CONTEXT: Publication of External Advisory Committee Report on Japanese Nuclear Incident The Report of the External Advisory Committee Examining the Response of the Canadian Nuclear Safety Commission to the 2011 Japanese Nuclear Event (the EAC Report) is now available. The External Advisory Committee, an arm's-length independent committee, was formed by the CNSC President and tasked with providing a report to the President on the CNSC's response to the Fukushima crisis. For transparency purposes, the Report has been posted on the CNSC Web site as it will likely be referred to during the May 3 Commission public meeting on the CNSC Fukushima Task Force Report's Staff Action Plan. The CNSC President received and accepted the EAC Report on April 12, 2012 and has instructed CNSC staff to take into consideration the EAC Report's recommendations in the CNSC Staff Action Plan. Although not a formal Commission Member Document (CMD) for the purposes of the May 3 Commission meeting, a copy of the EAC Report has nonetheless been provided to all the May 3 Commission Meeting participants.		**CONTEXTE : Publication du rapport du Comité consultatif externe sur l'accident nucléaire au Japon** Le rapport du Comité consultatif externe chargé de l'examen de la réponse de la Commission canadienne de sûreté nucléaire à l'accident nucléaire survenu au Japon en 2011 est maintenant disponible. Le Comité consultatif externe, un comité indépendant de la CCSN, a été mis sur pied par le président de la CCSN et a pour mandat de rendre un rapport au président sur la réponse de la CCSN à l'accident nucléaire survenu à Fukushima. Aux fins de transparence, le rapport est publié sur le site Web de la CCSN alors qu'on en discutera probablement lors de la réunion publique de la Commission concernant le Plan d'action du personnel de la CCSN au sujet du Rapport du Groupe de travail de la CCSN sur Fukushima, réunion qui aura lieu le 3 mai prochain. Le président de la CCSN a reçu et entériné le rapport du Comité consultatif externe le 12 avril 2012, et a demandé que le personnel de la CCSN tienne compte des recommandations qui y sont énoncées dans l'élaboration du Plan d'action du personnel de la CCSN. Quoique le rapport du Comité consultatif externe ne soit pas un document à l'intention des commissaires (CMD) en tant que tel aux fins de la réunion publique du 3 mai, un exemplaire a néanmoins été envoyé à chacun des participants à cette réunion. **Veuillez noter que la version française du rapport sera disponible sous peu.**

Report of the External Advisory Committee

Examining the Response of the Canadian Nuclear Safety Commission to the 2011 Japanese Nuclear Event

Presented to Michael Binder
President
Canadian Nuclear Safety Commission

April 12, 2012

April 12, 2012

Dr. Michael Binder
President,
Canadian Nuclear Safety Commission
280 Slater Street,
Ottawa, Ontario
K1P 5S9

Dear President Binder,

We are pleased to present the final report of the External Advisory Committee (EAC) examining the response of the Canadian Nuclear Safety Commission to the 2011 Japanese nuclear event at Fukushima. The report is the culmination of eight months of gathering information about how the CNSC responded in the early stages of the crisis and how the organization went about developing its longer-term plan to assess and apply lessons learned from the Japanese event.

We appreciate the opportunity to have served on the EAC, and appreciate the assistance and cooperation of CNSC staff members in providing us with information to answer our questions.

The attached report presents the EAC's findings as well as nine recommendations which we believe would permit the CNSC to complete the process initiated by the Fukushima accident. We trust you will find the report helpful, and would be pleased to discuss any of our findings and recommendations with you.

Sincerely yours,

Ken Knox Gilles Patry Henry Wright

Report of the External Advisory Committee

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Executive Summary

On March 11, 2011 at 1:41 EST, a magnitude 9.0 earthquake took place approximately 130 kilometres east of the city of Sendai off the eastern coast of Japan. A massive tsunami wave ensued striking a large part of Japan's east coast between 30 and 60 minutes after the earthquake causing widespread destruction and loss of life. It also damaged the Dai-ichi nuclear power plant in the Fukushima prefecture precipitating a severe nuclear accident which led to the evacuation of tens of thousands of Japanese residents.

The accident was closely monitored by several nations around the world, particularly by those with nuclear facilities of their own. In the days and weeks which followed March 11th, nuclear regulators were called on to reassure citizens in their countries that their own facilities were safe. Furthermore, several countries undertook an examination of their licensed facilities to assess the degree to which their power plant designs and emergency management procedures were able to withstand scenarios of extreme natural hazards.

In Canada, the Canadian Nuclear Safety Commission (CNSC) is the nuclear regulator and conducted such a review of Canada's nuclear power plants (NPPs). The CNSC sent letters requesting information to one group of licensees (primarily consisting of NPP operators) on March 17, 2011 and to a second group (including other major nuclear facility operators) on March 22, 2011. A review team, the Fukushima Task Force (FTF) was assembled consisting of CNSC staff to assess the responses to the letter requests and the FTF Report was made public on October 28, 2011 along with the response of CNSC's management. Subsequently, the CNSC developed a draft Action Plan which was posted for public review on December 21, 2011. The CNSC's Commission tribunal will meet on May 3, 2012 to review the FTF Report and the proposed CNSC Action Plan which incorporates input from stakeholders including industry and the public through three rounds of consultation.

In parallel with this work, on August 5, 2011 CNSC's President formed the External Advisory Committee (EAC) to review the CNSC's process in responding to the Fukushima crisis and in developing proposed changes to its processes and regulatory framework. The EAC consists of three members with expertise in a variety of fields but, importantly, not the nuclear industry - in order to conduct an assessment which is free from inherent assumptions. The three members of the EAC are: Mr. Kenneth Knox (Chair), Dr. Gilles Patry and Mr. Henry Wright.

The mandate of the EAC was set out as the following:

> The External Advisory Committee was established under paragraph 21(1)(c) of the *Nuclear Safety and Control Act* by the President of the CNSC and was mandated to:
>
> 1) review the CNSC's immediate response to the Japan nuclear events, including activation of its emergency operations centre and connections with the rest of government and international organizations;
>
> 2) review the CNSC's interactions with the Canadian nuclear sector and its regulated industries;

3) review the CNSC's communications with all affected stakeholders, including governments, international organizations and the public; and

4) assess the implications from the international response on the CNSC responses.

This document is the EAC's report. In conducting its study, the EAC heard presentations on a variety of topics from CNSC staff, met with external parties and participated in a site tour of an NPP. The EAC has conducted its fact-finding process in accordance with its mandate, and presents its findings in this report along with a series of recommendations for the CNSC President's consideration.

Findings

The EAC finds that:

- *In general, the CNSC acted in an appropriate manner in its response to the Fukushima crisis;*
- *The process for considering the FTF Report has provided appropriate opportunities for members of the public to view the FTF findings and submit input to the process;*
- *The CNSC has made adequate provisions in its process for receiving and incorporating such input into the final actions to be recommended to the Commission;*
- *The FTF was thorough and balanced in fulfilling its mandate relating to NPP safety;*
- *While the peer review process is valuable, the Integrated Regulatory Review Service (IRRS) review is not mandatory, suffers from a lack of information sharing between regulators and a lack of enforcement mechanisms through the International Atomic Energy Agency (IAEA);*
- *The CNSC acted promptly in deploying its emergency operations centre;*
- *The CNSC acted early to initiate and maintain contact with its government counterparts in the first stages of the crisis;*
- *There is a lack of coordination of emergency planning roles in Canada with regard to nuclear events;*
- *Broadly-based emergency planning exercises have been carried out infrequently;*
- *The CNSC acted early to initiate and maintain contact with international organizations in the first stages of the crisis;*
- *In general, the CNSC interacted promptly and pro-actively with the nuclear industry beginning early in the crisis and throughout the longer term;*
- *The CNSC had a clear process to address the responses from the NPPs;*
- *With regard to licensed facilities which are not nuclear power plants, the CNSC's proposed actions for assessing the information gathered and proposing any new measures have not been made clear to the public;*

- *It is not evident that the CNSC has considered the area of Human and Organizational Performance in its FTF recommendations;*
- *The CNSC's plans for dealing with the FTF's concerns about the design capability of NPPs to withstand tornado hazards remain unclear;*
- *In general, the CNSC acted promptly to establish communication channels and was open to share and disseminate information, both domestically and abroad;*
- *During the nuclear incident, there was no evidence of a coordinated government-wide communication strategy and the CNSC attempted to fill the void and provide information, but this role was primarily limited to web-based communications;*
- *During the Fukushima incident the CNSC had a limited public communication/ education strategy that was mostly focused on web-based activities;*
- *The CNSC played a leadership role in helping to shape international actions to address the Fukushima crisis; and*
- *There is a lack of coordination of emergency planning exercises with other countries, particularly the United States.*

On the basis of these findings, the EAC makes the following nine recommendations to CNSC's President:

RECOMMENDATION 1 – The EAC recommends that the CNSC continue to work with regulators of other member states of the IAEA to ensure that the IRRS process is mandatory, transparent and that the findings and recommendations are enforced.

RECOMMENDATION 2 – The EAC recommends that the CNSC work with its fellow regulators in convincing World Association of Nuclear Operators' (WANO) members to share the results of their peer review process to promote nuclear safety in all nations with nuclear power plants.

RECOMMENDATION 3 - The EAC recommends that the CNSC work with other government departments to ensure better coordination and redefinition of departmental roles and responsibilities should a nuclear accident occur in Canada, the United States or overseas.

RECOMMENDATION 4 - The EAC recommends that the CNSC meet with its partner organizations and licensees to establish the extent and frequency of multi-level emergency exercises.

RECOMMENDATION 5 – The EAC recommends that the CNSC clarify its position on the 12(2) orders with respect to the non-NPPs.

RECOMMENDATION 6 – The EAC recommends that the CNSC examine the area of Human and Organizational Performance to achieve a more complete understanding of lessons learned from the Fukushima crisis.

RECOMMENDATION 7 – The EAC recommends that the CNSC clarify its plans to address tornado hazards.

RECOMMENDATION 8 – The EAC recommends that the CNSC develop a comprehensive communication and education strategy that includes the use of various tools including social media and expands partnerships and relationships with various science media organizations that have the ability to inform the public on nuclear safety.

RECOMMENDATION 9 – The EAC recommends that, as the Canadian nuclear safety regulator, the CNSC should play an active role in ensuring that emergency planning exercises with the United States are conducted regularly.

While none of these findings or recommendations signal areas requiring urgent action, the EAC believes that they all contribute in some way to completion of the CNSC's response to the Fukushima crisis, whether it is to conduct further studies, or to influence other partner organizations to improve emergency processes, or to help ordinary Canadians to understand how the CNSC intends to deal with certain safety concerns.

1. Background

1.1 The Fukushima Crisis

On March 11, 2011 at 1:41 EST, a magnitude 9.0 earthquake took place approximately 130 kilometres east of the city of Sendai off the eastern coast of Japan. This was one of the largest earthquakes in recorded history.

A large tsunami wave precipitated by the earthquake struck the east coast of Japan approximately 30 minutes to an hour after the initial seismic event. This wave caused widespread damage to many areas of northeastern Japan, resulting in the death or disappearance of approximately 25,000 citizens as well as the destruction of infrastructure in its path- including roads, buildings, houses and utility services. None of these deaths resulted from the nuclear incident at the Fukushima nuclear power plant.[1]

The tsunami struck the Fukushima Dai-ichi nuclear power plant, owned by the Tokyo Electrical Power Company (TEPCO). The plant consists of six reactor units, four of which suffered extensive damage including apparent core meltdown, hydrogen explosions and radiation releases. This damage was primarily caused by the loss of cooling to the plant resulting from equipment damage and affected not only the reactors but also the adjacent spent fuel pools.

Authorities in Japan initially ordered the evacuation of residents within a radius of 10 kilometres from the Dai-ichi plant and increased this zone to 20 kilometres, with a voluntary evacuation recommendation for those people living between 20 and 30 kilometres from the plant.[2]

In subsequent weeks and months, TEPCO gradually restored cooling functions to the facilities and began to gain the upper hand in stabilizing the plant. Although the full cleanup is expected to take several years, TEPCO announced that it had the plant under control before the end of 2011, with cooling functions restored. In September 2011, the Japanese government allowed residents to begin returning to areas within the 20 kilometre evacuation zone, although the timing for lifting evacuation orders for areas closer to the plant remains uncertain.

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[1] See The Washington Post, May 14, 2011, Worker at Japan's crippled nuclear plant dies; no sign of radiation exposure. According to the story, a 60-year old worker collapsed while working at the Dai-ichi plant. Earlier in the day, he reportedly had said he was not feeling well. However, he showed no signs of radiation over-exposure. The article also reports that on March 30th, two plant workers' bodies were found and they were thought to have died when the initial earthquake and tsunami on March 11th hit the power panel room where they were working. Two other workers involved in the recovery operations were hospitalized with radiation burns in late March 2011 after stepping into contaminated water without wearing the proper boots. See http://www.washingtonpost.com/world/worker-at-japans-tsunami-hit-nuclear-power-plant-dies-no-radioactive-substance-found-on-body/2011/05/14/AFozaK3G_print.html .

[2] Source: CNSC Website, Daily Update logs for March 12, 16 and 25, 2011. See http://www.nuclearsafety.gc.ca/eng/mediacentre/updates/2011/japan-earthquake/index.cfm#LatestUpdates .

1.2 Overview- The CNSC and Government of Canada Response

The Japanese earthquake and tsunami occurred several hours before Canadian Nuclear Safety Commission (CNSC) staff began their work day on March 11, and it soon became apparent that the nuclear power plants along Japan's east coast had been impacted and officials were reacting to the emergency. The CNSC was aware from its network of nuclear industry regulators worldwide that the situation was not yet under control. Consequently, at 11:52 a.m. EST the CNSC activated its Emergency Operations Centre (EOC) and staffed it around the clock until April 4, 2011 when the situation at Fukushima Dai-ichi had largely stabilized.

The Department of Foreign Affairs and International Trade Canada (DFAIT), under which the Canadian Embassy in Tokyo operates, was the federal government's lead agency in the early stages of the crisis because the event was taking place in a foreign country. Public Safety Canada's (PSC) Government Operations Centre (GOC), which is always in a state of activation, was responsible for coordinating the broader Canadian government response to the crisis.

In parallel to the CNSC's EOC, CNSC staff was actively involved providing advice and guidance to DFAIT, PSC and all other government departments as required, including Health Canada (HC), Natural Resources Canada (NRCan), Environment Canada (EC), Department of National Defence (DND) and the Canadian Food Inspection Agency (CFIA) on a range of health and safety issues relating to the Fukushima incident. Additionally, the CNSC was in regular contact with international parties such as the International Atomic Energy Agency (IAEA) and regulators from other countries.

The CNSC's role was to provide expert advice on the nuclear technology and the potential emissions based on the ongoing analysis of the situation at the plant.

The focus of the government's effort was the health and safety of Canadians, both those living in Japan and in Canada, including the provision of timely and accurate advice as to the risks from the natural hazards still underway (e.g. seismic aftershocks) as well as the growing radiation emissions as the Dai-ichi situation worsened. For Canadians in Japan, this included advice on radiation levels, what constituted a safe distance from the power plant in order to avoid dangerous levels of radiation, and the impact of radiation in air, water and food for Canadian nationals living near Dai-ichi and Tokyo.

In this regard, it is important to note that there was a great deal of confusion and conflicting information during this period. Different countries were developing their own assessments of the situation and providing advice to their nationals living in Japan. As a result, there were different assessments being released by countries as to recommended evacuation zone distances and as to what level the accident should be rated on the International Nuclear Event Scale (INES- a measure of the severity of the nuclear incident).

For residents of Canada, the government carried out modelling and measurements to predict the path and timing of radiation particles travelling in the atmosphere to Canada (this is known as plume modelling) and thereby advised the population of any precautions that might need to be taken.

The CNSC's contact with other regulators, notably those of the United States, the United Kingdom and France, was aimed at developing a better understanding of the condition of the Dai-ichi reactors and spent fuel pools, in order to predict the potential emissions. As the information

available from knowledgeable Japanese sources was very limited, teams of nuclear experts around the world were trying to assess the situation based on available evidence, collaborating with others in the community to compare analyses and develop the knowledge base. While the CNSC has not licensed any of the specific types of reactors found at Dai-ichi, its experts were able to make reasonably reliable determinations of the reactors' behaviour in cooperation with their international colleagues.

Part of the response of the international nuclear regulator community was to explain to its citizens what degree of safety existed in their own nuclear plants, and raise questions about what crisis scenarios had been built into their designs. As a result, many regulators began inquiries among their operators to expand the knowledge base on extreme catastrophic scenarios and the ability of plans to deal with them. The CNSC, under section 12(2) of the *Nuclear Safety and Control Act* (NSCA), issued letters to all of its operators during the period of March 17 to 22, 2011 asking for responses to specific safety questions, with responses to the "short-term" questions due before April 30, 2011 and responses to longer-term issues due by July 28, 2011.[3]

This CNSC action was consistent with similar initiatives carried out by other countries' nuclear regulators. For example, the U.S. Nuclear Regulatory Commission (U.S. NRC) issued directions to staff on March 21, 2011 to set up a task force to examine lessons learned from the Fukushima crisis and make recommendations for required action in the United States. Similar action was taken by multilateral nuclear safety organizations including the International Atomic Energy Agency (IAEA), the International Nuclear Regulators Association (INRA) (both of which the CNSC participates in) and the Western European Nuclear Regulators' Association (WENRA).

1.3 Overview- The CNSC Fukushima Task Force

Following its issuance of requests for information under section 12(2) of the NSCA, the CNSC established the Fukushima Task Force (FTF) on March 30, 2011. This body served as the internal team responsible for assessing the responses from licensees and making recommendations for necessary regulatory, licensing or procedural reforms.

The FTF presented its preliminary findings to the CNSC Commission members at the August 10, 2011 Commission meeting. A final report was subsequently completed and a CNSC Management Response was issued, and on October 28 both documents were released for a 30-day public consultation period. Incorporating public input gained from this consultation, an Action Plan was then developed including implementation timelines.

A second round of public consultation was held from December 23, 2011 to February 3, 2012 seeking comments on how CNSC management had dispositioned of comments received during the first round.

A Commission Member Document (CMD) finalizing the CNSC Action Plan was put out for a public comment period lasting from March 2 to April 2, 2012 and will be presented to the Commission at the May 3, 2012 meeting. At that meeting, the Commission will make its determinations on the CNSC's implementation plan and schedule.

[3] For clarity, the letters were issued under ss. 12(2) of the *General Nuclear Safety and Control Regulations*. The *Regulations* are made under s. 44 of the NSCA. See Appendix 3 for examples of these letters.

1.4 External Advisory Committee (EAC) Formation

This document is the report of the External Advisory Committee ("the EAC"). What follows in this section is a brief background of why the EAC was formed, its mandate and its members.

In the summer of 2011, CNSC's executive management committee agreed that a panel of independent experts should review the CNSC's response to the Fukushima crisis from when it began to unfold through to the determination of long-term action identified for nuclear facilities. The panel would consist of individuals in various fields relating to governance, technology and forensic investigation, but be composed of individuals who were not from the nuclear industry and not former CNSC employees.

1.4.1 Terms of Reference

The parameters of the EAC's role and deliverables are outlined in the following Terms of Reference.

Purpose

The External Advisory Committee will provide the President of the Canadian Nuclear Safety Commission with an independent and external assessment of the CNSC's actions to date in response to the Japan 2011 nuclear event and to make recommendations for improvement.

Mandate

The External Advisory Committee was established under paragraph 21(1)(c) of the *Nuclear Safety and Control Act* by the President of the CNSC and was mandated to:

1) review the CNSC's immediate response to the Japan nuclear events, including activation of its emergency operations centre and connections with the rest of government and international organizations;
2) review the CNSC's interactions with the Canadian nuclear sector and its regulated industries;
3) review the CNSC's communications with all affected stakeholders, including governments, international organizations and the public; and
4) assess the implications from the international response on the CNSC responses.

Scope

The External Advisory Committee:

- undertook a full review of all of the CNSC's activities as a result of the Japan nuclear events and made recommendations to the President for improvement;
- was provided access to CNSC documentation and staff in performing its assessment;

- liaised with key CNSC management and staff, especially the CNSC's internal Task Force Examining the Lessons Learned from the Japan Earthquake; and
- was assisted by the CNSC in obtaining access to any other stakeholders (e.g., other government departments) or licensees as was required by the committee to conduct their review.

1.4.2 Committee Membership and Biographies

The three members of the EAC are:

- Mr. Ken Knox, Chair
- Dr. Gilles Patry
- Mr. Henry Wright

Brief biographies of the EAC panel members are listed below.

Ken Knox – (Chair) - 27-year public career in the Ontario Government, including six years as Deputy Minister of Agriculture and Food, and Energy, Science and Technology; strong supporter of the use of science and innovation in meeting challenges and opportunities.

Since taking early retirement from the government in 2000, Mr. Knox has been working to breathe new life into initiatives that share a mandate to implement a culture of innovation. His interest has increasingly grown as it is now clear that the future of Canada's economy depends on our society's interest in, and knowledge of, science.

The Innovation Institute of Ontario, of which Mr. Knox was the volunteer President and CEO, provides the link and administrative support for many of these initiatives. Mr. Knox was also the President of the Ontario Innovation Trust and was the President of the Ontario Research and Development Fund (2000-2006). Mr. Knox provides strategic and governance advice to a number of science based and agri-food organizations.

Gilles G. Patry, C.M., O.Ont., P.Eng., Ph.D., FCAE - President and CEO, Canada Foundation for Innovation. On August 1, 2010, Dr. Gilles G. Patry became the fourth President and CEO of the Canada Foundation for Innovation (CFI), following a long and distinguished career as a consultant, a researcher, and a university administrator.

Dr. Patry holds a B.A.Sc. and M.A.Sc. in civil engineering from the University of Ottawa, and a Ph.D. from the University of California, Davis in environmental engineering. He was an environmental engineering consultant (1971-78) before becoming professor of civil engineering at École Polytechnique de Montréal (1978-83) and then at McMaster University in Hamilton, Ont. (1983-93). Dr. Patry's research program at McMaster led him to develop an innovative modelling concept for the simulation of wastewater treatment plant dynamics, and ultimately, to launch a Hamilton-based consulting company, Hydromantis, Inc.

Returning to the University of Ottawa as Dean of Engineering in 1993, Dr. Patry was instrumental in the creation of the School of Information Technology and Engineering, and

in 1997 he became Vice-Rector (Academic). During his tenure as President and Vice-Chancellor (2001-08), Dr. Patry led the development and implementation of the university's strategic plan Vision 2010, promoted the development of multidisciplinary initiatives, spearheaded the most successful fundraising campaign in the history of the University and initiated more than $300 million of capital investments on campus. He is now Professor and President Emeriti at the University of Ottawa.

Dr. Patry is a Member of the Order of Canada, a recipient of the Order of Ontario and a Fellow of the Canadian Academy of Engineering. He has received honorary doctorates from the University of Waterloo and McMaster University, and was named Executive of the Year in 2004 by the *Regroupement des gens d'affaires* of the National Capital Region. In 2009, he was named *Chevalier de l'Ordre de la Pléiade* of the *Assemblée parlementaire de la Francophonie*.

Henry Wright - A Member of the Transportation Safety Board of Canada from 1999 to 2008, Mr. Wright participated annually in the development of business and strategic plans; worked with staff to develop and implement an Outreach Program designed to raise the Board's public profile and enhance uptake of its recommendations; advised and co-ordinated with staff on crisis communications; and developed recommendations to further the safety of Canada's transportation system.

Mr. Wright has extensive experience in administrative and strategic management in the public and non-profit sectors. He was an auditor for the Ontario Ministry of Community and Social Services and has served at the senior management level for a number of non-profit organizations, including Covenant House in Toronto, Burlington Association for the Mentally Retarded, and Peel Children's Centre in Mississauga. Prior to his appointment to the Transportation Safety Board, he served as a consultant to the Business Development Bank of Canada in the areas of government and public relations.

As a private consultant, Mr. Wright has assisted various organizations in developing strategic approaches in the areas of financial, human resources, and project management. He holds a Bachelor Degree in Business Administration from Bishop's University.

2. Methodology

The fact-finding conducted by the EAC was driven by the same factors that would motivate the curiosity of the average Canadian, for example:

- *What was the situation?*
- *How did you approach the situation?*
- *Who did you obtain information from and why?*
- *What did you do with the information?*
- *What are you planning to do next and why?*
- *Is there anything that we think you've overlooked?*
- *Given the CNSC's role, were the interests of Canadians in Japan and in Canada well looked after throughout the process?*

The EAC's first meeting took place August 5, 2011 with CNSC's President and other officials. Subsequent meetings took place approximately monthly through the fall of 2011 and spring of 2012, typically involving a presentation from CNSC staff followed by a question-and-answer session. The CNSC provided a small group of staff dedicated to the EAC as its secretariat responsible for organizing the logistics of the EAC's meetings.

The EAC's fact-finding process also included meeting with external stakeholders of the CNSC - specifically two CNSC power plant licensees (Bruce Power and Ontario Power Generation), the Ontario Emergency Management Organization (EMO) and the Integrated Regulatory Review Service (IRRS) team reviewing the CNSC in late 2011 operating under the auspices of the IAEA.

The EAC also made a site visit to the Darlington Nuclear Power Plant in Clarington, Ontario, allowing the EAC members to experience firsthand the physical scale of a nuclear facility.

The EAC requested briefings from CNSC personnel on specific topic areas:

- Emergency Management at CNSC
- Emergency Management between Canada and the United States
- Communications
- CNSC Fukushima Task Force Report
- IAEA Post-Fukushima Action Plan
- Integrated Regulatory Review Service (IRRS)
- Comparison of the CNSC's actions with those of other nuclear regulators
- Human and Organizational Performance
- Transportation of nuclear materials

The mandate of the EAC was to examine the CNSC's *process* in responding to the Fukushima crisis but not to evaluate the *specific technical recommendations* of the FTF Report, as this is beyond the expertise of the EAC members. The EAC examined the actions taken by the CNSC and looked for any gaps that might have existed or issues/actions that were overlooked.

2.1 The Framework of the Canadian Nuclear Industry

As the EAC members are not nuclear industry experts, the EAC had to establish for its own satisfaction how the CNSC fits into the federal government framework and to what extent it was truly in a position to take action. Only then could the CNSC's actions be assessed on their own merits as the valid responses to the situation at Fukushima.

The CNSC was created by the enactment of the *Nuclear Safety and Control Act* in 2000. The mandate of the CNSC is best captured in section 9 of the *Act* wherein it states that the "Objects" of the CNSC are: to regulate nuclear energy and nuclear substances, equipment and prescribed information in order to prevent unreasonable risk to the environment and to the health and safety of persons; and to prevent unreasonable risk to national security and to regulate in such a manner as to achieve conformity with Canada's international obligations relating to nuclear technology. Further, the CNSC is mandated to disseminate objective scientific, technical and regulatory information to the public regarding its activities and on the effects of the above uses of nuclear materials on the environment and on the health and safety of persons.

Within the federal government structure, the CNSC is an independent regulator answerable to Parliament. Because reports and other information can only be tabled in Parliament by an officer of Parliament, the CNSC therefore reports through the Minister of Natural Resources, but importantly, not <u>to</u> the Minister.

The nuclear facilities regulated by the CNSC are owned by a variety of entities with varying ownership profiles. These entities are licensed by the CNSC. Ontario Power Generation (OPG), Hydro-Quebec and New Brunswick Power are provincially-owned utilities who own and operate nuclear power plants (NPPs) in their respective provinces. Bruce Power Limited is a privately-owned company operating an NPP in Ontario. Atomic Energy of Canada Limited (AECL) is a federal Crown corporation which is licensed to carry on a variety of nuclear activities across Canada and whose major facility is the Chalk River site in Ontario. This facility is not an NPP but does include the National Research Universal (NRU) reactor which is used for research and is a major producer of medical isotopes.

Decisions to build NPPs are the purview of the provinces based on their individual electricity demand and their plans for development of generation capacity to meet that demand. The CNSC is not involved in that decision-making process and is independent from the business case which underlies an NPP in the supply mix. The CNSC does not regulate electricity rates- this responsibility is managed at the provincial level.

2.2 CNSC and its Role Within the Framework

The EAC was mindful in its review that the CNSC was required to carry out its response to the Fukushima crisis in accordance with its mandate. The CNSC needed to ensure it addressed the direct impacts of the accident on the health and safety of Canadians and the environment; the safety of nuclear facilities under its jurisdiction was sufficient to protect the health and safety of Canadians and the environment; Canada's international obligations respecting the use of nuclear energy were adhered to; and, the CNSC fulfilled its educational role in disseminating information to the public.

3. Findings and Recommendations

The EAC has examined several areas of interest which were relevant to the CNSC's Fukushima crisis response. The fact-finding process spanned the period from early August 2011 to the end of March 2012, a period of some eight months, in which much information was learned in a structured manner. Throughout its fact-finding process, the EAC has ensured that its actions were aligned with its stated mandate and to the extent possible, the EAC's findings have been captured accordingly. However, other findings apply to several areas of the mandate, and are listed separately under the heading General Findings.

General Findings

Finding G-1 - In general, the CNSC acted in an appropriate manner in its response to the Fukushima crisis.

Having examined the CNSC's management of the crisis through its various actions, the EAC concludes that the overall response was prompt and appropriate, with some exceptions as noted below in Findings 2-3, 2-4, 2-5 and 3-3. During the morning of March 11, 2011 as the crisis began to unfold, the CNSC took the decision to activate its Emergency Operations Centre (EOC), coordinate with domestic and international parties, and initiate and maintain communications channels. In the weeks and months that followed, the CNSC continued to put into place longer-term plans to address lessons learned from the crisis and to pursue similar reforms among its counterparts in the international regulatory community. (Refer to Appendix 2 for details of the early stages of the crisis response.)

As the EAC's review has uncovered areas which require further improvement, it notes that many of these areas involve other organizations and that the CNSC cannot solve the problems by itself. This is further described in various findings below, and is consistent with the findings of the Integrated Regulatory Review Service (IRRS) Report which stated that "CNSC has performed a

systematic and thorough review of the implications and the lessons learned from the [Fukushima crisis]….".[4]

Finding G-2 - The EAC is satisfied that the process for considering the FTF Report has provided appropriate opportunities for members of the public to view the FTF findings and submit input to the process. As well, the EAC considers that the CNSC has made adequate provisions in its process for receiving and incorporating such input into the final actions to be recommended to the Commission.

The EAC has reviewed the process followed by the FTF and is of the view that it has been adaptable and accommodating to ensure that adequate inputs have been sought out and incorporated. The information collection process began with publicly-available letters to licensees and considered by the FTF team whose creation and terms of reference were made public. Three rounds of public consultation have been provided in order to ensure that all stakeholders have had the opportunity to review and comment on the recommendations and action plan as they have evolved. Given that the original process envisaged only one round of consultation, the EAC concludes that the CNSC has conducted a flexible and appropriate process.

Finding G-3 – In general, the EAC considers that the FTF was thorough and balanced in fulfilling its mandate relating to NPP safety.

From the perspective of the EAC the findings of the FTF Report appear to be thorough with the disclosure of both positive and negative findings. Furthermore, the Staff Action Plan on the FTF recommendations also appears to have linked the findings and recommendations to clearly specified actions with reasonable timelines for implementation.

Notwithstanding, the EAC believes the FTF should have made a more thorough examination of a few key issues which are further clarified in findings 2-3, 2-4, 2-5 and 3-3 below .

Finding G-4 – The EAC found that while the peer review process is valuable, the IRRS review is not mandatory, suffers from a lack of information sharing between regulators and a lack of enforcement mechanisms through the IAEA.

The international regulatory community, under the IAEA, benefits from the Integrated Regulatory Review Service (IRRS) whereby a country's regulator is evaluated by its counterparts according to the IAEA framework. Through this process, regulators are encouraged to improve their adherence to internationally-accepted practices and thereby to raise the bar for nuclear safety internationally. The results of each IRRS review may be made public at the discretion of the regulator being reviewed.

Participation in IRRS exercises is purely voluntary, however, and individual national regulators are not required to conduct them. Consequently, the potential benefits of the IRRS services remain

[4] Integrated Regulatory Review Service (IRRS) Follow-up Mission Report to the Government of Canada, Ottawa, Canada, 28 November-9 December 2011, page 65. See http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/March-2-2012-IRRS-Follow-up-Mission-to-Canada-Report_e.pdf .

unrealized when certain nations do not conduct these reviews. In order to best ensure consistent adherence to the best international standards of nuclear regulatory safety, the EAC believes it would be beneficial for the IAEA to enforce participation in the IRRS process among all member states. As described further in Finding 4-1, the CNSC was active in promoting reform in this area.

RECOMMENDATION 1 – The EAC recommends that the CNSC continue to work with regulators of other member states of the IAEA to ensure that the IRRS process is mandatory, transparent and that the findings and recommendations are enforced.

The peer review mechanism is used by regulators and industry alike. The peer review process appears to be even more prevalent among the international operator community under the auspices of the World Association of Nuclear Operators (WANO). The EAC understands that the WANO reviews are very detailed and that there is an element of peer competition to achieve high results. However, the results of these reviews are kept confidential and not shared with the regulatory community.

The EAC agrees that the peer review process is an effective approach for promoting safety across the global nuclear industry. However, the EAC notes that, in the same way that WANO members are aware of exemplary operating practices among their peers, it follows that they are likely also aware of issues in that same community which could compromise safety. Because the results are not shared with the regulators, this removes an opportunity for action to be taken to prevent the threat of a nuclear accident.

RECOMMENDATION 2 – The EAC recommends that the CNSC work with its fellow regulators in convincing WANO members to share the results of their peer review process to promote nuclear safety in all nations with nuclear power plants.

Further Findings:

EAC Mandate Element 1 - review the CNSC's immediate response to the Japan nuclear events, including activation of its emergency operations centre and connections with the rest of government and international organizations-

Finding 1-1 – The CNSC acted promptly in deploying its emergency operations centre (EOC).

The EAC finds that the CNSC took the appropriate action in determining that the developing situation at the Dai-ichi and potentially other Japanese NPPs in the immediate aftermath of the earthquake and tsunami warranted the deployment of its EOC during the morning of March 11, 2011. This facility operated on a 24/7 basis for a period of some three weeks until Japanese authorities demonstrated they had begun to control the situation. Because of its early action, the CNSC was in a position to lend support to other government and international organizations when these requests materialized.

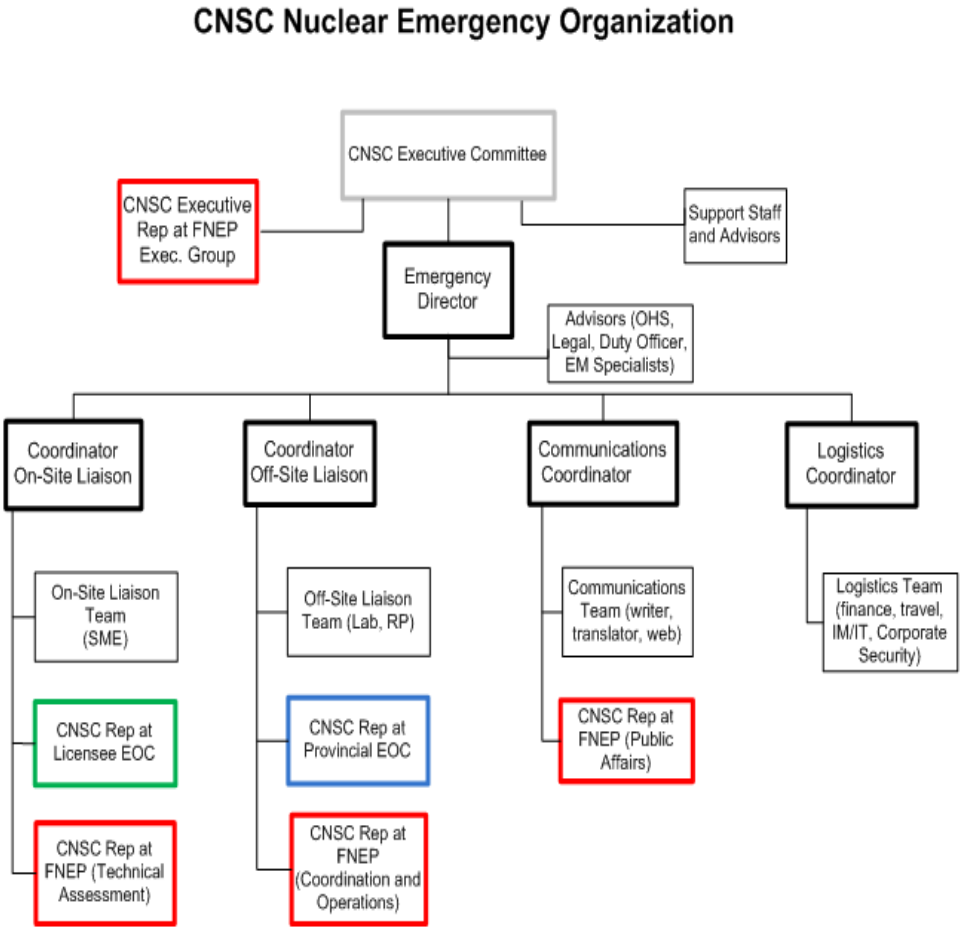
Finding 1-2 – The CNSC acted early to initiate and maintain contact with its government counterparts in the first stages of the crisis.

The EAC finds that the CNSC established contact with a wide range of government organizations involved in managing elements of the crisis, including Health Canada, DFAIT, Environment Canada, Public Safety Canada (PSC), the Canadian Forces and the Canada Border Services Agency. This contact began mid-morning on March 11, 2011, the initial day of the crisis, when PSC and CF contacted the CNSC. CNSC participated in a daily DFAIT-led multi-party conference call which included Canada's Embassy in Tokyo. In addition to its own deployed EOC, on Tuesday March 15, 2011 the CNSC began providing around-the-clock staff to PSC's Government Operations Centre (GOC) - one of the few government organizations outside of PSC to do so.

The CNSC executes its internal emergency management through the Nuclear Emergency Organization (NEO), shown below in Figure 1[5]. This diagram illustrates the CNSC's interaction with other agencies involved in responding to nuclear emergencies, with many of the "boxes" representing an individual located at the emergency operations centre of another responder organization. Two such positions represent the CNSC's coordination with the Health Canada-led Federal Nuclear Emergency Plan (FNEP) which is the guiding process for a specific nuclear incident. As noted below in Finding 1-3, however, the FNEP was not activated during the Fukushima crisis but these two roles were nonetheless activated and coordinated with PSC's GOC instead.

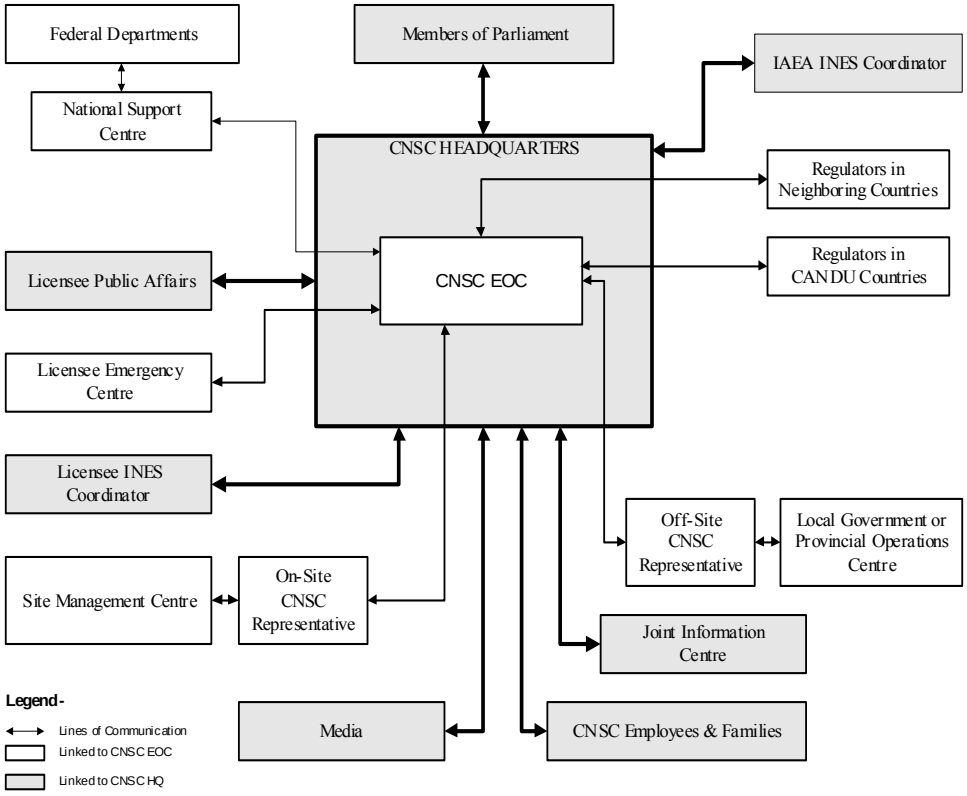
[5] From presentation by Director, Emergency Management Programs Division, CNSC, Sept. 1, 2011, page 12.

Figure 1 Nuclear Emergency Organization (NEO) Structure



The CNSC's emergency operations structure also provides for a larger scope of interaction which includes Canadian organizations outside the immediate group of first responders as well as non-Canadian bodies who would need to be informed or consulted. Figure 2 shows this structure[6]. Organizational details on the role of CNSC in the FNEP process are found in Appendix 4.

Figure 2 Inter-Organizational Links



[6] CNSC Emergency Response Plan, CAN2-1, December 2010 (Revision 6), Figure 6.2.

Finding 1-3 There is a lack of coordination of emergency planning roles in Canada with regard to nuclear events.

DFAIT immediately implemented its emergency plans as the Japanese earthquake and tsunami had caused widespread loss of lives and infrastructure in Japan, thereby raising concerns for the safety of Canadians living in Japan and causing officials to consider how Canada could provide assistance to the Japanese people. Shortly following the initial event, the CNSC learned about the nuclear emergency developing in Fukushima and activated its emergency operations centre. In the following days, the nuclear accident would come to overshadow the earthquake and tsunami impacts. This caused the Canadian government to consider the need to evacuate Canadians from Japan who might face radiation exposure and to monitor the spread of radiation to Canada itself.

These concerns spread the emergency response across several federal government departments and exposed the lack of clearly-defined responsibilities and leadership as it pertains to a nuclear emergency in Canada or a global event such as the Fukushima crisis. Examples include responsibility for public release of radiation level measurements in British Columbia and the confusion over the lead role being either with Public Safety Canada, the department with the authority to manage the Federal Emergency Response Plan (FERP) or with Health Canada, the responsible organization for the Federal Nuclear Emergency Plan (FNEP). In reviewing the implications for a domestic nuclear emergency, the potential for confusion over roles and responsibilities is even greater- involving federal, provincial and municipal governments, with each containing its own responsible organizations.

The CNSC is not alone in identifying a need for greater coordination- for example, Health Canada released a 'lessons-learned' assessment which cites many of the same issues. While the CNSC is generally of the view that the FNEP should have been activated[7], Health Canada decided not to. For a brief period Health Canada's website indicated that the FNEP had been implemented, and was subsequently corrected. [8] This concern over a lack of coordination in federal plans is also shared by the nuclear power plant operators with whom the EAC met.

RECOMMENDATION 3 - The EAC recommends that the CNSC work with other government departments to ensure better coordination and redefinition of departmental roles and responsibilities should a nuclear accident occur in Canada, the United States or overseas.

Finding 1-4 – Broadly-based emergency planning exercises have been carried out infrequently.

Related to, but distinct from, the roles and responsibilities during an emergency is the ongoing practice of procedures laid out in emergency plans. Exercises are not only necessary for the respondent organizations to simulate the actions during a real emergency, but also for identifying potential gaps in planning and conflicting roles- the very issue identified above.

[7] The FNEP (Fourth Edition, May 2002) applies to nuclear emergencies (s. 1.3) and includes those incidents occurring in other countries with a potential to affect Canadians living in Canada or abroad (s. 1.1). While there are permitted exemptions from obligatory activation of FNEP (s. 1.5), the Fukushima crisis would not appear to apply, and thus it could be argued that FNEP needed to be activated, even if only at the lowest level- Monitoring (s. 4.2.1).
[8] Health Canada, Lessons Learned Review, Declaration of Nuclear Emergency - Japan, released circa December 12, 2011, p. 9.

CNSC staff reported that the last broadly-based federal exercise took place in the 1997-1999 timeframe, predating the creation of Public Safety Canada and its central role in emergency planning/response. The EAC also heard that the last exercise at Darlington which involved multiple groups was the CANATEX-3 simulation in 1998-1999. The EAC has learned that a major exercise took place in late March 2012 at Point Lepreau in New Brunswick and that Bruce Power is planning a similar event at its NPP in Ontario in October 2012. While there have been a number of exercises of limited scope simulating nuclear emergencies[9], the EAC's fact-finding process revealed that there appears to be general agreement that these are not sufficient for testing the full range of response actions called for in the emergency plans.

The EAC recognizes that such exercises are costly for the parties involved and require a significant effort to organize if they are to be effective. Because emergency management is within the authority of government organizations at the municipal, provincial and national levels, the CNSC has a limited ability to ensure emergency management beyond the "fence" through the imposition of licence conditions on licensees.

To ensure the safety of Canada's citizens, the EAC considers that it would be beneficial for NPP operators to conduct more frequent exercises with the cooperation of the many partner organizations involved. The EAC considers that the CNSC is well-positioned to influence the parties and increase the regularity of these activities.

RECOMMENDATION 4 - The EAC recommends that the CNSC meet with its partner organizations and licensees to establish the extent and frequency of multi-level emergency exercises.

Finding 1-5 – The CNSC acted early to initiate and maintain contact with international organizations in the first stages of the crisis.

The EAC finds that the CNSC established contact with a wide range of foreign-based bodies. By the early afternoon of March 11th, the CNSC had contacted other regulators to begin sharing information and attempt to analyze and assess the situation and potential impacts. Daily conference calls were held with the U.S., U.K. and French nuclear regulatory agencies as the crisis progressed.

Further, the CNSC engaged with DFAIT, and the Ambassador and staff at Canada's mission in Vienna to maintain daily contact with the IAEA and support international actions. As part of this involvement, the CNSC sent a staff technical expert to the IAEA in Vienna to work on the assessment team during the first weeks of the crisis.

[9] See, for example, Health Canada's website page at http://www.hc-sc.gc.ca/hc-ps/ed-ud/prepar/nuclea/exer-eng.php

EAC Mandate Element 2 - review the CNSC's interactions with the Canadian nuclear sector and its regulated industries-

Finding 2-1 – In general, the EAC finds that the CNSC interacted promptly and pro-actively with the nuclear industry beginning early in the crisis and throughout the longer term.

The CNSC initiated early contact with its licensees and followed a structured process to assess the safety of Canadian installations after the Fukushima crisis. The CNSC issued letters under section 12(2) of the NSCA to licensees asking for detailed information and plans to address issues raised by the Fukushima crisis.[10] These letters were issued in two groups: the first group of letters was issued March 17, 2011 to the operators of major facilities such as NPPs and the Chalk River site which includes the National Research Universal (NRU) reactor. The second set of letters was issued March 22, 2011 to operators of other significant nuclear facilities, such as fuel processing plants and uranium mines. Over the balance of 2011 and well into the first quarter of 2012, the CNSC followed up with the results of the FTF's findings and developed the CNSC's Action Plan in consultation with industry and other stakeholders for approval by the CNSC Commission tribunal.

Finding 2-2 – The EAC found that the CNSC had a clear process to address the responses from the NPPs.

The CNSC's process for utilizing the industry's responses to the requests for information was inclusive and provided the opportunity for licensees as well as other stakeholders including the public to participate. The EAC learned during its fact-finding process that the CNSC and its NPP licensees held frequent discussions in the early stages of the crisis at several levels within their organizations, and that communications were free-flowing and cooperative.

Finding 2-3 –The EAC finds that with regard to licensed facilities which are not nuclear power plants, the CNSC's proposed actions for assessing the information gathered and proposing any new measures have not been made clear to the public.

On initial review, the EAC found it challenging to discern what the CNSC plan was for dealing with the responses from its licensees for major facilities that are not NPPs, following the letter requests sent on March 22, 2011 in accordance with section 12(2) of the NSCA.

However, the EAC has since learned that the CNSC has also considered the information learned from this second group and has developed a plan whereby the CNSC intends to apply newly-adopted protection measures as licence conditions during the licence-renewal process for each licensee. In the FTF Report, it states simply that "CNSC staff will use the results of the Task Force investigations of NPPs to drive continuous improvement at other facilities."[11]

However, it does not appear to the EAC that the CNSC has otherwise publicized this intended process for dealing with information obtained from the second set of letters issued.

[10] See Appendix 3 for examples of these letters.
[11] CNSC Fukushima Task Force Report, document No. INFO-0824, October 2011, section 3.2, page 10.

RECOMMENDATION 5 – The EAC recommends that the CNSC clarify its position on the 12(2) orders with respect to the non-NPPs.

Finding 2-4 - It is not evident that the CNSC has considered the area of Human and Organizational Performance in its FTF recommendations.

It is not apparent that Human and Organizational Performance, which includes human performance and human factors[12], has been explicitly examined by the CNSC in its response to the Fukushima crisis.

The human element is an important component of NPP safety, both in terms of preventing accidents and in management of an emergency. Notably, on average 75%[13] of industrial events have human and organizational causes versus technical ones, and as such should be considered as key elements when reviewing the recommendations in the FTF Report. The Chernobyl nuclear accident in 1986 is widely considered to have resulted from the lack of a "safety culture" - an important element of Human and Organizational Performance practice as it relates to the nuclear industry.

The EAC learned that the CNSC has an extensive level of specialized knowledge in this field and a detailed process for regulating Human and Organizational Performance in its licensing of NPPs and their operators.

The FTF Report does not explicitly address Human and Organizational Performance and suggests that the FTF may not have examined this potential safety area- whether intentionally or not. Therefore, it is unclear what, if any, regulatory modifications need to be implemented for NPP operators to guard against an accident scenario from this source. The EAC believes this would be a valuable supplement to the FTF Report, noting that the French and U.K. regulators have specifically addressed Human and Organizational Performance in their lessons-learned reports. The French have gone further and have launched an investigation into the role of contractors in their study of human factors.

There has yet to be a full understanding of what the Japanese authorities have learned about human actions at the Dai-ichi plant. Facility and equipment damage from the earthquake and resulting tsunami appear to have been the focus of study on the part of most regulators seeking to learn from the Fukushima crisis. It is not yet clear, however, to what extent the crisis could have been mitigated had human actions been different.

RECOMMENDATION 6 – The EAC recommends that the CNSC examine the area of Human and Organizational Performance to achieve a more complete understanding of lessons learned from the Fukushima crisis.

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[12] From presentation by Director-General, Directorate of Safety Management, CNSC, December 13, 2011, slide 16. CNSC definitions - "Human performance: The outcomes of human behaviours, functions and actions in a specified environment, reflecting the ability of workers and management to meet the system's defined performance under the conditions in which the system will be employed. Human factors: Factors that influence human performance as it relates to the safety of a nuclear facility or activity over all phases, including design, operation, maintenance and decommissioning. Factors may include the characteristics of the person, task, equipment, organization, environment or training."

[13] ibid, slide 17.

Finding 2-5 – The EAC found that the CNSC's plans for dealing with the FTF's concerns about the design capability of NPPs to withstand tornado hazards remain unclear.

The FTF identified in its Report that "the assessment for the design-basis and beyond-design-basis tornado hazards was found to be weak at some NPPs".[14]

During its fact-finding process, the EAC noted that a Category F3 tornado landed on the shore of Lake Huron in the summer of 2011 and devastated the town of Goderich, Ontario. Given that Goderich is only approximately 60 kilometres from a nuclear power plant, the EAC was concerned that strong tornadoes are realistic hazards that could cause damage to the infrastructure at any of Canada's NPPs.

In light of the fact that the FTF identified issues with the design capability of NPPs to withstand this specific hazard, the EAC is concerned that there are no further details on how the CNSC proposes to address this deficiency in the FTF Report and in the Action Plan.

The EAC is therefore unclear as to how CNSC plans to address tornado hazards in the future.

RECOMMENDATION 7 – The EAC recommends that the CNSC clarify its plans to address tornado hazards.

EAC Mandate Element 3 - review the CNSC's communications with all affected stakeholders, including governments, international organizations and the public-

Finding 3-1 –In general, the EAC finds that the CNSC acted promptly to establish communication channels and was open to share and disseminate information, both domestically and abroad.

The CNSC took early action to develop communications channels with other government parties, regulators in foreign countries and international organizations such as the IAEA. Equally as important, the CNSC was active by mid-morning on March 11, 2011, the first day of the crisis, preparing material for the media and the public. The CNSC made factual and science-based information available starting on the afternoon of March 11 on its website and through other means such as the media. (Refer to Appendix 2 for more details.)

The CNSC was also the first nuclear regulator to post its plume-modelling data for the public to access, making available the forecasting information relating to the airborne transport of radioactive particles and its anticipated arrival time in Canadian territory.

The CNSC is connected with the Science Media Centre, an organization which is accessed by the media when it is in need of technical background on a news event, and CNSC personnel were contacted by the media through this channel. As noted below, however, the EAC considers that other aspects of the communications function need to be improved by the CNSC and other parties.

[14] CNSC Fukushima Task Force Report, document No. INFO-0824, October 2011, section 6.1.3, page 23.

Finding 3-2 - The EAC finds that, during the nuclear incident, there was no evidence of a coordinated government-wide communication strategy and that the CNSC attempted to fill the void and provide information, but that this role was primarily limited to web-based communications.

The public looks to several sources for information during a crisis. Factual and science-based information, explained in understandable terms, is a crucial element in meeting this need. Government, industry and academia are some of the few reliable sources for this information.

The FNEP was not activated during the Fukushima event and there was no official federal government "voice" to provide updates to the public. The CNSC took early action to establish lines of communication with other organizations, including government and international bodies, and to make available regular status updates on its website for the media and public. The CNSC was seen by many government agencies as the go-to agency for nuclear reactor-related information.

The CNSC, as a government organization, has a role to play because of its specific technical expertise. While the EAC recognizes that the CNSC's mandate is to regulate the nuclear industry rather than promote it, in the event of a nuclear emergency, the CNSC would of course have firsthand knowledge which would be critical to the communications role.

However, in the EAC's view, it is the federal government who should take the lead in the communications role during a nuclear emergency, able to provide regular and consolidated updates for the public and media.

Finding 3-3 – The EAC finds that during the Fukushima incident the CNSC had a limited public communication/ education strategy that was mostly focused on web-based activities.

One element of the CNSC's mandate is to disseminate objective scientific, technical and regulatory information to the public regarding the effects of the use of nuclear materials on the environment and on the health and safety of persons. The EAC considers that the information that Canadians are seeking during a crisis does not need to be kept in waiting for an emergency. It would be advantageous for Canadians to be educated on these issues beforehand so that they are better equipped to know what they should be concerned about and how to react in various situations.

Notwithstanding the prompt communications actions and daily web updates by the CNSC in the early stages of the Fukushima crisis, the EAC notes that in the time that has passed since the crisis subsided there has been little visible communications/ education progress to prepare for a future incident. During the crisis, it was observed that Canadians were looking for readily-available answers regarding a variety of issues such as the impact of radiation on humans and on food, what measures were in place if radiation was to reach Canada (e.g. potassium-iodide, or KI, pills), and how Canadian nuclear reactors protect against a similar accident.

RECOMMENDATION 8 – The EAC recommends that the CNSC develop a comprehensive communication and education strategy that includes the use of various tools including social media and expands partnerships and relationships with various science media organizations that have the ability to inform the public on nuclear safety.

EAC Mandate Element 4 - assess the implications from the international response on the CNSC responses-

Finding 4-1 – The EAC finds that the CNSC played a leadership role in helping to shape international actions to address the Fukushima crisis.

The EAC was informed that the CNSC was a key player behind the Canadian delegation to the IAEA and of its vocal support for a strong Action Plan. This included efforts involving the May 27/28, 2011 G8 Leaders Summit in Deauville, France, the International Atomic Energy Agency (IAEA) Board of Governors Meeting and IAEA General Conference, the International Nuclear Regulators Association (INRA) and United Nations General Assembly in New York City.

In the end, the IAEA announced the creation of an Action Plan and an implementation task force that would introduce measures to strengthen transparency and peer review participation.

The EAC is further aware that the CNSC is active in the development of Canada's response to the Action Plan, and involved in Canada's efforts to influence changes internationally, including the preparation of a position paper to be submitted to the IAEA and INRA. Also, the CNSC will be hosting the next meeting of INRA in Ottawa in April 2012.

Finding 4-2 - There is a lack of coordination of emergency planning exercises with other countries, particularly the United States.

As noted earlier, emergency planning and management are a key element in dealing with a nuclear crisis, and the EAC believes that coordination and practice are essential to being prepared. The Fukushima crisis illustrated how a foreign nuclear emergency can quickly become a local one. This is certainly true for Canada and the United States, where an incident in a nuclear plant in one country could quickly impact communities in the other country.

The Joint Regulatory Emergency Response Plan (JRERP) provides for emergency cooperation between Canada and the United States during a nuclear incident. However, the JRERP has not been updated since 1996. This plan is led by Public Safety Canada (PSC) and by the Federal Emergency Management Agency (FEMA) in the United States, while the CNSC and the U.S. Nuclear Regulatory Commission (U.S. NRC) play supporting roles within the JRERP.

The FTF Report has called for a review of all emergency management plans. In order for lessons learned from the international response to Fukushima to be factored into the JRERP, it will be critical for the CNSC and the U.S. NRC to be actively involved in updating the plan.

The EAC learned during its fact-finding process that there are infrequent joint emergency drills between emergency planning organizations on both sides of the Canada-U.S. border[15]. Similarly to the domestic situation, it is important that these exercises be regularly scheduled.

RECOMMENDATION 9 – The EAC recommends that, as the Canadian nuclear safety regulator, the CNSC should play an active role in ensuring that emergency planning exercises with the United States are conducted regularly.

[15] Vice-President, Technical Services Branch, CNSC, January 26, 2012.

4. Conclusion

In summary, the EAC concludes that the process followed by the CNSC in responding to the Fukushima crisis was appropriate. The CNSC immediately activated its emergency operations centre and established contacts with a wide array of stakeholders, both domestically and internationally. Furthermore, the CNSC made it a priority to obtain and make publicly available science-based information regarding the crisis and to update this information regularly.

The CNSC, within one week, set in motion a process for examining the situation regarding Canadian facilities and whether any measures were required to protect against issues which were identified from lessons being learned from Japan. This process included a flexible, open and transparent process with three opportunities for public input in the development of proposals to amend the regulatory framework in Canada.

In carrying out its mandate, the EAC identified some instances where those (like the EAC) who are not nuclear experts may not understand how the CNSC intends to address potential areas of concern. In other cases, it was considered that the CNSC and/or other parties needed to take further action to improve the state of readiness to help avoid and/or to respond to an emergency in Canada. While none of these findings and recommendations signal alarms for urgent action, the EAC believes that they require further attention as improvements that would help to minimize the potential for accidents and to help in the management of emergency situations.

Appendix 1 - List of Acronyms

AECL	Atomic Energy of Canada Limited
CF	Canadian Forces
CFIA	Canadian Food Inspection Agency
CMD	Commission Member Document
CNSC	Canadian Nuclear Safety Commission
DFAIT	Foreign Affairs and International Trade Canada
DND	Department of National Defence
EAC	External Advisory Committee reviewing the CNSC response to Fukushima
EC	Environment Canada
EMO	Emergency Management Ontario
EOC	Emergency Operations Centre
FEMA	Federal Emergency Management Agency (U.S. agency)
FERP	Federal Emergency Response Plan
FNEP	Federal Nuclear Emergency Plan
FTF	Fukushima Task Force- internal CNSC team reviewing measures needed in response to Fukushima
GOC	Government Operations Centre
HC	Health Canada
IAEA	International Atomic Energy Agency
INES	International Nuclear Event Scale
INRA	International Nuclear Regulators Association
IRRS	Integrated Regulatory Review Service
JRERP	Joint Regulatory Emergency Response Plan
NEO	Nuclear Emergency Organization (within the CNSC)
NPP	Nuclear Power Plant
NRCan	Natural Resources Canada
NRU	National Research Universal (isotope-producing reactor at Chalk River, Ontario)
NSCA	*Nuclear Safety and Control Act*
OPG	Ontario Power Generation
PSC	Public Safety Canada
TC	Transport Canada
TEPCO	Tokyo Electrical Power Company
U.S. NRC	Nuclear Regulatory Commission (United States)
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association

Appendix 2 - Chronology of CNSC Actions

A2.1 - March 11, 2011 - The First 24 Hours

From the Emergency Management Programs Division (EMPD) log (*see note below)

11-Mar, 09:01	CNSC Daily Clippings include issues at Japan nuclear plant
11-Mar, 09:36	EMPD receives email from CF [Canadian Forces] contacts re: planning for Japan
11-Mar, 10:16	EMPD receives email from PS [Public Safety Canada] requesting nuclear SME [subject matter expert] in support of DFAIT
	EMPD staff confer regarding need to coordinate CNSC activities and communications
11-Mar, 11:18	Dir/EMPD recommends to DG/DSS to active NEO in monitoring mode
11-Mar, 11:26	DG/DSS proposes to EVP/ROB, VP/TSB, VP/RAB to activate NEO
11-Mar, 11:51	VP/TSB instructs to active NEO
11-Mar, 11:52	EMPD staff begin EOC start-up and adapts NEO structure
11-Mar, 12:08	DG/DSS and VP/RAB approve first roster of adapted NEO structure
	Emergency Director + Technical, Communications and External Liaison Leads + EMPD support
11-Mar, 12:30	First meeting of NEO in EOC at headquarters 3rd floor – NEO at monitoring mode
	External contacts established (GOC, HC, DFAIT, USNRC, IAEA)
	Information gathering, analysis and comms activities begin
11-Mar, 23:09	ED issues reports and stands down for evening, CNSC Duty Officer continues monitoring
	Telecon scheduled for 12-Mar, 10:00
12-Mar, 00:50	GOC issues email notice of Japan nuclear emergency declaration to Fed/Prov contacts
12-Mar, 05:09	GOC calls CNSC Duty Officer to inform of explosion, Duty Officer calls Dir/EMPD
	Dir/EMPD and ED telecon, NEO recalled by Duty Officer
12-Mar, 07:00	NEO reconvenes in EOC – NEO at partial activation mode
	24/7 operations
	Tech, Comms and Liaison Leads add team members
	Japan Executive Team and Logistics Team added to NEO structure

*Note: EVP= Executive Vice-President, VP= Vice-President, DG= Director-General, Dir= Director, ED= Emergency Director, NEO= Nuclear Emergency Organization. Other acronyms refer to CNSC organizational units.

From the Strategic Communications Division (SCD) records

11-Mar, 04:04	SCD received e-mail from Wgpcnews[16] monitoring contact
11-Mar, 06:00	SCD monitoring media reports
11-Mar, 07:20	Internal CNSC request to monitor and share information (DG/SPD e-mail)
11-Mar, 08:00	SCD initiated media lines, internal and external messaging.
11-Mar, 09:00	DG/SCD attended a meeting with VP/TSB and DG/DSS. Based on IAEA information and media reports, recommended activating EOC as soon as possible.
11-Mar, 09:01	CNSC Daily Clippings include issues at Japan nuclear plant
11-Mar, 10:00	Management Committee meeting (scheduled earlier)- discussion of Japan developments and confirmation that EOC would be activated even though not a Canadian incident.
11-Mar, 10:34	First all-staff e-mail sent out.
11-Mar, 15:00	Began posting Japanese crisis information on CNSC website.

[16] The "WGPC" is the Working Group on Public Communication of Nuclear Regulatory Organisations, under the Nuclear Energy Agency/ Organisation for Economic Cooperation and Development (NEA/OECD).

A2.2 - The First Six Months

March 17, 2011

- The CNSC issues order under 12(2) Directive to all Canadian Class I nuclear facilities licensees to review initial lessons learned and re-examine safety cases

March 22, 2011

- The CNSC issues order covering the rest of the major facilities not covered by the March 17th letters: Class I facilities and uranium mines and mills

March 30, 2011

- CNSC staff releases update No. 1 to Commission members
- CNSC task force (FTF) is convened to evaluate operational, technical and regulatory implications
- Short-term actions are taken to confirm readiness of installed equipment
- Long-term measures are taken to update safety cases of nuclear power plants (NPPs)

April 20, 2011

- The CNSC issues a news release to announce the creation of the CNSC task force to evaluate lessons learned from Japan

May 27, 2011

- Licensee progress updates No. 2 on CNSC 12(2) directive
  - On site inspections completed by CNSC staff at all NPP sites to assess readiness of accident-mitigating systems
  - Progress update on actions taken by CNSC site staff and licensees

June 08, 2011

- CNSC staff issue progress update No. 2 to Commission Members announcing all short-term actions completed to confirm readiness of installed components and equipment

July 28, 2011

- NPP licensees' submissions of safety case re-assessments for long-term measures to update safety cases of NPPs, including assessment of external hazards and beyond-design-basis accidents

August 5, 2011

- External Advisory Committee convened for an independent review of CNSC actions in response to Fukushima event

A2.3 Opportunities for Public Input on CNSC Action Plan

October 28 – December 1, 2011

- *Task Force Report* and *Management Response* posted for public comment

December 21, 2011 – February 3, 2012

- Posting of draft *CNSC Staff Action Plan* and disposition of comments from public reviews

March 2 – April 2, 2012

- Public consultation on revised *CNSC Staff Action Plan* and disposition of comments received from public and stakeholder review

May 3, 2012

- Commission public meeting to endorse *CNSC Staff Action Plan*

Appendix 3 - Examples of Section 12(2) Letters Sent to Licensees

Directorate of Power Reactor Regulation

Word Ref. E-Docs # 3694380
PDF Ref. E-Docs # 3694381
File # 4.01.02

March 17, 2011

Subject: Request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations: Lessons Learned from Japanese Earthquake*

Dear:

Further to the serious situation that is occurring at the Fukushima site in Japan, and pursuant to my authority as a person authorized by the Commission for the purposes of subsection 12(2) of the *General Nuclear Safety and Control Regulations*, I request that major nuclear facilities in Canada, namely all nuclear power plants and AECL's Chalk River Laboratories, complete the following actions by April 29, 2011:

- review initial lessons learned from the earthquake in Japan and re-examine the safety cases of nuclear power plants, in particular the underlying defence-in-depth concept, with focus on:
    - external hazards such as seismic, flooding, fire and extreme weather events;
    - measures for prevention and mitigation of severe accidents;
    - emergency preparedness; and
- report on implementation plans for short-term and long-term measures to address any significant gaps.

Please note that, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations*, you are required to file a report by April 1, 2011, with the Commission that contains the following information:

> *a) confirmation that the request will or will not be carried out or will be carried out in part;*
> *b) any action that you have taken to carry out the request or any part of it;*
> *c) any reasons why the request or any part of it will not be carried out;*
> *d) any proposed alternative means to achieve the objectives of the request; and*
> *e) any proposed alternative period within which you propose to carry out the request.*

If you have any questions related to this matter, please do not hesitate to contact me by telephone at (613) 947-8899 or by e-mail at Ramzi.Jammal@cnsc-ccsn.gc.ca.

Yours truly,

Ramzi Jammal
Executive Vice-President and Chief Regulatory Operations Officer
Regulatory Operations Branch

c.c.: M. Binder, T. Jamieson, J. Cameron, G. Rzentkowski, J. Lavoie, G. Frappier

Directorate of Nuclear Substance Regulation

Telephone: (613) 993-7699
Email: andre.regimbald@cnsc-ccsn.gc.ca

File #2.38

Word Ref. E-Docs # 3695381
PDF Ref. E-Docs # 3695411

March 21, 2011

Subject: Request pursuant to Subsection 12(2) of the *General Nuclear Safety and Control Regulations: Lessons Learned from Japanese Earthquake*

Dear:

Further to the serious situation that is occurring at the Fukushima site in Japan, and pursuant to my authority as a person authorized by the Commission for the purposes of subsection 12(2) of the *General Nuclear Safety and Control Regulations,* I request that _____ complete the following actions by April 29, 2011:

- Review initial lessons learned from the earthquake in Japan and re-examine the safety case for _____, in particular the underlying defense-in-depth concept, with focus on:
    - external hazards such as seismic, flooding, fire and extreme weather events;
    - measures for prevention and mitigation of severe accidents;
    - emergency preparedness; and
- Report on implementation plans for short-term and long-term measures to address any significant gaps.

Please note that, in accordance with subsection 12(2) of the *General Nuclear Safety and Control Regulations,* you are required to file a report by April 1, 2011, with the Commission that contains the following information:

a) confirmation that the request will or will not be carried out or will be carried out in part;

a) *confirmation that the request will or will not be carried out or will be carried out in part;*
b) *any action that you have taken to carry out the request or any part of it;*
c) *any reasons why the request or any part of it will not be carried out;*
d) *any proposed alternative means to achieve the objectives of the request; and*
e) *any proposed alternative period within which you propose to carry out the request.*

If you have any questions related to this matter, please do not hesitate to contact me by telephone at (613) 993-7699 or by e-mail at Andre.Regimbald@cnsc-ccsn.gc.ca

Yours truly,

André Régimbald
Director General
Directorate of Nuclear Substance Regulation

c.c.: M. Binder, J. Cameron, J. Lavoie, R. Jammal
K. Murthy (CNSC)
J.Sandeman (CNSC)

Appendix 4 - The CNSC's Role Within the Federal Nuclear Emergency Plan (FNEP)[A]

[A] Health Canada, Federal Nuclear Emergency Plan, Part 1: Master Plan, Fourth Edition, May 2002, Appendix 5.

APPENDIX 5: NUCLEAR EMERGENCY FUNCTIONS

Because of the inherent technical nature and complexity of nuclear emergencies, the FNEP introduces generic nuclear emergency functions. Nuclear emergency functions are subject areas which group actions specifically related to a nuclear emergency that may be taken in the response phase of the emergency. In accordance with the model in the *Government Emergency Book* [11], responsibilities are assigned to primary and supporting departments or agencies for each nuclear emergency function. Responsibilities listed under those functions are intended to complement, not replace, the all-hazards emergency functions and emergency support functions (see Appendix 4). As roles and responsibilities depend upon the specific mandate of departments and agencies, and the nature of the emergency, functions and assigned departmental responsibilities include, but are not necessarily limited to those identified in this Appendix.

ID #	DESCRIPTION
1	Provide staff, resources and support for activation and operation of the National Support Structure in support of the FNEP and its Provincial Annexes.
2	Participate in maintaining a good flow of information and a coordinated response.
3	Establish and maintain liaison with federal institutions, non-governmental organizations, foreign governments, international organizations, the private sector (e.g., industry, universities), etc.
4	Gather technical information on the accident.
5	Run plume dispersion and dose projection models.
6	Conduct and coordinate departmental activities for monitoring and sampling.
7	Perform laboratory analysis of food, soil, air filters, dosimeters, etc.
8	Provide a capability to the Technical Advisory Group for the evaluation of the radiological hazards and to the Coordination and Operations Group for the evaluation of the national impacts of interventions.
9	Provide a capability to Technical Advisory Group for the formulation of recommendations for protective measures.
10	Implement protective measures under federal jurisdiction or as requested by a province.
11	Provide medical radiation expertise and capabilities for the treatment of contaminated and/or overexposed casualties.
12	Provide technical support for the shipment of radioactive material and the disposal of contaminated soil, equipment, etc.
13	Provide radiation protection advice, assistance and equipment for federal emergency workers.
14	Facilitate the deployment of personnel and equipment for operations in affected areas.
15	Provide emergency telecommunications equipment and services for operations in the affected areas.
16	Assist in the management of requests/offers for assistance.
17	Assist the Public Affairs Group in disseminating and customizing the information products on protective measures to target and specialized audiences.
18	Provide support, equipment, technical experts and spokespersons for operation of a media centre.
19	Provide available public information packages.
20	Propose emergency classification level (International Nuclear Event Scale).
21	Provide resources and infrastructure for operation of public inquiries systems.
22	Provide resources and infrastructure for monitoring of national and regional media.
23	Assist in termination of the FNEP.

Abbreviations Used in Nuclear Emergency Functions

AAFC	Agriculture and Agri-food Canada
AECL	Atomic Energy of Canada Limited
CCRA	Canada Customs and Revenue Agency
CFIA	Canadian Food Inspection Agency
CH	Canadian Heritage
CIC	Citizenship and Immigration Canada
CNSC	Canadian Nuclear Safety Commission
COG	Coordination and Operations Group
DFAIT	Department of Foreign Affairs and International Trade
DND	National Defence
EC	Environment Canada
EOC	Emergency Operations Centre
DFO	Fisheries and Oceans Canada
FNEP	Federal Nuclear Emergency Plan
FRO	Federal Regional Organization
HC	Health Canada
HRDC	Human Resources Development Canada
IAEA	International Atomic Energy Agency
IC	Industry Canada
INAC	Indian and Northern Affairs Canada
INES	International Nuclear Event Scale
LFD	Lead Federal Department
LLRWMO	Low Level Radioactive Waste Management Office
NGO	Non-Governmental Organization
NPV	Nuclear Powered Vessel
NRCan	Natural Resources Canada
NSC	National Support Centre
NSS	National Support Structure
OCIPEP	Office of Critical Infrastructure Protection and Emergency Preparedness
PAG	Public Affairs Group
PCO	Privy Council Office
TAG	Technical Advisory Group
TC	Transport Canada
U.S. DOD	United States Department of Defence
U.S. EPA	United States Environmental Protection Agency
U.S. FEMA	United States Federal Emergency Management Agency
U.S. FRMAC	United States Federal Radiological Monitoring and Assessment Center
U.S. NRC	United States Nuclear Regulatory Commission
WHO	World Health Organization

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities

ID #	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
1	Provide staff, resources and support for activation and operation of the NSS in support of the FNEP and its Provincial Annexes.	Departments to notify their own staff, headquarters and regional offices, to establish and maintain a departmental EOC, to provide required staff to support the NSC, the provincial emergency management organization and a federal regional EOC, when required. HC (for an emergency in Canada or the U.S.A. near the Can-U.S.A. border) to staff the NSC Management Team and provide staff for the FRO. DND (for an emergency involving an NPV) to assist the National Coordinator in implementing the FNEP, to chair the OPS, to provide a Federal Spokesperson (for technical aspects of the accident) and the Federal Operations Liaison Officer. DFAIT (for an emergency involving a nuclear facility in a foreign country) to chair the OPS. OCIPEP to provide the interim Federal Coordination Officer. LFD to arrange for the provision of the NSC and identify communications requirements.	AAFC, CFIA to provide staff for an ingestion impact assessment Task Team, if required. EC to chair the Task Team on plume dispersion and dose projections, if required. HC to chair the Task Team on radiation protection for emergency workers, and to chair the Task Team on ingestion impact assessment, if required. HRDC to provide support for the provision of NSC. OCIPEP to designate the Federal Operations Liaison Officer and assist the National Coordinator in implementing the FNEP. PCO to approve designation of the Lead Federal Department for Response, to chair a Task Team on Government/Cabinet briefings, if required. TC to chair a Task Team on transportation and logistics, if required. LFD to chair the Task Team on public inquiries and rumour control, if required.
2	Participate in maintaining a good flow of information and a coordinated response.	Departments to implement their plans and procedures in accordance with the terms contained in the FNEP and Provincial Annexes, to respond to the emergency in consultation with the NSC, to report their activities to the appropriate Federal Liaison Officer and to the NSC, and to coordinate their activities with their provincial counterpart, as necessary.	PCO to provide standard Government/Cabinet briefing documents.
3	Establish and maintain liaison with federal institutions, NGOs, foreign governments, international organizations, the private sector (e.g., industry, universities), etc.	CNSC for liaison with the Canadian nuclear facility or with foreign regulators (such as U.S. NRC). DND for liaison with DND military bases and U.S. DOD. DFAIT for liaison with foreign governments, international organizations, Canadian embassies and Ottawa based foreign embassies.	CNSC, DND, HC, OCIPEP to provide support, as required, for liaison with international agencies, including advice on existing plans and arrangements. HC for liaison with U.S. EPA, U.S. FRMAC, IAEA, and WHO. OCIPEP for liaison with U.S. FEMA.
4	Gather technical information on the accident facility or source.	AECL (for emergency at Chalk River Laboratories) to gather on-site data. CNSC (for emergency involving a nuclear facility in Canada or in U.S.) to gather on-site data from the Canadian nuclear facility or foreign regulators (such as U.S. NRC). DND (for emergency involving an NPV) to gather on-site data. DFO (for emergency involving a vessel at sea)	AECL to gather information on the CANDU system and specialized knowledge arising from AECL research activities (e.g., plutonium handling). EC to gather weather data, forecasts and atmospheric dispersion factors. NRCan to assist as required.

ID #	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
5	Run plume dispersion and dose projection models.	AECL, CNSC, EC, HC to run atmospheric trajectory, dispersion and/or dose projection models if requested by a province or required for federal purposes, and to provide outputs to TAG. DND (for emergency involving an NPV) to run their marine dispersion model.	EC to provide weather data, forecasts, atmospheric dispersion factors and scientific advice on meteorology. DFO to provide oceanographic or hydrographic information related to marine dispersion plumes.
6	Conduct and coordinate departmental activities for monitoring and sampling.	Departments to identify departmental resources available for operations in affected areas, to contact and deploy their national and regional personnel and equipment, and to provide monitoring and sampling data to TAG. AAFC for agricultural food stuff, dairy products and animal feed. CFIA for consumers food and food fish. EC for water, soil and vegetation. HC for environmental radioactivity measurements NRCan to provide remote sensing or other surveying services.	EC to assist in locating the plume trajectory. AECL to provide stand-by personnel and resources for field monitoring. AECL, CNSC to provide emergency personnel and resources for survey and control of contamination and exposure. CNSC to provide field monitoring units. DND (for an emergency involving an NPV) to provide field monitoring units for monitoring outside the emergency planning zone in support of provinces. DND to provide a support capacity for air-lifting all necessary monitoring equipment. LFD to provide an inventory of potential national and international resources for operations. NRCan to provide an inventory of potential aerial monitoring capabilities and resources.
7	Perform laboratory analysis of food, soil, air filters, dosimeters, etc.	HC to provide existing resources and facilities for laboratory analysis.	AECL, CNSC to provide stand-by resources and facilities for laboratory analysis. HC to provide an inventory of laboratories which can perform radiological analysis.
8	Provide a capability to TAG for the evaluation of radiological hazards and to OPS for the evaluation of national impacts of interventions.	AAFC for agricultural lands, facilities, commodities, agricultural food stuff and livestock. CFIA for consumer food products. EC for environmental impacts. DFO for marine transportation over sea routes except in ports and St. Lawrence Seaway. HC for public health and safety issues, including drinking water, consumer food products.	AECL, CNSC, EC, HC to provide support in the analysis of technical data and response trends. NRCan to provide support in the analysis of technical data and response trends, especially for contamination and remediation of contaminated areas through the LLRWMO.
9	Provide a capability to TAG for the formulation of recommendations for protective measures.	Departments for analysis of assessment data and formulation of recommendations for areas within their jurisdiction.	HC for urgent protective actions such as evacuation and sheltering, when requested by a province.

ID #	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
10	Implement protective measures under federal jurisdiction or as requested by a province	Departments to identify departmental resources available for operations in affected areas, to contact and deploy their national and regional personnel and equipment. CFIA food consumer foods. CH for national heritage sites, national parks and reserves. DFO for marine traffic control over sea routes except in ports and St. Lawrence Seaway. INAC for aboriginal and arctic lands. TC for air traffic control and airports.	CCRA to assist in the control of food and goods importation from affected regions. DND to provide support for marine traffic control. DND (for an emergency involving an NPV) to provide personnel and resources for operations in the Emergency Planning Zone. DND (for emergency involving a vessel) to provide emergency personnel and equipment. DFO to provide support for marine traffic control in ports and St. Lawrence Seaway. LFD to provide an inventory of potential national and international resources for operations.
11	Provide medical radiation expertise and capabilities for the treatment of contaminated and/or overexposed casualties.	HC to coordinate the identification of experts and capabilities in Canada and abroad, to provide medical radiation expertise and to provide bioassay, radiobiology and *in vivo* monitoring services for evaluation of internal doses.	AECL, CNSC, DND (for an emergency involving an NPV) to provide technical support, equipment and facilities.
12	Provide technical support for the shipment of radioactive material and the disposal of contaminated soil, equipment, etc.	AECL for advice and assistance as required. NRCan for remediation of contaminated areas through the LLRWMO.	CNSC to provide technical radiation protection support. DND to provide logistics support. TC to coordinate logistics support for the removal of contaminated soil and for the selection of transportation means and routes.
13	Provide radiation protection advice, assistance and equipment for federal emergency workers.	CNSC to provide radiation protection standards for on-site nuclear energy workers, and technical support and advice on radiation protection. HC to provide: radiation protection standards for off-site emergency workers; support in radiation protection issues; dosimeters and emergency supplies of iodine tablets; bioassay, radiobiology and *in vivo* monitoring services for evaluation of internal doses, and to evaluate cumulative external doses.	AECL to provide technical support and advice. TC to facilitate the delivery of iodine tablets, and to provide airlift information and advice for delivery of dosimetry and personal protection equipment required by federal emergency workers.
14	Facilitate the deployment of personnel and equipment for operations in affected areas.	TC to implement emergency transportation arrangements for movement of personnel and equipment within Canada.	CCRA to facilitate the movement across the Canadian border of goods to be used temporarily for a nuclear emergency (e.g., radioactive standards). DND, DFO to provide transportation support, as required. TC to make arrangements for transportation of radioactive samples across Canada, and to provide information and advice on aviation matters including air transportation resources and operations.

ID #	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
15	Provide emergency telecommunication equipment and services for operations in the affected area.	IC for coordination and delivery of emergency telecommunications equipment.	Departments to provide advice and assistance to the NSS with respect to their telecommunications requirements. DND, EC, DFO, OCIPEP, IC to support operations with their existing telecommunications systems and to identify transportation resources required for transport of telecommunications equipment to the site.
16	Assist in the management of requests/offers for assistance.	Departments to formulate requests for assistance, to use and manage resources offered for operations within their mandates, and to provide information on their ability to provide assistance. NRCan to prepare, in consultation with the Treasury Board Secretariat, submissions concerning provincial requests for disaster financial assistance (under the *Nuclear Liability Act*).	CNSC, DND, EC, HC, OCIPEP to provide support, as required, for liaison with international agencies. DFAIT to provide advice and assistance on the handling of offers and requests for assistance from foreign governments taking into account Canada's international commitments.
17	Assist PAG in disseminating and customizing the information products on protective measures to target and specialized audiences.	Departments for audiences within their mandates. DFAIT for Canadians abroad, relevant Canadian missions and Ottawa based foreign embassies.	CNSC, EC, HC to provide assistance. IC to obtain broadcast approvals, and coordinate and activate communications networks, when required. NRCan to provide assistance in ensuring that communications have considered the risks within a larger context including societal costs of intervention measures. OCIPEP to assist with the development of messages for use on the emergency broadcasting system (if available).
18	Provide support, equipment, technical experts and spokespersons for operation of a media centre.	Departments to provide spokespersons and support personnel, as required. LFD to identify the media centre. OCIPEP to provide staff to set up and operate a national media centre.	CNSC (for emergency involving a nuclear facility in Canada) to allow use of the CNSC media centre by the PAG until an alternate location is established and operating. DFAIT to provide operating staff as required for specialized interpreting or translation skills and for contact and liaison with foreign media both in Ottawa and abroad.
19	Provide available public information packages.	Departments to provide available public information material on relevant emergency plans to PAG.	AECL to provide available public information material on radiation and reactors. CNSC to provide available public information material on nuclear safety, radiation and regulatory matters. DND to provide available public information material on NPVs and military nuclear devices. HC to provide material on radiation protection issues and the FNEP.

ID #	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
20	Propose emergency classification level (INES).	CNSC as required.	
21	Provide resources and infrastructure for operation of public inquiries systems.	HC provide existing public inquiries systems.	Departments to provide information and personnel to staff public inquiries systems.
22	Provide resources and infrastructure for monitoring of national and regional media.		IC to provide technical advice and assistance with respect to the operation of broadcast systems.
23	Assist in termination of the FNEP.	PCO to approve designation of the Lead Federal Minister for Recovery and a National Recovery Coordinator, and to assist the Executive Group and the National Coordinator in making the transition to Recovery.	Departments to provide technical and operational advice on the appropriateness of terminating the FNEP.