to the Commission, a quasi-judicial tribunal independent of the CNSC, in January 2022 for endorsement and, as a result, a questionnaire was developed and will be sent to Commission members for their feedback on future RORs
  - the CNSC will continue to engage with members of the public, stakeholders and Indigenous Nations and communities and will return to the Commission later in 2022 with an update

Experimentation

The CNSC is leveraging advanced technologies to digitize its regulatory framework. The Digital Regulatory Documents pilot project, launched in April 2021, is an initiative that will make it easier for the public to view, in a single document, all requirements and guidance related to a facility or regulatory topic. Having a digital regulatory framework will enable stakeholders to conduct more advanced searches based on their specific information needs and access a comprehensive document collated from the relevant sections of several regulatory documents. In 2021–22, the CNSC identified 70 regulatory documents that will be digitized to enable content reusability and create enhanced search functions. The tools required to carry out this project are currently being reviewed to ensure that the functional needs of the initiative are met.

Results Achieved

Departmental results	Departmental Result	Target	Date to achieve	2019–20	2020–21	2021–22

	Indicators		target	Actual results	Actual results	Actual results
The environment is protected from releases from nuclear facilities and activities.	Number of instances of radiological releases that exceeded regulatory limits	0	March 31, 2022	1 [37]	0	0
	Number of instances of hazardous releases that exceeded regulatory limits	≤ 5	March 31, 2022	2	2	0
	Percentage of Independent Environmental Monitoring Program (IEMP) samples (food, water, air and vegetation) that met guidelines	≥ 95%	March 31, 2022	98.9%	94.9% [38]	97%
Canadians are protected from radiation resulting from nuclear facilities and activities.	Number of radiation doses to members of the public that exceeded regulatory limits	0	March 31, 2022	0	0	0
	Number of radiation doses to workers that exceeded regulatory limits	0	March 31, 2022	2 [39]	3 [40]	0
Nuclear material and substances, facilities and activities are secure and used for peaceful purposes.	Number of instances of non-peaceful or malicious use of Canadian exports of nuclear substances, equipment	0	March 31, 2022	0	0	0

	and information					
	Number of lost or stolen radioactive sealed sources	≤ 2	March 31, 2022	0	0	0
	Canada's international commitments to the International Atomic Energy Agency (IAEA) with respect to nuclear safeguards and verification are met	IAEA broader conclusion	December 31, 2021	Met	Met	Met
Canadians, including Indigenous peoples, have meaningful information about, and the opportunity to participate in, the nuclear regulatory process.	Percentage of Commission proceedings that were accessible to members of the public and Indigenous peoples	> 90%	March 31, 2022	100%	100%	92%
	Percentage of Commission proceedings for which the Participant Funding Program (PFP) was made available to members of the public and Indigenous peoples	> 90%	March 31, 2022	100%	100%	100%
	Percentage of Commission proceedings documents that were available in a timely manner on the CNSC external website upon request by members of the public and	> 90%	March 31, 2022	100%	100%	95%

Indigenous peoples					
Number of self-identified Indigenous groups and organizations who participated in CNSC proceedings	Increasing trend	March 31, 2022	22	18 [41]	23

Budgetary financial resources (dollars)

2021–22 Main Estimates	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	2021–22 Difference (Actual spending minus Planned spending)
97,749,225	105,302,857	107,725,313	96,598,106	(8,704,751)

Financial, human resources and performance information for the Canadian Nuclear Safety Commission's Program Inventory is available in the GC InfoBase. [42]

Human resources (full-time equivalents)

2021–22 Planned full-time equivalents	2021–22 Actual full-time equivalents	2021–22 Difference (Actual full-time equivalents minus Planned full-time equivalents)
629	592	(37)

Financial, human resources and performance information for the Canadian Nuclear Safety Commission's Program Inventory is available in the GC InfoBase. [42]

Internal services

Description

Internal Services are those groups of related activities and resources that the federal government considers to be services in support of Programs and/or required to meet corporate obligations of an organization. Internal Services refers to the activities and resources of the 10 distinct services that support Program delivery in the organization, regardless of the Internal Services delivery model in a department. These are:

- Management and Oversight Services
- Communications Services
- Legal Services
- Human Resources Management Services
- Financial Management Services

- Information Management Services
- Information Technology Services
- Real Property Management Services
- Materiel Management Services
- Acquisition Management Services

Results highlights

The CNSC's Diversity and Inclusion Plan 2019–22 outlined ongoing and new commitments to leverage diversity and to make progress in creating a safe, inclusive workplace. In 2021–22, the CNSC:

- developed new employment equity hiring goals for women, members of visible minorities, persons with disabilities, and Indigenous peoples through an employment systems review
- drafted an annual update for its diversity and inclusion plan
- worked with the Canadian Centre for Diversity and Inclusion to:
  - launch a "mentorship plus" program that will support and advocate for employment equity and equity-seeking groups at the CNSC
  - develop a new inclusion advisory committee
- developed 3 new employee networks (Accessibility Network, Pride Network, and Diverse Employees Network) in addition to the 5 employee networks currently in place (Administrative Professionals Network, Young Professionals Network, Women in STEM Network, Black Employees Network and Indigenous Network); these networks bring forward a variety of perspectives that help to improve the workplace for everyone
- submitted its response [43] to the Call to Action on Anti-Racism, Equity, and Inclusion in the Federal Public Service, [44] including a list of what the CNSC has done, what it has learned, and its path forward

The COVID-19 pandemic has demonstrated that most of the CNSC's work can be performed remotely and that staff continue to be productive. The CNSC is able to carry out its mandate without skipping a beat. In response to the new remote work environment, the CNSC launched the Reimagine the Workplace Initiative (RWI) to consider the principles for the future of work at the CNSC and focused on 4 pillars: leadership practices and organizational culture; management model, policies and management processes; IT infrastructure; and physical infrastructure. Options and recommendations for long-term workplace solutions that foster safe, productive and enjoyable jobs and lives were generated through engagement activities with staff and management. As a result of the RWI, the CNSC is committed to:

- co-creating flexible in-office and remote work practices that prioritize personal well-being and maximize team connection, collaboration and innovation, regardless of location
- implementing an internal trust strategy to support an organizational culture and leadership cadre that focuses on results, regardless of where work takes place
- providing IT systems and tools to support remote and hybrid work, including updating systems to Microsoft 365 and monitoring developments in security management tools to allow confidential material to be accessed remotely

- implementing the Government of Canada's GCworkplace vision through an accelerated 5-year plan that will see the conversion of CNSC spaces to modern design standards; in the short term, some steps, such as the transition to unassigned seating, have been taken to support a hybrid workplace

Budgetary financial resources (dollars)

2021–22 Main Estimates	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	2021–22 Difference (Actual spending minus Planned spending)
45,999,636	49,554,286	48,548,128	46,942,192	(2,612,094)

Human resources (full-time equivalents)

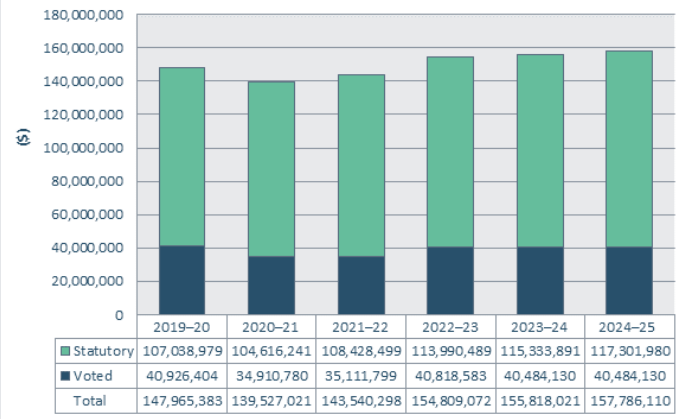
2021–22 Planned full-time equivalents	2021–22 Actual full-time equivalents	2021–22 Difference (Actual full-time equivalents minus Planned full-time equivalents)
284	279	(5)

Spending and human resources

Spending

Spending 2019–20 to 2024–25

The following graph presents planned (voted and statutory spending) over time.



	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25
Statutory	107,038,979	104,616,241	108,428,499	113,990,489	115,333,891	117,301,980
Voted	40,926,404	34,910,780	35,111,799	40,818,583	40,484,130	40,484,130
Total	147,965,383	139,527,021	143,540,298	154,809,072	155,818,021	157,786,110

▶ Departmental spending trend graph: Text version

The CNSC is financed by the Government of Canada through voted parliamentary and statutory authorities. Included in the statutory appropriation is a revenue-spending authority, which allows the CNSC to spend most licence-fee revenue, as well as funding for contributions to employee benefit plans. The voted authority provides funding for the activities of licensees exempt from paying fees (that is, hospitals and universities) and for activities relating to Canada's international obligations

(including non-proliferation activities), public responsibilities such as emergency management and public information programs, and the updating of the Nuclear Safety and Control Act and its associated regulations.

The budgetary performance summary section provides variance explanations on year-to-year fluctuations in spending.

The "Budgetary performance summary for core responsibilities and internal services" table presents the budgetary financial resources allocated for the CNSC's core responsibilities and for internal services.

Budgetary performance summary for core responsibility and internal services (dollars)

Core responsibilities and internal services	2021–22 Main Estimates	2021–22 planned spending	2022–23 planned spending	2023–24 planned spending	2021–22 total authorities available for use	2019–20 actual spending (authorities used)	2020–21 actual spending (authorit used)
Nuclear Regulation	97,749,225	105,302,857	104,496,124	105,177,164	107,725,313	101,570,723	92,862,64
Subtotal	97,749,225	105,302,857	104,496,124	105,177,164	107,725,313	101,570,723	92,862,64
Internal Services	45,999,636	49,554,286	50,312,948	50,640,857	48,548,128	46,394,660	46,664,37
Total	143,748,861	154,857,143	154,809,072	155,818,021	156,273,441	147,965,383	139,527,0

The CNSC's Main Estimates for fiscal year 2021–22 totalled $143.7 million, compared to total authorities of $156.3 million. The $12.6 million in additional authorities is primarily attributable to:

- contributions to employee benefit plans for personnel expenditures related to subsection 21(3) of the *Nuclear Safety and Control Act* that are not included in the 2021–22 Main Estimates: $9.0 million
- an operating budget carry-forward from 2020–21 to 2021–22: $1.8 million
- an increase in revenue spending authority arising from a reduction in the amount available for subsequent years: $1.1 million
- funds received from the Treasury Board of Canada for negotiated salary adjustments and from the Regulators' Capacity Fund: $0.5 million
- funding received from the Department of National Defence to support the Canadian Safety and Security Program: $0.1 million
- funds received from the disposal of surplus Crown assets: $0.1 million

The $8.5 million decrease in actual spending from $148.0 million in 2019–20 to $139.5 million in 2020–21 is mainly due to a decrease in travel expenditures, with management implementing extensive restrictions as a consequence of the COVID-19 pandemic, and lower personnel costs resulting from a decrease in FTE use related to a halt in hiring during the pandemic.

The $4.0 million increase in actual spending from $139.5 million in 2020–21 to $143.5 million in 2021–22 is mainly due to:

- an increase in personnel costs resulting from a rise in FTE use and from economic increases, including retroactive payments: $4.7 million

- an increase in professional and special services, primarily management consultants engaged in a strategic review of the CNSC's operations: $0.8 million
- an increase in travel expenses attributable to the easing of restrictive travel guidelines in mid-year 2021–22: $0.6 million
- a decrease in equipment expenditures, both capital and non-capital, as 2020–21 included IT equipment costs to support a remote work environment and some lab equipment replacements: $2.0 million
- a net decrease in other expenditure categories: $0.1 million

Planned results for 2021–22 were established during uncertain conditions due to the COVID-19 pandemic. As a result, actual spending was $143.5 million in 2021–22, compared with planned spending of $154.9 million. Spending on travel, professional services and personnel was lower than forecast in part due to the impact of the pandemic on how the CNSC operates and to delays in IT and facility project spending.

As published in the 2022–23 Departmental Plan, planned spending is forecast to increase to $154.8 million in 2022–23 and $155.8 million in 2023–24, primarily as a result of anticipated salary increases and a projected higher level of staffed positions.

Human resources

The "Human resources summary for core responsibilities and internal services" table presents the full-time equivalents (FTEs) allocated to the CNSC's core responsibility and to internal services.

Human resources summary for core responsibility and internal services

Core responsibilities and Internal Services	2019–20 Actual full-time equivalents	2020–21 Actual full-time equivalents	2021–22 Planned full-time equivalents	2021–22 Actual full-time equivalents	2022–23 Planned full-time equivalents	2023–24 Planned full-time equivalents
Nuclear regulation	605	581	629	592	613	608
Subtotal	605	581	629	592	613	608
Internal Services	281	269	284	279	284	282
Total	886	850	913	871	897	890

The decrease in FTEs from 886 in 2019–20 to 850 in 2020–21 is primarily a result of reduced term staff due to COVID-19. The increase in FTEs from 850 in 2020–21 to 871 in 2021–22 is primarily a result of the staffing of vacant positions. Planned FTE use is forecast to increase to 897 in 2022–23 and 890 in 2023–24 due to the anticipated staffing of vacations positions.

Expenditures by vote

For information on the Canadian Nuclear Safety Commission's organizational voted and statutory expenditures, consult the Public Accounts of Canada 2021. [45]

Government of Canada spending and activities

Information on the alignment of the Canadian Nuclear Safety Commission's spending with Government of Canada's spending and activities is available in GC InfoBase. [42]

Financial statements and financial statements highlights

Financial statements

The Canadian Nuclear Safety Commission's financial statements (audited) for the year ended March 31, 2022 are available on the departmental website. [46]

Financial statement highlights

Condensed Statement of Operations (unaudited) for the year ending March 31, 2022 (dollars)

Financial information	2021–22 Planned results	2021–22 Actual results	2020–21 Actual results	Difference (2021–22 Actual results minus 2021–22 Planned results)	Difference (2021–22 Actual results minus 2020–21 Actual results)
Total expenses	174,595,000	157,653,268	157,861,636	(16,941,732)	(208,368)
Total revenues	124,506,000	115,676,030	114,037,050	(8,829,970)	1,638,980
Net cost of operations before government funding and transfers	50,089,000	41,977,238	43,824,586	(8,111,762)	(1,847,348)

The total actual expenses of $157.7 million were 9.7% or $16.9 million less than the planned expenses of $174.6 million. Planned results for 2021–22 were established during uncertain conditions due to the COVID-19 pandemic, resulting in lower-than-planned expenditures for salaries and associated employee benefit costs, travel, and professional and special services. The actual total revenues of $115.7 million were 7.1% or $8.8 million lower than planned revenues of $124.5 million due to the reduced levels of spending and resulting cost recovery.

The CNSC's total expenses decreased by 0.1% or $0.2 million and revenues increased by 1.4% or $1.6 million largely as a result of a reduction in the salary adjustment for COVID-19 lost productivity from 2020–21.

Condensed Statement of Financial Position (unaudited) as of March 31, 2022 (dollars)

Financial information	2021–22	2020–21	Difference (2021–22 minus 2020–21)
Total net liabilities	50,753,285	52,015,686	(1,262,401)
Total net financial assets	34,533,170	35,829,557	(1,296,387)
Departmental net debt	16,220,115	16,186,129	33,986
Total non-financial assets	9,973,337	11,610,242	(1,636,905)
Departmental net financial position	(6,246,778)	(4,575,887)	(1,670,891)

The decrease of $1.3 million in the CNSC's net liabilities is mainly due to decreases in vacation liabilities, Phoenix damages payable, and employee future benefits.

The decrease of $1.3 million in the CNSC's net financial assets is the result of a decrease in accounts receivable and a decrease in the amount due from the Consolidated Revenue Fund, which is an amount due from the federal government that may be disbursed without further charges to the CNSC's authorities.

The decrease of $1.6 million in non-financial assets is a result of a decrease in the net book value of tangible capital assets, as amortization expenses exceeded the costs of new capital acquisitions.

The decrease of $1.7 million in the CNSC's departmental net financial position, which is the difference between total non-financial assets and the departmental net debt, is attributable to the decrease in tangible capital assets.

Corporate information

Organizational profile

Appropriate minister: Jonathan Wilkinson

Institutional head: Rumina Velshi [47]

Ministerial portfolio: Natural Resources Canada [48]

Enabling instrument: *Nuclear Safety and Control Act* [49]

Year of incorporation: 2000

Other: The CNSC's headquarters is located in Ottawa, Ontario. The CNSC maintains 11 regional offices, both at major facilities and elsewhere, in order to conduct inspections of licensees across the country on a regular basis.

Raison d'être, mandate and role: who we are and what we do

"Raison d'être, mandate and role: who we are and what we do" is available on the Canadian Nuclear Safety Commission's website. [50]

Operating context

Information on the operating context is available on the Canadian Nuclear Safety Commission's website. [50]

Reporting framework

The Canadian Nuclear Safety Commission's Departmental Results Framework and Program Inventory of record for 2021–22 are shown below.

Core Responsibility: Nuclear Regulation	
Description: The CNSC regulates the development, production and use of nuclear energy and substances to protect health, safety, security of persons and the environment; implements Canada's international commitments on the peaceful use of nuclear energy; and disseminates objective scientific and regulatory information to members of the public. The CNSC maintains a regulatory framework and conducts licensing (including environmental protection reviews), compliance verification and enforcement. The CNSC is committed to building and maintaining the confidence of the public and Indigenous peoples through transparent, open and inclusive regulatory processes.	
Departmental Results	**Indicators**
R 1: The environment is protected from releases from nuclear facilities and activities.	Number of instances of radiological releases that exceeded regulatory limits
	Number of instances of hazardous releases that exceeded regulatory limits
	Percentage of Independent Environmental Monitoring Program (IEMP) samples (food, water, air, soil, sediment, sand and vegetation) that met guidelines
R 2: Canadians are protected from radiation resulting from nuclear facilities and activities.	Number of radiation doses to members of the public that exceeded regulatory limits
	Number of radiation doses to workers that exceeded regulatory limits
R 3: Nuclear material and substances, facilities and activities are secure and used for peaceful purposes.	Number of instances of non-peaceful or malicious use of Canadian exports of nuclear substances, equipment and information
	Number of lost or stolen radioactive sealed sources
	Canada's international commitments to the International Atomic Energy Agency (IAEA) with respect to nuclear safeguards and verification are met
R 4: Canadians, including Indigenous peoples, have	Percentage of CNSC proceedings that were accessible to members of

meaningful information about, and the opportunity to participate in, the nuclear regulatory process.	the public and Indigenous peoples
	Percentage of CNSC proceedings for which the Participant Funding Program (PFP) was made available to members of the public and Indigenous peoples
	Percentage of public proceedings documents that were available in a timely manner upon request by members of the public and Indigenous peoples
	Number of self-identified Indigenous groups and organizations who participated in CNSC proceedings

Program Inventory				
Nuclear Fuel Cycle	Nuclear Reactors	Nuclear Substances and Prescribed Equipment	Nuclear Non-Proliferation	Scientific, Regulatory and Public Information
Internal Services				

Supporting information on the program inventory

Supporting information on planned expenditures, human resources, and results related to the Canadian Nuclear Safety Commission's program inventory is available in the GC InfoBase. [42]

Supplementary information tables

The following supplementary information tables are available on the Canadian Nuclear Safety Commission's website: [50]

- Reporting on Green Procurement
- Details on transfer payment programs
- Gender-based analysis plus

Federal tax expenditures

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance Canada publishes cost estimates and projections for these measures each year in the Report on Federal Tax Expenditures. [51] This report also provides detailed background information on tax expenditures, including descriptions, objectives, historical information and references to related federal spending programs as well as evaluations and GBA Plus of tax expenditures.

Organizational contact information

Mailing address

Head office
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Canada

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Toll free: 1-800-668-5284
Fax: 613-995-5086

Email: info@cnsc-ccsn.gc.ca

Website: www.nuclearsafety.gc.ca [52]

Appendix: Definitions

APPROPRIATION (CRÉDIT)
Any authority of Parliament to pay money out of the Consolidated Revenue Fund.

BUDGETARY EXPENDITURES (DÉPENSES BUDGÉTAIRES)
Operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

CORE RESPONSIBILITY (RESPONSABILITÉ ESSENTIELLE)
An enduring function or role performed by a department. The intentions of the department with respect to a core responsibility are reflected in one or more related departmental results that the department seeks to contribute to or influence.

DEPARTMENTAL PLAN (PLAN MINISTÉRIEL)
A report on the plans and expected performance of an appropriated department over a 3-year period. Departmental Plans are tabled in Parliament each spring.

DEPARTMENTAL PRIORITY (PRIORITÉ)
A plan or project that a department has chosen to focus and report on during the planning period. Priorities represent the things that are most important or what must be done first to support the achievement of the desired departmental results.

DEPARTMENTAL RESULT (RÉSULTAT MINISTÉRIEL)
A consequence or outcome that a department seeks to achieve. A departmental result is often outside departments' immediate control, but it should be influenced by program-level outcomes.

DEPARTMENTAL RESULT INDICATOR (INDICATEUR DE RÉSULTAT MINISTÉRIEL)
A quantitative measure of progress on a departmental result.

DEPARTMENTAL RESULTS FRAMEWORK (CADRE MINISTÉRIEL DES RÉSULTATS)
A framework that connects the department's core responsibilities to its departmental results and departmental result indicators.

DEPARTMENTAL RESULTS REPORT (RAPPORT SUR LES RÉSULTATS MINISTÉRIELS)

A report on a department's actual accomplishments against the plans, priorities and expected results set out in the corresponding Departmental Plan.

EXPERIMENTATION (EXPÉRIMENTATION)

The conducting of activities that seek to first explore, then test and compare the effects and impacts of policies and interventions in order to inform evidence-based decision-making, and improve outcomes for Canadians, by learning what works, for whom and in what circumstances. Experimentation is related to, but distinct from innovation (the trying of new things), because it involves a rigorous comparison of results. For example, using a new website to communicate with Canadians can be an innovation; systematically testing the new website against existing outreach tools or an old website to see which one leads to more engagement, is experimentation.

FULL-TIME EQUIVALENT (ÉQUIVALENT TEMPS PLEIN)

A measure of the extent to which an employee represents a full person year charge against a departmental budget. For a particular position, the full time equivalent figure is the ratio of number of hours the person actually works divided by the standard number of hours set out in the person's collective agreement.

GENDER-BASED ANALYSIS PLUS (GBA+) (ANALYSE COMPARATIVE ENTRE LES SEXES PLUS [ACS+])

An analytical tool used to support the development of responsive and inclusive policies, programs and other initiatives; and understand how factors such as sex, race, national and ethnic origin, Indigenous origin or identity, age, sexual orientation, socio-economic conditions, geography, culture and disability, impact experiences and outcomes, and can affect access to and experience of government programs.

GOVERNMENT-WIDE PRIORITIES (PRIORITÉS PANGOUVERNEMENTALES)

For the purpose of the 2021–22 Departmental Results Report, government-wide priorities refers to those high-level themes outlining the government's agenda in the 2020 Speech from the Throne, namely: Protecting Canadians from COVID-19; Helping Canadians through the pandemic; Building back better – a resiliency agenda for the middle class; The Canada we're fighting for.

HORIZONTAL INITIATIVE (INITIATIVE HORIZONTALE)

An initiative where two or more departments are given funding to pursue a shared outcome, often linked to a government priority.

NON-BUDGETARY EXPENDITURES (DÉPENSES NON BUDGÉTAIRES)

Net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

PERFORMANCE (RENDEMENT)

What an organization did with its resources to achieve its results, how well those results compare to what the organization intended to achieve, and how well lessons learned have been identified.

PERFORMANCE INDICATOR (INDICATEUR DE RENDEMENT)

A qualitative or quantitative means of measuring an output or outcome, with the intention of gauging the performance of an organization, program, policy or initiative respecting expected results.

PERFORMANCE REPORTING (PRODUCTION DE RAPPORTS SUR LE RENDEMENT)
The process of communicating evidence-based performance information. Performance reporting supports decision-making, accountability and transparency.

PLAN (PLAN)
The articulation of strategic choices, which provides information on how an organization intends to achieve its priorities and associated results. Generally, a plan will explain the logic behind the strategies chosen and tend to focus on actions that lead up to the expected result.

PLANNED SPENDING (DÉPENSES PRÉVUES)
For Departmental Plans and Departmental Results Reports, planned spending refers to those amounts presented in Main Estimates.

A department is expected to be aware of the authorities that it has sought and received. The determination of planned spending is a departmental responsibility, and departments must be able to defend the expenditure and accrual numbers presented in their Departmental Plans and Departmental Results Reports.

PROGRAM (PROGRAMME)
Individual or groups of services, activities or combinations thereof that are managed together within the department and focus on a specific set of outputs, outcomes or service levels.

PROGRAM INVENTORY (RÉPERTOIRE DES PROGRAMMES)
Identifies all the department's programs and describes how resources are organized to contribute to the department's core responsibilities and results.

RESULT (RÉSULTAT)
A consequence attributed, in part, to an organization, policy, program or initiative. Results are not within the control of a single organization, policy, program or initiative; instead they are within the area of the organization's influence.

STATUTORY EXPENDITURES (DÉPENSES LÉGISLATIVES)
Expenditures that Parliament has approved through legislation other than appropriation acts. The legislation sets out the purpose of the expenditures and the terms and conditions under which they may be made.

TARGET (CIBLE)
A measurable performance or success level that an organization, program or initiative plans to achieve within a specified time period. Targets can be either quantitative or qualitative.

VOTED EXPENDITURES (DÉPENSES VOTÉES)
Expenditures that Parliament approves annually through an appropriation act. The vote wording becomes the governing conditions under which these expenditures may be made.

Endnotes

1 Canada's Small Modular Reactor, SMR Action Plan, https://smractionplan.ca/

2 Canadian Nuclear Safety Commission, Indigenous Knowledge Policy Framework, https://www.cnsc-ccsn.gc.ca/eng/indigenous-relations/indigenous-knowledge-policy-framework/

3 Canadian Nuclear Safety Commission, Arrangements with Indigenous groups, https://www.cnsc-ccsn.gc.ca/eng/indigenous-relations/engagement-protocols/

4 Canadian Nuclear Safety Commission, Sharing our expertise with the U.S. Nuclear Regulatory Commission: Signing of a memorandum of cooperation to strengthen regulation of nuclear safety, https://nuclearsafety.gc.ca/eng/resources/news-room/feature-articles/sharing-our-expertise-with-the-us-nuclear-regulatory-commission

5 United Nations, Transforming our world: the 2030 Agenda for Sustainable Development, https://sustainabledevelopment.un.org/post2015/transformingourworld

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14 Justice Laws Website, Nuclear Non-proliferation Import and Export Control Regulations, https://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-210/page-1.html

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37 DraxImage event, reported to the Commission in December 2019. Jubilant Draximage Inc. reported that its weekly sampling monitoring results were above the weekly release limit for I-131 as specified in its licence. On November 20, 2019 the average weekly release concentration was calculated as 322 Bq/m^3 for I-131 and the weekly release limit for I-131 is 175 Bq/m^3.

38 In fiscal year 2020–21, 94.9% of IEMP results met the guidelines. Exceedances for the 2020–21 fiscal year were expected, and similar to the values reported by CNSC licensees' environmental monitoring programs. No unexpected exceedances were noted. There were 3 exceedances at Port Hope Conversion Facility. Three fluoride concentrations measured in lake water samples were slightly above the CCME freshwater quality guideline for the protection of aquatic life but were below Health Canada's guidelines for drinking water quality and well below the CCME toxicity benchmark for sensitive aquatic biota. Thus, adverse effects are not expected. There were 26 exceedances at Cigar Lake out of 468 samples. The exceedances were selenium and polonium-210 in fish tissue samples collected at both the exposure station, which could potentially be impacted by the operation of the facility, and the reference station, which is not impacted by the operation of the facility. Thus, the exceedances are not attributed to the facility. These results were also within the natural background range for the region. Exceeding a guideline does not mean that there is an expected health impact; rather, it triggers a more in-depth assessment by CNSC staff to ensure that the health and safety of people and the environment are protected. In all noted cases, CNSC staff concluded that the public and environment are protected from ongoing releases from

nuclear facilities and activities. More information in IEMP results for each site is available on the CNSC website.

39 **Unexplained dose** of 1.85 mSv on quarterly badge reading of a non-nuclear energy worker, which exceeded the annual dose limit of 1 mSv/year. No health effects were observed or expected as a consequence of this event. This event was reported to the Commission in November 2019 in CMD 19-M41. **Unexplained dose** on quarterly badge reading of a nuclear medicine technologist. NEW worker exceeded both the one-year effective dose limit (recorded dose of 56.91 mSv) and equivalent dose limit for the lens (recorded dose of 174.9 mSv). Investigation concludes that the recorded dose is likely non-personal but rather due to contamination on the dosimeter although this cannot be demonstrated conclusively. No health effects were observed or expected. This event will be reported to the Commission in 2020.

40 In 2020–21, there were 3 occurrences of a worker exceeding a regulatory dose limit. The first instance involved a non-NEW who received an effective dose of 1.28 mSv, which exceeded the annual dose limit of 1 mSv/year. The second instance involved a non-NEW who received an effective dose of 1.3 mSv, which exceeded the annual dose limit of 1 mSv/year. This event was reported to the Commission in January 2021 in CMD 21-M10. The third instance involved a non-NEW who received an effective dose of 1.05 mSv, which exceeded the annual dose limit of 1 mSv/year. Note that there was a fourth event reported to the Commission in 2020/21, although the event occurred in 2019/20. This case involved a non-Nuclear Energy Worker (NEW) who recorded a non-occupational effective dose of 3.54 mSv on their dosimeter. This exceeded the annual dose limit for non-NEWs of 1 mSv/year. This event was reported to the Commission in September 2020 in CMD 20-M27. In all cases, there was no health effect to the worker from the exposures.

41 The decrease in Indigenous participation in 2020–21 relative to 2019–20 is due to less overall total number of proceedings, including public proceedings because of the COVID-19 pandemic.

42 GC InfoBase, https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#start

43 Privy Council Office, Canadian Nuclear Safety Commission: Letter on Implementation of the Call to Action on Anti-Racism, Equity and Inclusion, https://www.canada.ca/en/privy-council/corporate/clerk/call-to-action-anti-racism-equity-inclusion-federal-public-service/letters-implementation/1/canadian-nuclear-safety-commission.html

44 Privy Council Office, Call to Action on Anti-Racism, Equity, and Inclusion in the Federal Public Service, https://www.canada.ca/en/privy-council/corporate/clerk/call-to-action-anti-racism-equity-inclusion-federal-public-service.html

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46 Canadian Nuclear Safety Commission, Financial and performance reporting, /eng/resources/publications/reports/quarterly-financial-reports/

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49 Justice Laws Website, *Nuclear Safety and Control Act*, www.laws-lois.justice.gc.ca/eng/acts/N-28.3/

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Meeting Minutes: CNSC Advisory Committee Workshop

Agenda

1. Opening remarks/ Roundtable Introductions
2. Discussion on Draft Phase I Report
3. Closing Remarks

Date

November 19, 2021

Time

10:30 AM – 12:30 PM

Duration

2 hours

1. Opening Remarks / Roundtable Introductions

K. Heppell-Masys, Director General (DG) for the Directorate of Security and Safeguards (DSS) welcomed participants to the CNSC Advisory Committee Workshop for the Potassium Iodide (KI) Pill Working Group.

Roundtable introductions of all members was conducted.

K. Heppell-Masys explained to the members that the intent of the workshop is to go through the draft Phase I Report and discuss any comments, questions or feedback that the members have on the document. Comments received from the 90-day public review period were also presented to the members for feedback.

L. Casterton provided background information on the work done by the KI Pill Working Group between 2020 and 2021, and reiterated the role of the Advisory Committee.

Action 1:L. Casterton highlighted the following timelines and milestones of the KI Pill Working Group:

L. Casterton to share the Advisory Committee's Operating Procedures.

- All comments received during the public review period and during the Advisory Committee Workshop will be included in the Commission Member Document (CMD) submission.
- The Draft Phase I report will be presented to the Commission during the January 26 – 27, 2022 Commission proceeding.
- Following the Commission Proceeding, the KI Pill Working Group will commence Phase II as described in the Terms of Reference.
- Phase II is targeted to be complete by early 2023.

2. Discussion on Draft Phase I Report

A. Bellingham and L. Casterton presented the comments received during the public review period on the Draft Phase I Report.

The Draft Phase I Report and the comments received during the public review period can be found on the CNSC's e-consultation page.

Advisory Committee members were asked to provide comments and feedback on the Draft Phase I Report. The following comments were received:

	Section	Member	Comment/Discussion
1.	General	D. Novog	Commended the efforts by the Working Group on the Phase I report, and appreciated the concept of operations

			presented in Section 4. The Working Group offered a valuable opportunity for Public Health Units (PHUs) and Emergency Management Coordinators (EMCs) to provide input into the concept of operations.
2.	General	T. McClenaghan	The report adds value by having all the information in one place. Understanding that the working group activities have two phases, is there an opportunity during or after Phase II to revisit the Phase I report and update as required, i.e. is this report an evergreen document? **CNSC:** Once Phase I is complete the Working Group will not revise or update the Phase I report itself, however since Phase II is an extension of Phase I, there will be opportunities in Phase II to capture those items as required.
3.	Section 1	T. McClenaghan	The Phase I report describes the current plans in place, but what about the do-ability/adequacy/effectiveness of the distribution of KI in the event of an accident/emergency and the appropriateness of planning zones; will Phase II address address this? **CNSC:** Phase II will look at the feasibility of these plans. In addition, other ways that this could be addressed include the IAEA EPREV follow-up mission (anticipated to take place in 2023), as well CNSC's engagement with OFMEM on the revision of the PNERP.
4.	Section 1	D. Novog	For emergency distribution, the municipalities will be actioned to support the emergency distribution of KI pills, can this report elaborate on what needs to be done at the municipal level to ensure they have the appropriate capabilities/resources? **S. Watson**: Agreed. At the municipal level, ensuring sufficient resources and staffing to carry out these actions needs to be

			discussed. This is something that Kincardine and other municipalities are looking at as the Bruce County area builds up. **CNSC:** During the KI Pill Working Group workshop when discussing emergency distribution of KI pills, PHUs/EMCs referred to the strategies and response actions that took place during H1N1 in 2009. In present day, the response required by municipalities during the COVID-19 pandemic will provide additional information and insights to support the concept of operations for the emergency distribution of KI. This will be considered for Phase II.
5.	Section 2	T. McClenaghan	There is a need to ensure all information is available for anyone who requires it before an event happens. For example, we need to reinforce guidance and specific medical advice for those who can and cannot take KI pills, and how that differs for populations such as pregnant women or those with thyroid issues. Timeliness to disseminate information and coordinate response actions is a reoccurring concern. For the COVID-19 and H1N1 response the timeframes are within days/weeks/months, however for a nuclear event the timeframes are within hours; there is going to be a lot of coordination required in a short amount of time. There is a need to address any coordination, cooperation, and public information matters in advance.
6.	Section 3	T. McClenaghan	See comment 4, same comment referring to the timeliness of public information/medical advice being prepared in advance of an event. Public communications relating to emergency preparedness has come a long way, but it is still complex. Should also consider impacts of misinformation.

7.	Section 3	T. McClenaghan	Figure 11, bullet 2 under Quick Facts: "*In the highly unlikely event of a nuclear emergency, potassium iodide (KI) pills are key to keeping you safe*". Suggest reviewing this public information product to ensure KI pills are not presented as a "magic pill" during a nuclear event. Phase II should provide more information on the efficacy of the KI pills.
8.	Section 4	D. Novog	Section 4 indicates that the concept of operations was "confirmed" during the KI Pill Working Group Phase I Workshop, could it be elaborated on how this was confirmed? In addition, what was the tabletop scenario conducted during this workshop? **CNSC:** The tabletop scenario did not refer to a specific on-site scenario at a nuclear power plant, it was focussed around an anticipated release occurring within a certain timeframe and the actions required by offsite response authorities. The meeting minutes from the Workshop are available through the KI Pill Working Group webpage. **Action 2:** L. Casterton to share the meeting minutes from the KI Pill Working Group Workshop.
9.	Section 4	T. McClenaghan	Page 27, in terms of public alerting, the Working Group should consider the lessons learned from the Pickering false alert.
10.	Section 4	T. McClenaghan	Initial staging of KI pills was based on a Design Basis Accident (DBA) and can be expanded for a Beyond DBA (BDBA), but what about a Severe BDBA? Phase II will need to look at the timeliness of emergency distribution for a Severe BDBA, and if the timeliness cannot be achieved then pre-distribution needs to be considered. Impacts to each planning zone should be considered by applying a risk based approach to the level of detail needed.

11.	Section 4	D. Novog	Phase II should consider the impacts of a severe weather event on emergency response. Actions taken in response to a nuclear emergency may be part of a larger response to a severe weather event. **M. Burton:** Provided an explanation that KI pills were pre-distributed to schools, towns, and villages within the IPZ for Bruce Nuclear Generating Site in case of extreme weather that is experienced in the area.
12.	Section 4	B. Lemaich	For the concept of operations, realistic expectations need to be considered. For example, during Fukushima the response was superimposed with a severe weather event. For Phase II, other factors need to be considered in the concept of operations when it comes to capabilities such as staffing, resources, support from neighbouring municipalities/ offsite authorities, etc. There can be all the plans in place, but if communities get overwhelmed or there is a lack of support, those plans can fall apart.

The Advisory Committee members did not propose any specific changes to the report, but the comments provided above will be brought to the Working Group for further considerations to be included in Phase II.

Members of the Advisory Committee present at the workshop concluded that the Phase I Report meets the mandate of Phase I.

3. Closing Remarks

CNSC emphasized the importance of public engagement for this working group process and thanked all the Advisory Committee members for their participation in providing comments on the draft Phase I Report.

L. Casterton reiterated the following anticipated milestones going forward:

- January 2022 - Commission Proceeding to present the Phase I report and the comments received

- Spring 2022 - Advisory Committee Meeting to discuss the commencement of Phase II and receive their input on the Phase II Workshop Agenda topics
- Spring/Summer 2022 - Phase II Workshop with the KI Pill working Group
- Early 2023 - Present the Phase II Report to the Commission

The following actions were identified for CNSC:

Action 1:

L. Casterton to share the Advisory Committee's Operating Procedures.

Action 2:

L. Casterton to share the meeting minutes from the KI Pill Working Group Workshop.

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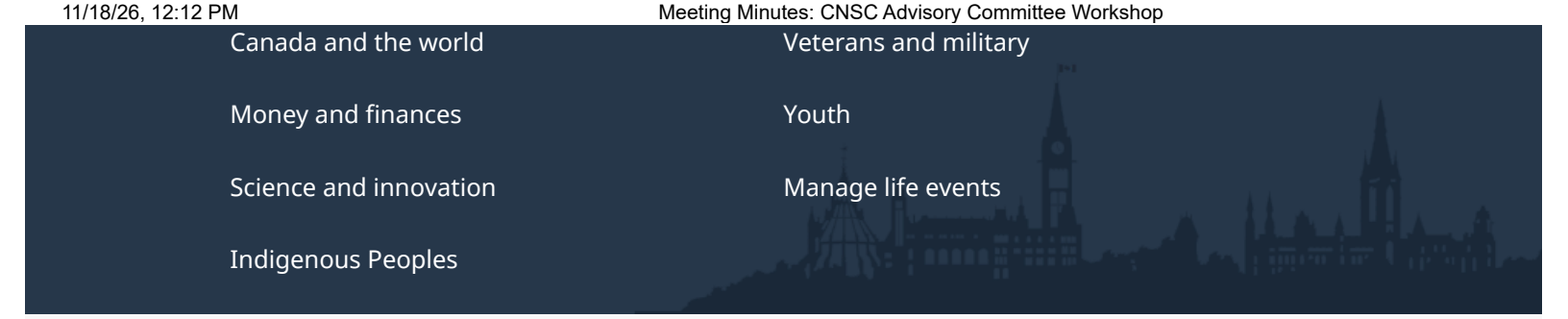
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KI Pill Working Group: Draft Report / Projet de rapport - Groupe de travail sur les comprimés de KI

Comments received from public consultation / Commentaires reçus dans le cadre du processus de consultation

Comments received:
• during first round (April 6 to July 5, 2021): sixteen comments from four (4) reviewers

Commentaires reçus :
• lors de la première période (du 6 avril au 5 juillet 2021) : seize commentaires reçus de quatre (4) examinateurs

Comments received during first round / Commentaires reçus lors de la première période:

	Section	Organization	Comment
1.	Does the draft report provide clarity on KI pill distribution?	Gord Weir Clarington Emergency and Fire Services Fire Chief/CEMC	https://www.clarington.net/en/town-hall/resources/Emergency-and-Fire-Services/Emergency-Plan-AODA.pdf. Just a couple of comments. Attached is a hyperlink for our most current Emergency Plan in Clarington. The document highlighted 2016 Only other comment as Fire Chief and CEMC there does not appear to be any clarification on how residents will be provided or notified on KI distribution. By this I mean there are many residents who move out of Clarington yearly. How does the new Home owner get advised about obtaining KI Pills. Possibly a yearly mail out would suffice to all residents along with utilizing social media with in each municipality maybe ? This was just not clear from what I read. Thanks
2.	Comment on specific content of this draft report	Kathy.Bleyer Office of the Fire Marshal and Emergency Management (OFMEM) Planning & Exercise Officer	Please delete the following and, until further notice, please make all references in this and future reports to OFMEM.: "As of June 2020, the Office of the Fire Marshal and Emergency Management (OFMEM) is now Emergency Management Ontario
3.	General	Ontario Power Generation (OPG)	The document does not mention Indigenous communities at all. If the document is public this may arose concern should any First Nation would be within the distribution zone. The closest communities to Pickering and Darlington are Scugog Island (Port Perry), Curve Lake, Hiawatha (both near Peterborough) and Alderville (north of Cobourg). Please check zones to see if any would be inside the distribution zone. Proposed change: Include reference to the Treaty Lands the PNGS and DNGS reside on. Insert 'Designated First Nations as a table at the end of Section 2 and make mention at the end of Section.
4.	General	OPG	Details on the central stockpile does not seem to be included, where it is kept, who supplies/maintains. Proposed change: Suggest including a note on the central stockpile (e.g. in Table 3 roles and responsibilities)

	Section	Organization	Comment
5.	Section 1.2, Definitions	OPG	EMO "As of June 2020, the Office of the Fire Marshal and Emergency Management (OFMEM) is now Emergency Management Ontario (EMO). …." Please confirm the above, and if OFMEM name has been changed. Proposed change: Please update the acronym/definition accordingly.
6.	Section 1.2, Definitions	OPG	Vulnerable Population Vulnerable Population definition does not align with CSA N1600:21. Proposed change: Consider adding the "most" to align with CSA N1600:21. Are members of the public that are most vulnerable to radiation exposure (i.e., pregnant women and children).
7.	Section 1.4.2/1.4.5, Page 6-7	OPG	1.4.2 Target Population says "elderly people are at a lower risk of developing radiation induced thyroid cancer, and also may be at higher risk of experiencing adverse effects from KI ingestion" but then in section 1.4.5 says "The risk of side effects from taking a dose of KI is extremely low for all age groups, and the overall benefit of KI outweighs the risk of side effects." These statements seems to contradict each other. Proposed change: Suggest reviewing and revising the contradictory statements
8.	Section 1.4.6, Page 7	OPG	"KI is pre-distributed within the detailed planning zone (DPZ), available at reception centers, and stockpiled for the IPZ of Canadian Nuclear Power Plants by the host province, as required by CNSC REGDOC 2.10.1 [3]" REGDOC 2.10.1 doesn't specify about KI being available at reception centers. Proposed change: Suggest the wording of Section 1.4.6 align with REGDOC 2.10.1: "1. ensure that a sufficient quantity of iodine thyroid-blocking (ITB) agents is pre-distributed, to all residences, businesses and institutions within the designated plume exposure planning zone, together with instructions on their proper administration 2. ensure that a sufficient quantity of ITB agent is pre-stocked and available within the designated ingestion control planning zone; this inventory of ITB agents shall be located so that it can be efficiently obtained by, or provided to, members of the public when required…"
9.	Section 2.1, Page 10		"…documents listed are those currently available as of June 2020." The draft report was published in 2021, and the latest Consolidated Nuclear Emergency Plan was published in November 2020. Proposed change: Consider updating the date to 2021.

	Section	Organization	Comment
10.	Table 3, OPG, Page 11, 1st bullet	OPG	OPG Responsibilities – "The OPG Consolidated Emergency Plan [17] – considers KI pre-distribution. " R017 of CNEP included pre-distribution as well as stock piling: "The program established and maintained by OPG and the designated municipalities, ensures continued availability to residents of the DPZ and Ingestion Planning Zone (IPZ), and that information is available to the general public, including online" Proposed change: Suggest revising to align with the CNEP "… pre-distribution and continued availability to residents of the DPZ and IPZ."
11.	Table 3,OPG, Page 11, 1st bullet	OPG	OPG Responsibilities – "…and have KI stockpiled and ready for prompt emergency distribution in the IPZ [3, 7]." Is this stockpile referring to the Reception Centres? The current wordings could imply OPG stockpiles which is not the case. Proposed change: Suggest rewording
12.	Table 3, Page 11, 2nd bullet	OPG	OPG Responsibilities – "Procure KI for institutions and first responders [3, 7]." Should the distance be specified? KI isn't procured for ALL institutions in the IPZ Proposed change: Suggest including the distance that applies here (e.g. within the IPZ).
13.	Table 3, Page 11, 5th bullet	OPG	OPG Responsibilities – "Conduct robust, cyclical, and ongoing public education and awareness campaigns with the involvement of designated municipalities and the province [3, 7, 2, 8]" Suggest rewording. Proposed change: Minor, editorial (e.g. … campaigns in coordination of designated...)
14.	Section 3.2.1, Page 20	OPG	•"…members of the public living within 50 km (IPZ) …" The KI Pre-distribution applies to those both living and working (as per Section 3.1.1). Proposed change: Suggest updating to include those working.
15.	Section 4.2, Page 28	OPG	"….Chief Medical Officer of Health (CMOH) that logistical requirements are being arranged for the transportation of KI pills to certain locations within the IPZ." CMOH acronym has already been spelled out Proposed change: Minor, editorial Use acronym CMOH
16.	Section 5.1.2, Page 30	OPG	"Information campaigns are held periodically by OPG and the designated municipalities, particularly Durham Region, to point members of the public to reliable sources and increase awareness of KI." Toronto is also involved in coordination of the campaigns. Proposed change: Suggested adding wording to include Toronto.

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July 20, 2021

RE: Curve Lake First Nation Comments on 90-day public review period – Draft KI Working Group Phase 1 Report

Dear Mr. Lee Casterton,

On behalf of our Consultation Department at Curve Lake First Nation (CLFN), we hope this written review and commentary finds you safe and healthy during these difficult times and hope that members and staff at CNSC are doing well.

Curve Lake First Nation is the steward and caretaker of the lands and waters within our territory in perpetuity, as we have been for thousands of years, and we have an obligation to continue to steadfastly maintain this responsibility to ensure their health and integrity for generations to come. Protection, conservation, and sustainable collaborative management are a priority for Curve Lake First Nation.

Our Consultation Department has emphasized that environmental protection and sustainability is an integral component of the future of the Curve Lake First Nation. All plans and activities must be viewed through the lens of environmental protection and sustainability. These requirements ensure that Curve Lake First Nation's interests and rights are being protected within our territory; that we are able to protect the ability to exercise our rights as people – physically, culturally, and spiritually; that we are able to foster sovereignty, cultural identity, and sustainable succession. This is central to all relationships being progressed with various regulators and proponents.

We like to acknowledge and thank the CNSC for providing us with the opportunity to comment on the KI working group's Phase 1 Draft Report. As well, we appreciate the time and effort that CNSC gave us, through virtual meetings and dialogue (email correspondence) with our Consultation Department providing us with more information on the KI working group. Lastly, thank you for providing us with participant funding and a grace period, extending our submission deadline.

With that said, meaningful consultation takes time and engaging in a review of this proposal is not without barriers. Our Consultation Department is progressively building capacity to be able to match the various consultation needs, currently with three full time equivalent members on our team; these are our resources that have to respond to all sectors and projects across our territory. We would like to take this opportunity to share some thoughts and comments, in hopes that there will be continued engagement and opportunities for CLFN community involvement.

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The attention of this commentary includes issues of greatest concern to the Curve Lake First Nation Community, formed in questions or statements, with a focus on the potential to create impacts to Indigenous Rights and Title.

MAIN Comments:

1. Part of our Indigenous way of thinking involves the mindset of *All of our Relations.* Which means to always identify our interconnectedness to the earth, including all living beings, not just humans. This leads to the question: If the KI pills are protecting humans, what about the safety of the plants and animals within the 50km range and if they were to be consumed by humans? As well, is there a risk of I-131 in our drinking water? Can KI pills protect us from such contaminated water and not just air exposure to I-131? We suggest exploring education, awareness, and clarification on this issue, on the impacts beyond the human species and the different pathways of exposure to I-131. What are the key tangible actions that need to be taken – do we stop hunting and harvesting for a certain period? If we don't stop, what are the risks?

2. Clarification is needed on what is defined as a nuclear emergency/nuclear disaster event, would this be a controlled release event or an uncontrolled event (such as an explosion). What type of event would lead to exposure of radioactive Iodine within the 50km zone? In our meeting, CNSC described the extensive consideration of accident modelling that has been done, and seemingly is the basis of the emergency response plan for KI pill distribution, this could be clarified in communications. We would like to review the Provincial Nuclear Emergency Response Plan (PNERP) Technical Study to gain a better understanding of the inherent risk and likelihood of an event/disaster that would need the distribution of KI pills and how CLFN would fit into this plan.

   For example, what is the current program for CLFN in terms of pre-distribution of KI pills and replenishment? Including information, awareness, education tools that would go along with the KI pills. What is the current program or plan for CLFN in terms of an emergency situation? What are the notification and alert systems in place for CLFN? How would we ensure that our community members living on and off reserve are safe and aware of the evolving situation?

3. How are these predetermined zones, that are noted to be the zones of at-risk exposure, designated and the decision made on how far the zone reaches? More information on how this decision is made will be helpful. How do we know that there isn't a risk of exposure further than these zones?

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4. Roles and responsibilities at all levels need to be decided and communicated now, prior to an emergency event due to time-sensitivity of KI pills (communication between municipalities, province, and OPG, CNSC). Perhaps this can be done in Phase 2, but a broad discussion of plans can be mentioned in Phase 1. Furthermore, as rights holders to the land, Indigenous communities should be meaningfully consulted and engaged in the decision making process and distribution of KI pills. We believe this discussion should be included in the first phase of the KI Working Group report to allow feedback and dialogue between Indigenous communities and CNSC to help improve on for the second phase of this work.

5. How would Small Modular Reactors change the risk profile or perhaps introduce factors that would result in similar concerns?

We believe that there is sufficient information in the above commentary and review of the KI Working Group's Phase 1 Draft Report , albeit brief, that can act as a mere starting point for CLFN Consultation Department staff and CNSC staff to continue the dialogue on this topic.

We do this work to uphold our responsibilities to care for the earth and waters, for our people, our nation, and for all our relations. Our foundational belief is balance; our values and principles are built upon the respect, care, and nurturing of all life as part of an interconnected whole and necessary for the balance and harmony required for Mino-Bimaadiziwin now and for future generations.

Sincerely,

Submitted by email

Dr. Julie Kapyrka
Lands Resource Consultation Liaison
Curve Lake First Nation

cc:
Chief Emily Whetung, Curve Lake First Nation
Kaitlin Hill, Lands Resource Consultation Liaison, CLFN
Cassandre Roy-Drainville (CNSC)
Adam Levine (CNSC)

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

October 21, 2026

Sent by email interventions@cnsc-ccsn.gc.ca

Senior Tribunal Officer, Secretariat
Canadian Nuclear Safety Commission
280 Slater Street,
P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9

Re: Ref. 2026 - H-7 - Requests for Ruling
Disclosure of Periodic Safety Review 3 Documents, Ontario Power Generation Gap Analysis to Comply with Version 3 of RegDoc 2.10.1, and Opportunity for Public Comment Prior to Decision

We are counsel for the intervenors, Durham Nuclear Awareness, Slovenian Home Association and Canadian Environmental Law Association in Ref. 2026 – H-7. We are in receipt of the Procedural Direction of the Tribunal dated October 20, 2026, which provides an opportunity for further comment on the following:

- information on the construction and in-service timeline for the deep-water intake (DWI)
- Pickering NGS Periodic Safety Review 3 (PSR3) Basis Document (CMD 26- H7.1E)
- Predictive Environmental Risk Assessment for Pickering Refurbishment, Decommissioning, and Continued Operations - Revision 1 (CMD 26-H7.1F)
- Update on Potassium Iodide (KI) Distribution (CMD 26-H7.E)

Request for Ruling on Disclosure and Opportunity to Comment on All Periodic Safety Review 3 Documents

We are writing to seek a ruling on additional requests for a ruling made by the intervenors at the day 2 public hearing, pursuant to Rule 20(3) of the *Canadian Nuclear Safety Commission Rules of Procedure,* SOR/2000-211. The requests relate to disclosure of all Periodic Safety Review 3 documents and an opportunity to comment on those documents, and are not addressed by the Procedural Direction dated October 20, 2026:

- **Request for Ruling 1:** The intervenors request disclosure of full copies, not only summaries, of all PSR 3 documents:
    - All safety factor reports
    - Global Assessment Report: Currently, only a summary has been disclosed. (CMD 26 – H7.1B)
    - Integrated Implementation Plan (not yet completed)

- **Request for Ruling 2:** The intervenors request an opportunity to provide comments on all of the documents in the PSR3 process, including all of the safety factor reports, the full global assessment report, and the integrated implementation plan, prior to a decision by the Tribunal.

Request for Ruling on Disclosure of Ontario Power Generation's Gap Analysis to Comply with RegDoc- 2.10.1, Nuclear Emergency Preparedness and Response, Version 3 and Opportunity to Comment

The Canadian Nuclear Safety Commission is proposing to present the updated version of RegDoc 2.10.1, Nuclear Emergency Preparedness and Response for acceptance on December 2, 2026. Ontario Power Generation's failure to demonstrate compliance with RegDoc 2.10.1, version 3 was a subject of significant concern in the intervenor's submissions. The intervenors made the following recommendations:

> **RECOMMENDATION NO. 22:** The CNSC should address the requirements under REGDOC-2.10.1, Version 3 by requiring compliance with Version 3's substantive obligations as conditions of any licence; or (b) providing a reasoned explanation of why a renewed PROL should be granted on the basis of a standard the Commission's own staff has determined requires material upgrade. The Commission should firmly reject OPG's request for a licence for a 30-year refurbishment program on the basis of a standard that the CNSC has determined is inadequate and requires revision.
>
> **RECOMMENDATION NO. 23:** The Commission should treat the absence of a current, published, PNERP 2025-conformant Pickering Implementing Plan and a REGDOC-2.10.1 v3 gap analysis as a condition precedent to be satisfied prior to the renewal of the PROL, not as a matter to be resolved post-licensing. The intervenors recommend that the Commission withhold approval for the PROL renewal until the OPG's gap analysis is complete, the implementation plan and PSRs are all finalized, publicly vetted, and the OPG is found to be in full compliance with the most recent Canadian and international standards.
>
> …
>
> **RECOMMENDATION NO. 25:** The Commission should formally adopt the Draft REGDOC-2.10.1 Version 3 requirement to account for "multi-unit and/or multi-module accident scenarios" occurring during refurbishment activities.

Due to the update from the Commission on the timing of acceptance of RegDoc-2.10.1, Version 3, to December 2, 2026, we formally request:

Request for Ruling 3: The Ontario Power Generation Gap Analysis, to address the strengthened requirements in version 3 of RegDoc-2.10.1, must be completed and disclosed to the public and the Tribunal prior to a decision.

Request for Ruling 4: The public seeks an opportunity to comment on Ontario Power Generation's gap analysis and its compliance with RegDoc 2.10.1, Version 3, prior to a Tribunal decision.

Thank you for your attention to these matters.

Sincerely,
CANADIAN ENVIRONMENTAL LAW ASSOCIATION



Jacqueline Wilson
Counsel

Canadian Nuclear Safety Commission
Commission Registry

Commission canadienne de sûreté nucléaire
Greffe de la Commission

VIA EMAIL

September 23, 2026

Sara Irvine
Vice-President, Nuclear Regulatory Affairs
Ontario Power Generation Inc. (OPG)

Dear Sara Irvine

Re: Canadian Nuclear Safety Commission Request for Additional Documents Pursuant to OPG's Application for Authorization to Refurbish the Pickering Nuclear Generating Station and Renew its Pickering Nuclear Generating Station and Waste Management Facility licences (26-H7)

The Commission requests that OPG submit the following documents, referenced in CNSC staff CMD 26-H7, to the Commission Registry for inclusion in the hearing record:

- Pickering NGS Periodic Safety Review 3 (PSR3) Basis Document
- Pickering Nuclear 5-8 Safety Report: Part 3 – Accident Analysis

The hearing record is public by default. In accordance with the *Directive on Submitting Documentary Evidence for the Record*, if OPG wishes to protect either document from public disclosure under Rule 12 of the *Canadian Nuclear Safety Commission Rules of Procedure*, it must submit a request for confidentiality alongside submission of the documents.

Please provide the requested documents to the Commission Registry by **Monday, September 28, 2026**. If this timeline is not possible, please contact the Registry to discuss an alternate timeline, or any other questions you may have.

Sincerely,



Candace Salmon
Commission Registrar
Legal and Commission Affairs Branch
Canadian Nuclear Safety Commission
candace.salmon@cnsc-ccsn.gc.ca / cell: (343) 630-3471

Registraire
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c.c.: Dr. Alexandre Viktorov, CNSC
Anupama Bulkan, CNSC
Ross Richardson, CNSC
Daniel MacDonald, CNSC
Adam Levine, CNSC

Encl : Confidentiality Request form