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In the Matter of

Bruce Power Inc. – Bruce A and B Nuclear Generating Station

Request for a ten-year renewal of its Nuclear Power Reactor Operating Licence for the Bruce A and B Nuclear Generating Station

Commission Public Hearing – Part 2

May 28-31, 2018

À l'égard de

Bruce Power Inc. - Centrale nucléaire de Bruce A et Bruce B

Demande de renouvellement, pour une période de dix ans, de son permis d'exploitation d'un réacteur nucléaire de puissance à la centrale nucléaire de Bruce A et Bruce B

Audience publique de la Commission – Partie 2

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GREENPEACE

Comments on Bruce Power's application to renew its licence for the Bruce nuclear station

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1. Reject request to reduce public and Commission scrutiny

In Greenpeace's view, Bruce Power's request for a ten-year licence is, if approved, both inappropriate to address the external and internal challenges faced by Bruce Power over the next decade, and inconsistent with democratic values, such as transparency and public participation.

The following summarizes some key reasons the Commission should reject Bruce Power's application for a ten-year licence:

- *Prioritizing democratic values before business interests* – The practice of regular licence renewal hearings, encourages information disclosure, public participation and provides a mechanism to keep Bruce Power and CNSC staff accountable to the public. A ten-licence is in effect a de-prioritization of democratic values in the Commission's regulator process. Notably, this application comes only two years after Bruce Power received an unprecedented five-year for the Bruce A and B nuclear stations. The CNSC is showing a pattern of behaviour that deprioritizes public transparency.

- *Planning for Offramps* - Although the government of Ontario has signed a contract with Bruce Power to enable the life-extension of six additional reactors at the Bruce nuclear station, the contract also contains an "offramp" mechanism. This permits Ontario to abandon future reactor life-extensions if costs increases, electricity demand declines, or other energy options become more economical. A ten-year licence would hamper the Commission's ability to appropriately respond to such decisions.

- *Foreseeable Political Pressure may undermine safety* – There is a high likelihood that over the next decade reactor life-extension projects at the Darlington or Bruce nuclear stations will be delayed. This may increase political pressure to operate aging reactors beyond their design lives. The CNSC should anticipate such external pressures and put in place measures to shield safety oversight from undue political interference. In Greenpeace's view, one such measure is regular public licence renewals.

- *Risk and Complexity* - The undertakings proposed under the current application are significantly more complex than those permitted under the current licence. Bruce Power's application includes the reconstruction of three reactors over a ten-year period while in parallel operating reactors well beyond their operational lives. In Greenpeace's view, this complexity requires more, not less, oversight by the Commission and the public.

- *No Environmental Review of the Bruce B Life-extension* – The CNSC has supported exempting the life-extension of the Bruce B reactors from an environmental assessment with public participation. Such a reduction in public oversight and information disclosure should not be exacerbated by a longer licence.

Request: The Commission should approve a five-year licence to encourage greater transparency and accountability. This licence should require CNSC staff and Bruce Power to report annually on significant issues such as the aging of the station and the status of government decisions on future life-extensions.

2. Planning for life-extension offramps

In Greenpeace's view, a ten-year licence is inappropriate because it undermines the Commission's ability to respond appropriately to significant changes in Bruce Power's business planning.

Although the government released in December 2015 a contract with Bruce Power to rebuild and extend the operational lives of two reactors at the Bruce A nuclear station and four reactors at the Bruce B nuclear station,[1] the contract also included "offramps" to "allow the government to assess Bruce Power's cost estimates for each reactor prior to its refurbishment and stop the refurbishment if the estimated cost exceeds a predefined amount."[2]

Notably, there was no independent assessment of the desirability of Bruce contract by the Ontario Energy Board (OEB). Documents acquired by Greenpeace through provincial Freedom of Information (FOI) legislation show the cost-effectiveness of the Bruce reactors is marginal at best. A heavily redacted 2015 IESO presentation entitled "Bruce Nuclear Refurbishment: Effectiveness of Offramps"[3] states that "…there are resource portfolios that can replace Bruce refurbishment within the range of Bruce costs identified so far, but not at comparable levels of emissions performance."[4]

Anticipating future cost over-runs, the IESO also concludes that the Bruce life-extension may become disadvantageous for Ontarians. The presentation notes that the "…future evolution of the price and/or refurbishment schedule could impact the cost effectiveness of Bruce refurbishment and Bruce refurbishment options should therefore continue to be assessed on an ongoing basis."[5] It should be noted that the IESO refused to release details on the resource portfolios it considered in its analysis. The IESO, however, has a history of underestimating the cost declines in renewable costs.

While out of the CNSC's mandate, Greenpeace encourages the CNSC to maintain a situational awareness of the external pressures that may impact Bruce Power's business planning and create challenges for the Commissions oversight of safety. Such situational awareness is necessary in light of the IESO's finding that the Bruce life-extension is of marginal economic benefit.

Bruce Power's agreement with the Ontario government contains two types of offramp. First, "financial" or "threshold" offramps; and second, "economic" offramps. The IESO descries the financial offramp as optional "…if cost estimates provided by Bruce Power 18 month prior to refurbishment start of the next unit exceed the agreed upon threshold, a decision can be made

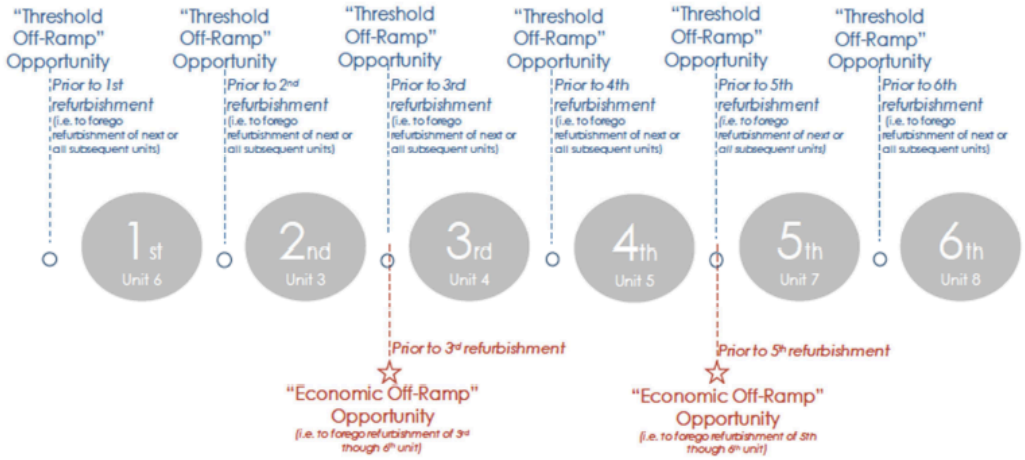
[1] Contract between Bruce Power and the IESO AMENDED AND RESTATED BRUCE POWER REFURBISHMENT IMPLEMENTATION AGREEMENT, December 3, 2015, http://14083-presscdn-0-0.pagely.netdna-cdn.com/wp-content/uploads/2015/12/Amended-and-Restated-Bruce-Power-Refurbishment-Implementation-Agreement.pdf
[2] Ministry of Energy, "Ontario Commits to Future in Nuclear Energy," press release, December 3, 2015
[3] IESO, Bruce Nuclear Refurbishment: Effectiveness of Off-Ramps, October 9, 2015, FOI Request #2015-070.
[4] Ibid, pg. 4.
[5] Ibid, pg. 5.

by the IESO to not refurbish one or all subsequent units."[6] The government has refused to release the "agreed upon threshold" that would be used to reject a Bruce offer.

Considering that Bruce B unit 6 is set to be rebuilt in 2020, it is reasonable to assume that Bruce Power will be submitting its first offer to Ontario government this summer. This means the government elected on June 8th will make a decision on whether to accept or reject Bruce Power's offer.

The IESO states that an economic offramp can be taken "….in light of changes to the planning context (e.g. lower demand or availability of lower cost resource options). Opportunities to exercise this kind of offramp exists after pairs of units have proceeded with refurbishment (i.e. after first two units have proceeded or after four units have proceeded)."[7]

The graphic below indicates when offramps can be taken under the Bruce contract. Notably, all of these offramp decisions would fall under the ten-year licence proposed by CNSC staff. Only the decision regarding Unit 8 would fall under the next licence.[8]



Considering that every nuclear project in Ontario's history has gone significantly over budget and the rapidly declining cost of renewables and storage technologies, Greenpeace believes it is imprudent to assume that Ontario will not exercise its contract right to forgo future life-extensions at the Bruce nuclear site.

According to documents obtained by Greenpeace through Freedom of Information (FOI) legislation, the IESO estimates there is an eighty percent likelihood that a reactor life-extension at Darlington or Bruce will undergo delays or cost over-runs in the 2024.[9] In Greenpeace's view, this supports a shorter five-year licence for the Bruce nuclear station.

[6] Ibid, pg. 5.
[7] Ibid, pg. 5.
[8] The life-extension of Unit 8 would begin in mid-2030. Thus, the offramp decision would be made in 2029.
[9] IESO FOI 2016-030, *APPENDIX: Resource Availability Risks*, pg. 6.

Request: The Commission should only approve a five-year licence to ensure the Commission has the capacity to appropriately respond to changes in provincial energy plans.

Request: The *License Control Handbook* should be modified to provide guidance to staff on how to approach provincial offramp decisions, including regular status reports from Bruce Power.

3. Self-regulation – lack of safety limits

Before allowing Bruce Power to rebuild and extend the lives of six reactors, the Commission should ensure clear risk limits are in place to drive continuous safety improvements at the Bruce nuclear station.

During the 2015 re-licensing hearings Greenpeace asked the Commission to address the loopholes in the CNSC's regulatory approach that have allowed reactor operators in Canada to effectively self-regulate. Greenpeace continues to be concerned that this form of self-regulation allows industry to avoid safety upgrades to cut costs.

Greenpeace urges the new Commission ensure Bruce Power sets rigorous and socially acceptable risk limits for the Bruce A and B nuclear stations before it is allowed to proceed with rebuilding unit six at Bruce B in 2020. Commission supervision is needed because Bruce Power has a financial interest in avoiding requirements that may force upgrades to the station. As witnessed during the 2013 Pickering licence renewal, CNSC staff have also failed to require OPG to respect its own risk limits when left unobserved.

3.1 A history of avoidance: risk limits & external events

CNSC staff have been aware of the lack of clear risk limits for existing reactors for over a decade, but have done nothing. Greenpeace encourages the new Commission to address this gap in CNSC regulatory oversight.

In 2008, the CNSC consulted and established risk limits for new reactors. Section 4.2.2 of RD-337, *Design of New Nuclear Power Plants*, states the following limit for large radioactive releases:

> *The sum of frequencies **of all event sequences** that can lead to a release to the environment of more than 10^{14} becquerel of cesium-137 is less than 10^{-6} per reactor year. A greater release may require long term relocation of the local population.*[10]

Notably, this limit is one level of magnitude lower than the limits set by industry (Ontario Power Generation and New Brunswick Power) for existing reactors. What's more, the wording "all event sequences" requires reactor operators to consider accident sequences triggered by more than component and structure failure (internal events). Specifically, this means external events, such as earthquakes, tornados, floods and terrorism. It was only in 2005 that the CNSC first required licencees to consider external events in their risk assessments.

[10] RD-337, *RD-337: Design of New Nuclear Power Plants*

In 2009, the CNSC attempted to establish clear and consistent regulatory guidance for existing reactors. It published Regulatory Document 152 (RD-152), *Guidance on the Use of Deterministic and Probabilistic Criteria in Decision-making for Class I Nuclear Facilities*, for consultation. RD-152 adopted the risk targets and limits that were historically used by Ontario Hydro and OPG.[11]

However, RD-152 imitated RD-337 by requiring external events be included when considering whether an operator is complying with risk limits. RD-152 states:

> "The safety goals include the ***contribution of facility-originated events*** (such as equipment failure, operator errors, internal fire, and internal floods) ***and external events*** (such as earthquakes, weather-originated events, and fire), but exclude malevolent act."

In Greenpeace's view, this was a positive step toward addressing a significant gap in the safety assessment of existing reactors. RD-152 was, however, never put into force by the CNSC.[12] This means that risk limits are still determined by licensees.

Greenpeace has reviewed all of the publicly available probabilistic risk assessments by Canadian nuclear operators. Notably, compared to historic risk assessments, the majority of the risk studies published between 2008 and 2015 showed a significant increase in the estimated likelihood of accidents leading to offsite releases triggered by internal events. The inclusion of external events into such calculations would increase the estimated likelihood still further.

Greenpeace is left to speculate that the CNSC's abandonment of RD-152 was influenced by industry opposition. Arguably such requirements could impose additional safety upgrades on licencees. In the 2009 – 2010 period it was becoming evident that the cost effectiveness of reactor life-extension was marginal at best. In 2010, OPG announced it would not proceed with the life-extension of the Pickering B reactors due to the prohibitive cost. OPG had already decided in 2005 against extending the operational lives of two units of the Pickering A nuclear station. Hydro-Quebec also announced in 2012 it would not proceed with the reconstruction of the Gentilly-2 nuclear station. Bruce Power's restart of two Bruce A units also went two billion dollars over budget.

The Canadian nuclear industry's cost challenges are in conflict with public safety. Bruce Power has an obvious financial interest in minimizing safety upgrades. In spite of this clear conflict, the CNSC hasn't ensured clear rules to govern reactor upgrade decisions. Greenpeace encourages the new Commission ensure clear risk limits so that public safety decisions are not unduly influenced by the financial interests of Bruce Power.

3.2 Risk limits: lack of CNSC staff consistency

Aside from the Commission needing to ensure Bruce Power establishes socially acceptable risk limits, the Commission also has an important role in verifying staff consistently apply these

[11] Canadian Nuclear Safety Commission, *RD-152: Guidance on the Use of Deterministic and Probabilistic Criteria in Decision-making for Class I Nuclear Facilities*, May 2009, Appendix B, p. 2.
[12] To Greenpeace's knowledge, no justification has been given for not issuing RD-152 as official regulatory guidance.

requirements. This was highlighted by staff's failure to apply such rules during the 2013 Pickering licence renewal.

In 2013, Greenpeace alerted the Commission that the latest risk assessment for the Pickering B nuclear station showed a significant increase in the estimated likelihood of a large radioactive release. The Large Release Frequency (LRF) was at such a level that, according to OPG's risk policy, OPG should have undertaken measures to reduce the risk posed by the station, including safety upgrades.[13] CNSC staff, however, effectively ignored this requirement in its submissions to the Commission.

Because of Greenpeace's intervention, the Commission directed OPG to submit an "action plan to address any identified issues should OPG exceed its targeted safety goals."[14] The Commission also affirmed in its 2013 ruling that that if a risk assessment finds the station is operating *"…above acceptable limits then safety improvements would be mandatory"* and that if the finds *"are between the limits and the targets, then safety improvements should be put in place if practicable."* This is in line with OPG's risk policy.

Bruce Power should also be required to carry out similar transparent risk reduction plans if its most recent probabilistic risk assessment finds any accident frequency exceeds safety goals. Notably, Bruce Power's submission indicates Bruce A currently has a Large Release Frequency for accidents triggered by internal fire of 7.3E-6. [15] In Greenpeace's view, Bruce Power should be reporting annually on a risk reduction plan similar to OPG.

Conclusion: The public as well as the Commission have an important role to play in ensuring CNSC staff are appropriately carrying out their responsibilities. Reducing opportunities for the public and Commission to scrutinize the behaviour of Commission staff may compromise safety.

Request: Bruce Power should be directed to undertake and report annually on a risk reduction plan to reduce the likelihood of internal fires leading to large radioactive releases before it is allowed to proceed with the reconstruction of Bruce B unit 6 in 2020.

3.3 Set deadline for Bruce Power risk policy

The 2013 Pickering relicensing highlights why the Commission should pay special attention to licencee risk policy during relicensing. Greenpeace requests the new Commission require Bruce Power to produce its own risk policy before it is permitted to proceed with rebuilding Bruce B unit 6 in 2020.

In 2014, the CNSC published REGDOC-2.4.2, *Safety Analysis: Probabilistic Safety Assessment (PSA) for Nuclear Power Plants* to replace S-294. It states that licencee probabilistic risk policies should be referenced in the LCH to become part of a station's licensing basis. The licensing basis sets the legal "boundary conditions" for reactor operation.

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[13] *Recording of Proceeding in the matter of Ontario Power Generation's application to Renew the Power Reactor Operating Licence for the Pickering Nuclear Generating Station,* August 9, 2013, pgs. 5 -6. See: http://nuclearsafety.gc.ca/eng/the-commission/pdf/2013-05-29-Decision-OPG-Pickering-e-Edocs4177096.pdf

[14] Ibid.

[15] Bruce Power, *Performance Review of Bruce A and B*, June 2017, Pg. 867

In 2015, Greenpeace asked Bruce Power to provide a list of documents referenced in its LCH related to probabilistic risk policy. Bruce Power provided some information from its internal "proprietary" probabilistic risk policy, but did not confirm if any such documents are listed in the LCH. A review of the proposed LCH shows no references to any such policy.

In the Commission's 2015 ruling, it issued non-mandatory language encouraging Bruce Power to establish a risk policy, specifically *"The Commission stated that such a policy should be formalized and strongly recommends that Bruce Power develops such a policy, as well as formally documents that enhancements to Bruce A and B will be considered by Bruce Power if the PSA result is between the safety goal limit and the target."*[16]

Greenpeace was disappointed that the previous Commission chose non-mandatory language in its 2015 ruling, and encourages the new Commission to be more assertive with Bruce Power and CNSC staff.

Notably, Bruce Power repeatedly references a safety policy in its submissions.[17] However, CNSC staff admit that no such policy has been completed. CNSC staff state that "Bruce Power's governance document for PSA development and application is currently under revision as part of REGDOC-2.4.2 transition plan."[18] No timelines are provided for the completion of the document or whether it will be publicly available.

In Greenpeace's view, it is inappropriate for CNSC staff to recommend a ten-year licence, and support plans for the life-extension of three reactors over the next decade, without a transparent plan for filling this significant gap in Bruce Power's safety policies. Greenpeace asks the new Commission to set accountable timelines for the production of this policy. Moreover, this policy should be vetted by the Commission before Bruce Power can proceed with its next life-extension.

Request: Bruce Power should be required to produce a draft risk limit policy for review by the Commission at a public meeting before it proceeds with the outage for Bruce B unit 6 in 2020.

4. Aging: Setting limits and proper oversight of design Limits

Greenpeace is concerned that foreseeable delays in the province's reactor life-extension plans will create undesirable political pressure on Bruce Power and Commission staff. Specifically, there is likely to be pressure for Bruce Power to operate the Bruce reactors beyond what is proposed in the current application. To mitigate this risk, Greenpeace recommends the Commission retain its authority to approve service extensions at the Bruce station.

Greenpeace encourages the Commission to consider lessons from the 2007 "radioisotope crisis." The shortage of isotopes was caused by the failure of Atomic Energy of Canada Limited's

[16] Canadian Nuclear Safety Commission, *Record of Decision, including Reasons for Decision in the matter of Bruce Power Inc.,* July 9, 2015, pg. 19.
[17] See Table 6 on Page A15 of Bruce Power, Application for Renewal of PROL 18.00/2020 supplemental material, February 2018.
[18] Commission Member Document 18-H4, March 2018, pg. 152.

(AECL) failure to complete a replacement reactor for the National Research Universal (NRU) reactor at Chalk River Laboratories. The aging and out-dated NRU should have been shut down to protect public safety, but was instead forced to continue operating to avoid radioisotope shortages. As the Commission is aware, Parliament eventually intervened in the CNSC's proceedings and former CNSC's president, Linda Keen, was fired by the Harper government.[19]

Similar to the failure of AECL to complete a reactor, delays in the reactor life-extensions could create electricity shortages or unwanted reliance on fossil generation. According to documents obtained through provincial Freedom of Information legislation, the Independent Electricity System Operator (IESO) estimates "…that the overall probability of one or more units being delayed is highest in the mid 2020s". According to the IESO, there is an 80% likelihood that one or more reactors outages undergoes delay in 2024.[20]

According to these FOI documents, the IESO is already assuming that reactors could be operated beyond what is currently being proposed by Bruce Power in this application to respond to refurbishment delays. Internal IESO documents state: "Opportunities could exist to defer the refurbishment starts of units in order to mitigate the impact of potential delays on previous units or to provide coverage for other system risks

Request: In light of the significant technical uncertainties and the potential for external political pressure, the Commission should maintain its authority to review and approve reactor service-extensions.

4. Site-wide risk assessment

Since the Fukushima disaster began, Greenpeace has drawn the Commission's attention to a regulatory loophole that allows Ontario's multi-unit nuclear stations to impose significantly higher levels of risk on surrounding communities than is allowed at the single unit Point Lepreau nuclear station in New Brunswick. This loophole was overlooked by the Commission's official review of Fukushima disaster.

In its 2013 ruling on OPG's request to renew the operating for the Pickering nuclear station, the Commission acknowledged the legitimacy of Greenpeace's concern and instructed OPG to develop "…a whole-site PSA or a methodology for a whole-site PSA [Probabilistic Safety Assessment], specific to the Pickering NGS site."[21] As noted in CNSC staff's submission to these proceedings, the Commission also recommended Bruce Power develop a whole-site PSA methodology with industry partners. This whole-site PSA methodology will be submitted to the Commission by the end of 2018.[22]

Notably, since the Commission acknowledged Greenpeace's concern and directed staff and licencees to address the site-wide risk posed by Ontario's nuclear stations, CNSC staff have

[19] Keen has asserted that the radioisotope was in fact just a pretext for her firing. Instead, Keen has argued that SNC-Lavalin lobbied to have her fired after she required modern international nuclear safety standards to be used in the licensing of new CANDU reactors.
[20] IESO FOI 2016-030, *APPENDIX: Resource Availability Risks*, pg. 6.
[21] Record of Decision, including reasons for decision, in the matter of Ontario Power Generation's application to renew the power reactor operating licence for the Pickering Nuclear Generating Station, August 9, 2013, pg 21.
[22] CMD 18-H4, March 2018, pg. 152.

repeatedly asserted that they are "world leaders" [23] in the field of site-wide risk assessment. Greenpeace is concerned that this claimed leadership will be lost without additional direction from the Commission.

Staff's submissions to these proceedings leave the impression that after the development of the whole-site methodologies there will be no further steps to integrate whole-site risk assessment into the CNSC's regulatory framework.[24] In Greenpeace's view, this is an example of staff complacency.

Bruce Power has applied for a ten-year licence. It is reasonable to assume that the integration of whole-site risk assessment would be integrated into the CNSC's regulatory framework over the next decade. Greenpeace is disappointed that CNSC staff did not use these proceedings to suggest expectations for the integration of whole-site risk assessment into Bruce Power's licensing requirements over the next decade.

Notably, following the 2013 Pickering renewal, the Commission updated *REGDOC-2.4.2, Probabilistic Safety Assessment (PSA) for Nuclear Power Plants* in 2014 to acknowledge the need for licencees to assess multi-unit accident sequences. It requires licencees to consider not only the reactor, but "…other radioactive sources such as the spent fuel pool (also called irradiated fuel bay)" in their PSAs. It also requires "Multi-unit impacts, if applicable, shall be included."[25] With Bruce Power and OPG having completed site-wide initial whole-site methodologies, it should be assumed that there will be additional amendments to CNSC's regulator guidance over the next decade.

It is Greenpeace's understanding that CNSC staff review and update Regulatory Documents on approximately five-year cycle. This means *REGDOC-2.4.2* will be set for a review and update in 2019. In Greenpeace's view, the update of *REGDOC-2.4.2* should include additional guidance regarding the methodology for site-wide risk assessment. It should also initiate a policy discussion on whether safety goals, which are currently set on a per reactor basis, should be re-configured on a site-wide basis to more meaningfully capture the risk posed by Ontario's multi-reactor nuclear stations.

Establishing site-wide safety goals is a reasonable response to Fukushima and acknowledgement of Ontario's multi-unit sites. With eight reactors, the Bruce site is one of the largest nuclear stations in the world. It thus goes without saying that this shift towards site-wide risk assessment will impact future licensing requirements for the Bruce nuclear station. For example, given PSAs are used to inform Periodic Safety Reviews (PSR), a shift to a site-wide risk assessment will impact Bruce Power's next scheduled PSR in 2018.

Considering that staff have proposed a ten-year licence to coincide with Bruce Power's next PSR, it is reasonable for the Commission to highlight any significant new expectations for this next

[23] According to colleagues at Greenpeace Korea, staff from the South Korean nuclear safety regulator also state they are world leaders in developing site-wide risk assessments.
[24] See CMD 18-H4, March 2018, 151 -.152.
[25] CNSC, *REGDOC 2.4.2, Probabilistic Safety Assessment (PSA) for Nuclear Power Plants, may 2014,* Available at: http://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-4-2/index.cfm

PSR. In Greenpeace's view, Bruce Power and staff should be directed to anticipate and prepare for Bruce Power's next PSR to be based on a whole-wide risk assessment

Given that *REGDOC-2.4.2* requires updated PSAs every five years, this could allow Bruce Power to produce its first whole-site risk assessment in approximately five years. As noted, Greenpeace believes this would be an appropriate time for a licence renewal. This would allow the public and the Commission to scrutinize Bruce Power's first site-wide risk assessment.

However, in light of CNSC staff's ongoing reactive approach to site-wide risk since the 2011 Fukushima disaster began, Greenpeace encourages the Commission to lay out additional regulatory milestones in its ruling.

Request: Direct CNSC staff to include a site-wide safety limit in the next iteration of *REGDOC-2.4.2*, which is scheduled to be updated in 2019.

Request: Bruce Power should be directed to plan and prepare a site-wide risk assessment for the Bruce site in support of the PSR it will produce by 2028.

Request: Instruct CNSC staff and Bruce Power to prepare the first iteration of a whole-site risk assessment for the Bruce nuclear site for the next licence renewal in 2023.

5. Bruce B should undergo an environmental review

Bruce Power is asking to begin rebuilding the Bruce B nuclear station in 2020, but, unlike other life-extension projects, without an environmental review. Greenpeace encourages the new Commission to ask the federal government to subject this project to an environmental assessment under the Canadian Environmental Assessment Act (CEAA).

Bruce Power has been examining ways to reduce the cost of reactor life-extension while avoiding additional environmental reviews for almost a decade. The life-extension of Bruce A units 1 and 2 went approximately two billion dollars over budget and was delayed by several years. As noted, other operators have decided against extending the life of CANDU reactors due to the prohibitive cost. The IESO has also found that other energy options could be competitive with reactor life-extension.

In 2010, Bruce Power proposed a new approach to extend the operational life of units three and four of Bruce A. In this approach, the entire Calandria Shield Tank Assembly (CSTA) would be removed from the reactor vault and replaced with a new CSTA manufactured offsite. According to Bruce Power, this approach would result in reduced worker dose, fewere convention safety incidents and make the cost and schedule life-extension more predictable.[26] However, the CNSC determined the project would be required to undergo an environment assessment.[27] Bruce Power did not proceed with this proposal.

[26] J. Stevenson, (CNSC) Project Manager – Bruce A Units 3 & 4 Refurbishment, *Bruce A Units 3 & 4 Refurbishment Project: Calandaria Shield Tank Assembly Replacement Project,* June 21, 2010, E-Doc # 3524194, pgs. 5 – 6. Acquired through Access to Information.
[27] Ibid., pg. 3.

In CEAA 2012, the Harper government removed the requirement for a federal environmental review of reactor life-extension projects. This means the life-extension of Bruce B would be the first reactor life-extension not to undergo an environmental assessment with public participation.

In Greenpeace's view, proceeding with a multi-billion dollar reactor life-extension without an environmental review is contrary to modern values such as open government and transparency. Eliminating an environmental assessment for the life-extension along with a ten-year licence renewal is an unacceptable reduction in transparency and public participation.

Request: The CNSC should request the Ministry of the Environment and Climate Change to designate the Bruce B life-extension for an environmental review.

6. Blindspot: offsite accident consequence analysis

If the Commission approves Bruce Power's application for a ten-year licence, it will effectively approve the continued operation of one of the largest nuclear stations in the world without an assessment of a major nuclear accident.

As per CNSC policy, the 2005 environmental review of the Bruce A life-extension only assessed the consequences of accidents with an estimated likelihood greater than 1E-6 – once in a million years of reactor operation. This method ignored both the potential contribution of external events to accident likelihood and was based on estimates for a single reactor. Thus, the 2005 Bruce A environmental assessment did not consider the offsite environmental effects of a large radioactive release.

In contrast, the most recent findings of the Bruce A PSA found a probability of large release at Bruce A for internal events was 1.5E-6, 7.3E-6 for internal fire, 1.7E -6 for seismic events and 4.8E-6 for high winds. [28] If the Bruce A life-extension were to undergo an environmental assessment today, it would arguably need to consider more severe accidents. This underlines why the CNSC's practice of excluding large radioactive releases from environmental reviews is not precautionary or reasonable. It unfortunately deprives the public and government authorities of information needed to judge the adequacy of emergency planning.

In Greenpeace's view, there continues to be a need to assess and publish the offsite impacts of a major radioactive release at the Bruce nuclear station. The most appropriate place for such a review to take place is in an environment review of the Bruce B life-extension. If this project is exempted from a review, the CNSC should require such an analysis for the Bruce site.

An assessment of site-wide risk should also take place before the CNSC approves the life-extension of the Bruce B reactors. Following the Fukushima disaster in 2011, the Joint Review Panel reviewing OPG's proposal to build new reactors at the Darlington site recommended:

> *…that prior to construction, the Canadian Nuclear Safety Commission require OPG to evaluate the cumulative effect of a common-cause severe accident involving all of the*

[28] Bruce Power, Application for Renewal of Prol 18.00/2020: Supplemental Material. February 2018, pg. 15.

nuclear reactors in the site study area to determine if further emergency planning measures are required.[29]

The Pickering and Darlington nuclear stations are approximately 30 km apart. Given the proximity of the Bruce A and B reactors, this recommendation is all the more relevant but has never been explored by government authorities.

According to the 2015 *Bruce A Internal Events Risk Assessment* acquired by Greenpeace through Access to Information, the Bruce A Release Category 0 sequence involves "severe core damage at all four reactors more or less simultaneously. These sequences are predicted to result in containment failures within 24 hours of the initiation of the accident sequences."[30] Bruce Power's current application admits that "…containment is assumed to fail in any four-unit scenario."[31]Moreover, the 2003 Bruce A probabilistic risk assessment identified two accidence sequences that lead to the release of over 50% of core inventory of 1-131 and Cs-137. These would be accidents on par with Chernobyl.[32]

Multi-unit accidents are both possible and will lead to significant radioactive releases. The impacts of such radioactive releases, however, have never been assessed publicly in Canada.

This is highlighted by the fact that it was only in 2015 that Bruce Power and OPG began developing a means of modelling multi-unit beyond design basis accidents that could lead to uncontrolled releases. [33]

Request: if an environmental review is not carried out on the Bruce B life-extension, the CNSC should direct CNSC staff undertake or require Bruce Power to commission a study of the impacts of significant radioactive releases at the Bruce site.

7. Disclaimer

This submission is not an endorsement of the CNSC's hearing process, credibility or independence. To the contrary, Greenpeace feels the recently elected federal government needs to re-establish the independence of the CNSC through a legislative review and by appointing a new CNSC president.

In Greenpeace's view, the former Harper government undermined the independence of the CNSC when it fired the CNSC president Linda Keen in 2008. Greenpeace has attempted to constructively participate in CNSC licensing hearings, but has found that CNSC hearings are often "staged" by CNSC management to keep inconvenient information off the record.

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[29] Joint Review Panel, E*nvironmental Assessment Report: Darlington New Nuclear Power Plant Project,* August 2011, pg. vi.
[30] Bruce Power, *Bruce Level 2 At-Power Internal Events Risk Assessment*, December 2013, NK21-03611.5 P NSAS, pg. 319.
[31] Bruce Power, *PERFORMANCE REVIEW OF BRUCE A AND BRUCE B*, June 2017, pg. 68.
[32] CNSC – Probabilistic Safety Assessment and Reliability Division, *Bruce A Probabilistic Risk Assessment (PAPRA) Detailed Review: Main Report*, Document File Number: 26-1-7-4-3, pg. 161.
[33] Performance Review of Bruce A and B, June 2017, pg. 184

Notably, public participation in CNSC proceedings increased following the 2011 Fukushima disaster. This increased participation arguably lead to an increase in Commission decisions contrary to the recommendations of CNSC staff and licencees. Examples include, among others, strengthened potassium iodide (KI) distribution requirements, direction to licensees to develop a process for site-wide risk assessment and the issuance of the 2014 “severe accident study”.

In spite of this evidence that increased pubic participation may lead to better regulatory decision-making, the CNSC has opted to reduce public participation and transparency by shifting to ten-year licences. The CNSC’s support for exempting the Bruce B life-extension from an environmental assessment reduces transparency, public participation and scrutiny still further. In Greenpeace’s view, this is evidence that the Commission’s mindset – the unspoken assumptions that inform actions - still views public input and scrutiny as a nuisance instead of a valuable alternate perspective and check on their activities.

Until such a time that there have been changes in CNSC senior management and to the CNSC’s rules of procedure to allow for cross-examination and testing of evidence, Greenpeace doesn’t believe CNSC hearings can be relied upon to provide trustworthy assessments of nuclear risks in Canada.