



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

*Comments on Ontario Power Generation's Application for the Authorization to Operate
Pickering Nuclear Generating Station Units 5 to 8 until 2026*

Prepared by:

Sara Libman, Legal Counsel

Expert Review by:

M.V. Ramana, Professor and Simons Chair in Disarmament, Global and Human Security

April 26, 2024

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

Dear Sir or Madam:

Sent by email interventions@cnscccsn.gc.ca

Re: Joint Submission of Durham Nuclear Awareness, Slovenian Home Association, and the Canadian Environmental Law Association, Regarding Ontario Power Generation's application for the authorization to operate Pickering Nuclear Generating Station Units 5 to 8 until 2026 (Ref. 2024-H-05)

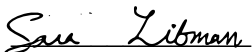
The Canadian Environmental Law Association ("CELA") has enclosed its comments, on behalf of Durham Nuclear Awareness, Slovenian Home Association, and CELA on the OPG's application to extend the operations of Pickering Nuclear Generating Station Units 5 to 8 until 2026.

Please find below our submission for your review.

By this letter, and pursuant to the CNSC's *Rules of Procedure*, CELA request status to participate as an intervenor in the public hearing and an opportunity to make a 30-minute oral presentation at the June 2024 hearing.

Sincerely,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION



Sara Libman
Legal Counsel, CELA

I. INTRODUCTION

Durham Nuclear Awareness (DNA) and Slovenian Home Association (SHA) together with the Canadian Environmental Law Association (CELA) and the expert review by Dr. M.V. Ramana,¹ submit this written report in response to the Canadian Nuclear Safety Commission's (CNSC) Participant Funding Notice to review Ontario Power Generation's (OPG) application and associated documents seeking to extend the operations of Pickering Nuclear Generating Station Units 5 to 8 until December 2026.²

DNA, SHA, and CELA's (herein, "the intervenors") submission is the result of a review of OPG's documents which have been made available to the public, as well as the CNSC staff Commission Member Document (CMD) prepared in response to OPG's application. In addition to reviewing the documents submitted by OPG, this submission considers the CNSC's jurisdiction pursuant to the *Nuclear Safety and Control Act* (NSCA), which requires that in making a licensing decision, the CNSC ensure the adequate protection of the environmental and human health. In meeting this objective, per section 24(4) of the NSCA, the intervenors' findings and concerns are itemized below. Our recommendations are summarized in **Appendix A**.

II. INTEREST AND EXPERTISE OF THE INTERVENORS

i. Durham Nuclear Awareness

Durham Nuclear Awareness (DNA) is a citizens' group with a longstanding interest in the Darlington Nuclear Generating Station and the Pickering Nuclear Generating Station. DNA was first organized in 1986 in the wake of the Chernobyl disaster and born out of a need for people in Durham Region to come together, learn & empower themselves.

As a volunteer group of concerned citizens, DNA dedicates themselves to raising public awareness about nuclear issues facing Durham Region, and fostering greater public involvement in the nuclear decision-making process. DNA has appeared on numerous occasions before the CNSC and has a lengthy history lobbying for critical public health and safety measures, including improved emergency planning and baseline health studies, and setting standards for tritium in drinking water. DNA continues to advocate for upgrades to nuclear emergency plans to ensure the protection of communities in the event of a nuclear accident.

¹ M.V. Ramana is the Simons Chair in Disarmament, Global and Human Security and Professor at the School of Public Policy and Global Affairs, University of British Columbia, Vancouver, Canada.

² Canadian Nuclear Safety Commission, *Participant Funding Notice*, online:

<https://www.nuclearsafety.gc.ca/eng/the-commission/participant-funding-program/opportunities/2023-pic-ext/>

ii. *Slovenian Home Association*

Slovenian Home Association (“SHA”) is a non-profit cultural organization dedicated to the preservation of Slovenian culture language, heritage and identity in Canada. Many Slovenians reside in the vicinity of the Pickering and Darlington nuclear plants and are concerned about the proposed plans to expand nuclear power generation within the region, particularly with OPG proposing novel reactor technology at the Darlington site. Much of these concerns stem from emergency planning for nuclear accidents.

SHA members are not aware of what to do in case of a nuclear alert from the Province of Ontario. Some questions posed to SHA by its members include: *Should they be prepared to evacuate or stay at home? Where is their closest evacuation center? How to protect themselves by staying at home?* Despite emergency planning being a heavy concern for its members, SHA not been made aware of any public information meetings where the details of the actions taken by the citizens, in case of a nuclear alert, were discussed. SHA would welcome an opportunity to distribute emergency preparedness instructions to its members and to organize and host a preparedness workshop on the topic of emergency preparedness.

iii. *Canadian Environmental Law Association*

CELA is a non-profit, public interest law organization. CELA is funded by Legal Aid Ontario as a speciality legal clinic to provide equitable access to justice to those otherwise unable to afford representation for environmental injustices. For nearly 50 years, CELA has used legal tools to advance the public interest, through advocacy and law reform, in order to increase environmental protection and safeguard communities across Canada.

CELA has been involved in number of nuclear facility licensing and regulatory matters before the CNSC including federal environmental assessments. CELA also maintains an extensive library of public legal education materials related to Canada’s nuclear sector on its website.³

iv. *Dr. M.V. Ramana*

Expert review of this submission was provided by M. V. Ramana, Professor and Simons Chair in Disarmament, Global and Human Security at the School of Public Policy and Global Affairs (SPPGA), University of British Columbia. M. V. Ramana has extensive knowledge and expertise in the nuclear non-proliferation safety risks of reactor designs and accompanying adverse environmental effects. His research interests are in the broad areas of international security and

³ Canadian Environmental Law Association, online: www.cela.ca

energy supply, with a particular focus on topics related to nuclear energy and fissile materials that can be used to make nuclear weapons. He combines technical skills and interdisciplinary methods to address policy relevant questions related to security and energy issues.

III. BACKGROUND

The Pickering Nuclear Generating Station (hereinafter, “Pickering” or “NGS”) is located on the north shore of Lake Ontario, in the City of Pickering in the regional municipality of Durham, Ontario. The facility lies 32 km northeast of downtown Toronto and 21 km southwest of Oshawa. The facility is owned and operated by OPG. Pickering consists of eight nuclear reactors, Units 1-4 (Pickering A) and Units 5-8 (Pickering B). Currently, Units 1 and 4, and Units 5-8 are operational, while Units 2 and 3 have been placed in a safe storage state.⁴

In August 2018, the CNSC renewed the licence for Pickering for a period of 10 years. During the relicensing hearing, the Commission noted that should OPG intend to operate any NGS Unit beyond December 31, 2024, a decision from the Commission via a public hearing process would be required to change OPG’s licencing basis.⁵

In June 2023, OPG submitted a licence amendment application requesting to operate NGS units 5-8 to December 31, 2026 (units 1 and 4 would adhere to the current licence condition of being shut down by December 31, 2024). Additionally, OPG’s application is requesting the Commission’s authorization for an increased operating limit for units 5-8 pressure tubes from up to 295,000 effective full power hours (EFPH) to up to 305,000 EFPH.⁶

This licence amendment application marks the third request by OPG to extend Pickering’s operating licence beyond its design life. Prior to the 2018 licence renewal hearing, in 2012 OPG applied to renew Pickering’s licence for a 5-year period ending in December 2020. Because 2020 was beyond the assumed design life of certain operational parts in the NGS, especially the pressure tubes, OPG was required to demonstrate that Pickering could be operated safely until the end of 2020. The CNSC renewed the licence for Pickering on August 9, 2013, valid to August 31, 2018, but imposed hold points to review additional safety information from OPG about the ability of the pressure tubes and other components to withstand longer operations. The hold- points were removed in 2014.

⁴ Canadian Nuclear Safety Commission, “CMD 24-H5: A Licence Amendment – Ontario Power Generation Inc. Pickering Nuclear Generating Station,” (27 February 2024), p 4 [Staff CMD]

⁵ *Ibid*, p 5

⁶ *Ibid*, p 6

The Intervenor have previously expressed concerns about the renewal and extension of operations at Pickering.⁷ The Pickering NGS reactors are the oldest operating nuclear power reactors in Canada. The original Pickering Generating Station licence application to operate Unit 1 was submitted to the CNSC's predecessor, the Atomic Energy Control Board on August 14, 1970; the construction permit was issued February 24, 1966. The original application to operate Unit 5 was submitted to the then Atomic Energy Control Board on May 6, 1980; the original construction permit had been issued July 19, 1974.⁸

As Canada's oldest operating nuclear power reactor, the Pickering NGS has had a history of poor performance and created a risk to the public. It has also been plagued by substantial operating costs while producing energy that is not needed in the face of much more feasible alternative sources of power. Just as CELA submitted at the 2018 licence renewal hearing, CELA again reiterates that there are significant concerns as to whether OPG will be able make adequate provision for the protection of the environment and the health and safety of persons if it were to be granted an extension of operations at Pickering units 5-8 beyond the current end date. For this and the reasons outlined below, the Intervenor request the CNSC deny OPG's application to extend the operations of Pickering units 5-8 beyond the current expiration of December 31, 2024.

IV. PRELIMINARY MATTERS & PROCEDURAL CONCERNS

Transparency, accessibility and disclosure of documents of critical value should be a priority in licencing stages

During the research and revision processes to prepare this submission, the Intervenor encountered several barriers to ensuring that the hearing process is transparent and accessible for members of the public to adequately engage with the licencing amendment materials.

Firstly, the Intervenor raise the issue of ease of access for reviewing documents. When reading through OPG's written submission, there are numerous references made, and various reports and studies mentioned.⁹ However, these references are not hyperlinked within the 135-page document. The references within the document are not hyperlinked to the References section at the end of the

⁷ Canadian Environmental Law Association, "Evaluating Environmental Protection and Emergency Preparedness at the Pickering Nuclear Generating Station (Ref. 2018-H-03)" (7 May 2018), online: <https://cela.ca/wp-content/uploads/2019/07/1189-CELA-Submission-to-the-CNSC-Pickering-Licence-Renewal-2018-H-03.pdf> , p 10 **[CELA submission 2018]**

⁸ Canadian Environmental Law Association, "Emergency Planning at Pickering NGS - Submission to the CNSC," (May 3, 2013), online: <http://www.cela.ca/sites/cela.ca/files/899PickeringEmergencyPlanning.pdf>

⁹ Ontario Power Generation, "Written submission from Ontario Power Generation Inc." CMD 24-H5.1 (16 June 2023). *For example*, see p 25, where there are references to Pickering's Periodic Safety Review 2 (PSR2-B), as well as CNSC regulatory documents and International Atomic Energy Agency information, but no easy way to access these references. **[OPG CMD]**

document. This requires the reader to scroll to the bottom of the document to track down the referenced document. To further complicate a reader's search for references, the Reference section does not provide hyperlinks to each reference. This means that the reader must conduct a web search to locate important documents, assuming that the document is publicly available for review. Members of the public do not necessarily have the luxury of time scour a document to find a reference made within the proponent's application, and then look up the referenced document separately. When reading through the CNSC Staff's CMD by comparison, there are hyperlinked references throughout the document, which greatly assists a reader's research process. The Intervenor submit that when preparing licencing applications, proponents should be required to hyperlink references made within the document.

Secondly, the Intervenor note that there is a lack of procedural fairness associated with the volume of complex technical documents for the licence amendment versus the time and participant funding available to review the information. While the Intervenor have numerous concerns surrounding the extension of operations at units 5-8, there is simply a lack of resources for members of the public and intervenors to heavily engage with materials to flesh out concerns surrounding safety given the level of funding made available to the funded Intervenor. Comparing these resources to other major federal energy tribunals such as the National Energy Board, the CNSC funding and resulting participation process is inadequate.

Thirdly, there are documents that are not readily available for review prior to the hearing. For instance, in the Periodic Safety Review 2-B (PSR2-B), "Appendix B: Integrated Implementation Plan Resolution Action Overview" shows a list of Resolution Action targets with their completion dates. There are targets as late as 30 November 2024, and the "overall safety evaluation" target date being 31 December 2024, for "correspondence confirming that Pickering NGS safety analysis results in supporting of commercial operations of Pickering Units 5 to 8 to the end of 2026 are submitted by OPG to the CNSC"¹⁰ The Intervenor submit the public should have a chance to see these reports and the CNSC's evaluation of these reports and comment on it before the Commission approves continued operations at Pickering. In other words, the decision timeline set out in PSR2-B undercuts any possibility of meaningful public input during this hearing. For meaningful public engagement to occur, the CNSC needs to ensure there is adequate access and resources available for the members of the public to access and digest complex materials associated with the proponent's requested amendments to Pickering's licence.

Finally, another issue in terms of transparency and fair access to crucial documents stems from the process of document retrieval. During a workshop hosted by OPG in March 2024, a number of intervenors sought clarity from OPG about the process of requesting documents that are not in the possession of the CNSC. It turned out that OPG had not thought about how members of the public

¹⁰ Ontario Power Generation, "Pickering NGS Periodic Safety Review 2-B (PSR2-B) Integrated Implementation Plan" Appendix B, p 45 of 56

and intervenors would access certain documents within the licence application. Initially, intervenors were instructed by OPG to file a freedom of information (FOI) request to access documents from OPG. Submitting an FOI request would take too long for an individual to gain access to specific documents. This process would prohibit an individual from receiving, reading, and responding to the contents of a requested document before the hearing would occur. The Intervenor submit that an FOI request is an unacceptable process for obtaining materials for a public hearing, and should not be the process suggested to member of the public seeking additional documents.

After intervenors expressed concerns to OPG about the unfair recommendation to submit an FOI request, OPG assured that there would be a designated email address established for requesting documents from OPG. However, subsequent advice to the intervenors indicated that some documents might still require a FOI request. The Intervenor submit that proponents should be required to, at a minimum, ensure there is a contact point to quickly and easily request documents for a public hearing. The Intervenor further submit that to best achieve procedural fairness, a proponent should be required to host a public accessible database of all referenced documents (with the exception of those with security-sensitive content) to ensure members of the public have quick and easy access to documents without awaiting a response from a proponent employee. Even in case of security concerns these should be thoroughly scrutinized by the Commission to ensure that no more information is protected than absolutely necessary.

Recommendation No. 1: To increase transparency, the Intervenor submit that OPG should be required to make references easily accessible via hyperlinks within documents.

Recommendation No. 2: To ensure there is meaningful public engagement and input during public hearings such as this to extend the operations at an ageing nuclear power plant, it is essential that there is ample time provided for the public to have access to and read through essential documents and reports before a decision can be made to approve licencing amendments and renewals.

Recommendation No. 3: An FOI request is an unacceptable process for obtaining materials for a public hearing, and should not be the process suggested to member of the public seeking additional documents.

Recommendation No. 4: Proponents should be required to, at a minimum, ensure there is a contact point to quickly and easily request documents for a public hearing. Furthermore, to best achieve procedural fairness, a proponent should be required to host a public accessible database of all referenced documents (with the exception of those with security-sensitive content) to ensure members of the public have quick and easy access to documents without awaiting a response from a proponent employee.

V. ACTION REQUESTED OF THE COMMISSION

After reviewing submissions by CNSC staff and OPG, the Intervenors submit that the CNSC should deny OPG's request to extend the operations of Pickering Units 5-8 to December 2026. Under the NSCA, the Commission has an obligation to "...prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use [of nuclear substances].." ¹¹ Upon reviewing the relevant documents associated with OPG's application, the Intervenors identified several areas of concern that would contravene the objective of the CNSC, namely: inadequate emergency planning and evacuation planning measures; risks associated with Pickering's ageing parts and facilities; a history of poor performance at Pickering; and inadequate consideration of climate change impacts.

These concerns are discussed below, along with a number of recommendations and requests for the CNSC to adopt in response to OPG's request to extend the operations at this ageing nuclear power facility.

Based on the findings within this submission, in the interest of protecting the environment and ensuring public health and safety, the Intervenors submit that the Commission cannot, in good conscience, approve an extension of the operation of Pickering Units 5-8 to 2026.

Because the operation timeframe for units 5-8 should not be extended, the Intervenors further submit that the CNSC should not grant OPG's request for an increased operating limit for units 5-8 pressure tubes from up to 295,000 EFPH to up to 305,000 EFPH.

A. Emergency Planning and Evacuation Planning are inadequate

One of the primary concerns of the Intervenors collectively is ensuring there is adequate emergency planning measures in place to protect the public. This is an issue that the intervenors have vocalized in various public engagement opportunities with the CNSC. During the 2018 licence renewal application for Pickering, CELA expressed concerns surrounding emergency response planning and preparedness, urging the CNSC to exercise its stringent oversight role as to whether emergency planning and preparedness has been proven prior to exercising its discretion with regards to the Pickering NGS licence renewal. ¹²

These concerns remain relevant for OPG's request to extend operations at the NGS units 5-8, and the Intervenors urge the Commission to exercise its stringent oversight role and review OPG's emergency plans for Pickering to make a determination whether the risk to the public is acceptably low per section 24(4) of the NSCA. The Intervenors submit the risk is not acceptably low. On a

¹¹ *Nuclear Safety and Control Act*, SC 1997, c 9 at s 9(a)(i)

¹² CELA submission 2018, p 43

full review of emergency preparedness and especially evacuation planning, the state of emergency preparedness in the Durham Region and beyond is not sufficient.

The concern described above about the risk of severe accidents is exacerbated by weaknesses in plans for how to deal with the large population in the event of a severe accident that requires evacuation of people. As of 2021, the population of the Toronto census metropolitan area (CMA) was 6.2 million, which constitutes nearly 17 percent of the entire population of Canada.¹³ Between 2016 and 2021, the population of the Durham Region Census Division grew by 7.3 percent. This rapid population growth rate means that plans for emergency management can quickly become obsolete.

In the event of a severe accident with offsite releases, a significant fraction of these people could have to be evacuated.

In the case of the Fukushima Daiichi accidents, areas as far away as 50 km from the site had to be evacuated due to high radiation levels.¹⁴ The U.S. Nuclear Regulatory Commission recommended that U.S. citizens living within 80 kilometers of the Fukushima plants evacuate the area. Finally, in response to Prime Minister Naoto Kan's instructions, the Japan Atomic Energy Commission drew up a worst-case scenario for the nuclear accident, which explained that "all residents living within 170 kilometers or more of the Fukushima plant might need to be relocated, and relocation might need to be advised for those living within 250 kilometers...evacuation of the 30 million residents in the Tokyo metropolitan area could become necessary, depending upon wind direction".¹⁵

In 2017, CELA recommended that the province expand "the current 50 km secondary zone to 100 km from every Ontario and non-Ontario reactor, and provide for education, outreach, preparation, inventories, communication channels, contingency planning and other efforts needed to be prepared to restrict ingestion and provide alternative food and water in the case of a severe offsite accident".¹⁶ Given the growing population of the area, CELA reiterates that recommendation.

According to OPG's application, the 2023 Pickering Evacuation Time Estimate (ETE) study determined "the time to evacuate 90% of the population from Pickering Detailed Planning Zone (DPZ) (i.e., out to 10 km) ranges from 4 hours and 45 minutes to 8 hours and 25 minutes (e.g.,

¹³ <https://www.durham.ca/en/regional-government/resources/Documents/Council/CIP-Reports/CIP-Reports-2022/2022-INFO-31.pdf>

¹⁴ Greenpeace, "Lessons from Fukushima", February 2012 at p. 18

¹⁵ Funabashi, Y., and K. Kitazawa. "Fukushima in Review: A Complex Disaster, a Disastrous Response." *Bulletin of the Atomic Scientists* 68, no. 2 (2012): 9–21 at p. 10.

¹⁶ Canadian Environmental Law Association, "Discussion Paper on Planning Basis Review and Recommendations and List of Proposed Changes to the PNERP 2009" (28 July 2017), online: <https://cela.ca/provincial-nuclear-emergency-response-plan-pnerp-2009-discussion-paper/> at p 23

wintertime, with heavy snow at mid-day on a weekday).¹⁷ OPG’s application does not discuss the even longer estimates to evacuate 100% of the DPZ: “the ETE for the 100th percentile are significantly longer than those for the 90th percentile, ranging from 4:30 to 10:15 for Regions R01 through R03 and 11:00 to 17:00 for Region R04. This is the result of significant congestion within the study area.”¹⁸ In the event of a severe accident, taking up to 17 hours to evacuate 100% of just the DPZ is deeply concerning, as this timing does not capture the impact of a larger zone radius (i.e., our proposed 100 km radius).

The Pickering ETE study notes:

Current Provincial Nuclear Emergency Response Plans indicate pre-planned protective actions are to be developed for the Detailed Planning Zone Outer Ring (DPZ Outer Ring) and contingency planning and arrangements are to be made for the Contingency Planning Zone (CPZ). As such, this report focuses on the DPZ Outer Ring, but provides information, including data, analyses and results, for the CPZ for contingency planning purposes.¹⁹

With the current radius limitations, the evacuation times are likely downplaying the potential public confusion and even chaos, and increased evacuation times needed for a larger area in the event of a severe offsite accident. Given the lengthy evacuation times needed to mitigate the health impacts on all the surrounding population of a severe accident at this ageing nuclear plant, the CNSC should insist on the expansion of the planning zones around Pickering.

Another area of concern arising from OPG’s application is the failure to carefully sufficiently consider potential accidents with large offsite releases. Hazards such as malfeasance or air accidents, for instance, are not considered by OPG, nor are unexpected chains of events and unexpected consequences of human error. When assessing internal and external hazards that may result in large offsite releases, certain hazards are have been screened out because OPG has deemed the likelihood of occurrence as low, even though risks such as those mentioned above are not outside the realm of possibility of occurring. When discussing the probabilistic safety assessment (PSA), OPG states:

PSAs are conducted separately for internal and external types of hazards, in particular, they are for internal events, internal fires, internal floods, seismic hazards, and high wind hazards. Many other hazards are also examined and addressed as part of the PSA hazard

¹⁷ OPG CMD at p 36.

¹⁸ Ontario Power Generation, “Pickering Nuclear Generating Station Evacuation Time Estimate” (24 March 2023), online: <https://www.opg.com/documents/pickering-ngs-development-of-evacuation-time-estimates/> p ES-2.

¹⁹ *Ibid*, p xiii

screening process (some hazards – meteorites, for example – are deemed to be of such low likelihood that they were screened out, and not developed into PSA models).²⁰

CELA has previously expressed concerns to the CNSC about OPG’s lack of consideration for severe accidents, and planning for worst-case scenarios due to low likelihood of occurrence.²¹ While meteorite strikes might not be a significant risk, screening out hazards from a PSA on the basis of the OPG’s evaluation of the likelihood of the hazard raises concerns that OPG is not prepared for worst case scenario accidents. Many scholars have explained why risk assessments are often unreliable because they cannot account for “unknown unknowns” and estimates of very low probabilities of accidents are not credible.²² No nuclear plant is immune to the possibility of a major accident, even in case of reactors featuring multiple safety systems. The case of the multiple reactor meltdowns at the Fukushima-Daiichi nuclear power plant involved the failure of many safety systems due to a single root cause – the earthquake, which was also the cause of the tsunami.

The failure was also institutional. The Tokyo Electric Power Company that owned and operated the Fukushima reactors and the nuclear safety agency in Japan both convinced themselves that the reactors were safe. CELA is concerned that safety assessments of the ageing Pickering nuclear plant might be suffering from similar blind spots. As CELA has emphasised in previous submissions before the CNSC, simply because the likelihood of an event occurring is very low, it does not guarantee that a severe nuclear reactor accident will never happen.

The Intervenor submit that the safety assessment for Pickering is inadequate because it does not plan for severe accident scenarios and the CNSC cannot come to the determination that the risk associated with extending units 5-8 would not pose a risk to human health and the environment.

Recommendation No. 5: The province should expand the current 50 km secondary zone to 100 km from every Ontario and non-Ontario reactor, and provide for education, outreach, preparation, inventories, communication channels, contingency planning and other efforts needed to be

²⁰ OPG CMD at p 29, *emphasis added*.

²¹ See for instance, CELA, “Comments on the applicability of the Darlington New Nuclear Project’s environmental assessment and plant parameter envelope to Ontario Power Generation’s selected BWRX-300 reactor technology” (17 November 2023), online: <https://api.cnsccsn.gc.ca/dms/digital-medias/CMD24-H2-8.pdf/object?subscription-key=3ff0910c6c54489abc34bc5b7d773be0> p15

²² Raju, Suvrat. “Estimating the Frequency of Nuclear Accidents.” *Science & Global Security* 24, no. 1 (2016): 37–62; Ramana, M. V. “Beyond Our Imagination: Fukushima and the Problem of Assessing Risk.” *Bulletin of the Atomic Scientists*, April 19, 2011. <https://thebulletin.org/2011/04/beyond-our-imagination-fukushima-and-the-problem-of-assessing-risk/>; Downer, John. “Disowning Fukushima: Managing the Credibility of Nuclear Reliability Assessment in the Wake of Disaster.” *Regulation & Governance* 8, no. 3 (2014): 287–309. <https://doi.org/10.1111/rego.12029>; Downer, John, and M. V. Ramana. “Empires Built on Sand: On the Fundamental Implausibility of Reactor Safety Assessments and the Implications for Nuclear Regulation.” *Regulation & Governance* 15, no. 4 (2021): 1304–25. <https://doi.org/10.1111/rego.12300>.

prepared to restrict ingestion and provide alternative food and water in the case of a severe offsite accident.

Recommendation No. 6: CNSC should declare that the accident analysis prepared for Pickering is inadequate and it cannot come to a determination that the risk associated with extending units 5-8 would not pose a risk to human health and the environment.

B. Ageing Parts and Facilities at the Pickering Nuclear Generating Station pose a cause for concern

CELA emphasizes that the extension request is for a nuclear reactor with old and ageing parts and equipment, while the size of the surrounding population has continued to increase, with more population planned for the area. The request is also being made when OPG has not completed all of the necessary outstanding safety studies relevant to this extension request. We note that Pickering NGS Periodic Safety Review 2-B (April 2023) includes no less than thirteen (13) unresolved issues, many of which have great safety significance. Since they have not been resolved, there is an insufficient basis to authorize continued operations past December 2024. Among the critical components that are at risk of aging related problems are fuel channels and steam generators.

Fuel Channels and their degradation pose major challenges. Each of these fuel channels is in a different location and operating at a different individual power level. Therefore, their degradation will not occur at the same rate; modelling these different components and how they might behave in the event of an accident is very complex.²³

These concerns should be considered in view of the insights from the Fukushima accident and dangers of climate change related events.

When they melted down, the first three reactor units at Fukushima Daiichi had been operating for 41 years, 38 years and 37 years respectively.²⁴ Pickering units 5 through 8 have been operating for 42 years, 41 years, 40 years, and 39 years.²⁵ Old nuclear plants are particularly susceptible to accidents, the likelihood of which can be described by something called the bathtub curve.²⁶ The failure rate is initially high due to manufacturing problems and operator errors associated with new technology. Then curving like a tub, the failure rate declines with experience and rises again as

²³ Nijhawan, Sunil. "Severe Accident Related Vulnerabilities, Potential Design Enhancements and Opportunities for International Cooperation in Risk Reduction in Pressurized Heavy Water Reactors." American Society of Mechanical Engineers Digital Collection, 2015. <https://doi.org/10.1115/NUCLRF2015-49574>.

²⁴ <https://pris.iaea.org/pris/CountryStatistics/CountryDetails.aspx?current=JP>

²⁵ <https://pris.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=CA>

²⁶ Lochbaum, David. "The Bathtub Curve, Nuclear Safety, and Run-to-Failure." *The Equation* (blog), November 17, 2015. <https://blog.ucsusa.org/dlochbaum/the-bathtub-curve-nuclear-safety-and-run-to-failure/>.

aging related wear and tear starts increasing. In other words, the dangers of continuing operations are high and increasing.

The problem of ageing is likely to be even more severe in the case of the Pickering units because they were intended to be shut down. The scale of the challenge might be appreciated from looking at the case of the Diablo Canyon nuclear plant in California in the USA. The two reactor units were to be shut down in 2024 and 2025 but due to political reasons, there are now plans to extend operations at this reactor.²⁷ This has led to an evaluation of its safety.

In July 2022, the Chair of the Diablo Canyon Independent Safety Committee explained why this case was very difficult: “so many different programs and projects and so on have been put in place over the last half a dozen years predicated on that closure in 2024-25 and each one of those would have to be evaluated and some of them are okay and some of them won't be and some are going to be a real stretch and some are going to cost money and some of them aren't going to be able to be done maybe”.²⁸ This is the kind of challenge that we are confronting at Pickering too.

One should note that in February 2011, just a month before the devastating accident at the Fukushima Daiichi nuclear plant, Japan's Nuclear and Industrial Safety Agency, approved a 10-year extension for the oldest of the six reactors at the power station. This was done despite warnings about its safety.²⁹ This decision, in part, resulted in the disastrous nuclear accident in 2011, posing immense consequences to people's health, the environment, and the economy.

The Intervenors submit that with so many uncertainties surrounding the ageing equipment of Pickering, allowing the NGS to continue operating beyond 2024 would irresponsibly place the environment and the public at enhanced and unsupportable risk. Due to the ageing parts and equipment at Pickering, along with the numerous unresolved issues within the Periodic Safety Review 2-B, the risk for severe incidents is too great to grant OPG's application.

Recommendation No. 7: The Commission should deny the application for a further extension of the aging units since allowing the NGS to continue operating beyond 2024 would irresponsibly place the environment and the public at risk.

²⁷ Sara Nelson and M. V. Ramana. “Managing Decline: Devaluation and Just Transition at Diablo Canyon Nuclear Power Plant.” *Environment and Planning A: Economy and Space* 55, no. 8 (2023): 1951–69. <https://doi.org/DOI:10.1177/0308518X231167865>.

²⁸ June 22, 2022: *Diablo Canyon Independent Safety Committee--Diablo Relicensing Concerns Discussed*, 2022. <https://www.youtube.com/watch?v=WjTq-ybnaSY>.

²⁹ Tabuchi, Hiroko, Norimitsu Onishi, and Ken Belson. “Japan Extended Reactor's Life, despite Warning.” *New York Times*, March 22, 2011.

C. Poor Performance at the Pickering Nuclear Generating Station

Pickering's performance data as reported by the International Atomic Energy Agency's ("IAEA") Power Reactor Information System Database does not suggest that these reactors are performing well.³⁰ The load factors for the last two years reported on the PRIS database for Pickering-5 are below its average lifetime load factor, with the 2022 load factor being a paltry 52.8 percent. Likewise, Pickering-7 and Pickering-8 fell below their lifetime averages in 2021 (with load factors of only 62.8 percent and 54.4 percent respectively).

According to the IAEA's Operating Experience with Nuclear Power Stations in Member Stations document for 2023, Pickering-5 was not functioning for 3826 hours (44 percent of the time), which includes 57 hours because of environmental conditions such as lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning; Pickering-6 for 915 hours, including 94 hours because of environmental conditions; Pickering-7 for 790 hours; and Pickering-8 for 971 hours.³¹ In other words, two of the units were not contributing energy for extended periods of time, and two were shut down for 2-4 days due to causes that might well have to do with climate change.

In addition to the findings by the IAEA, the CNSC Staff CMD itself highlights several concerns indicating poor performance at Pickering.

Firstly, in the application of the "as reasonably low as achievable" (ALARA) principle—which is a requirement under the *Radiation Protection Regulations*,³² through a desktop inspection in December 2022, CNSC staff identified non-compliant findings of low and negligible safety significance:

During the inspection, CNSC staff reviewed OPG's 5-year ALARA plan and found that OPG did not have the governance support documents in place to drive the creation and content of this plan. As a result, CNSC staff requested that OPG develop governance support documents to formalize the requirements for creating and maintaining a 5-year ALARA plan and create an implementation plan for corrective actions. CNSC staff will continue to monitor and assess OPG's implementation of these corrective actions and its 5-year ALARA plan at the Pickering NGS.³³

³⁰ IAEA, "Power Reactor Information System (PRIS)", Canadian plant details, online:

<https://pris.iaea.org/pris/CountryStatistics/CountryDetails.aspx?current=CA>

³¹ IAEA, "Operating Experience with Nuclear Power Stations in Member States 2023 Edition" (2023), online:

https://www-pub.iaea.org/MTCD/Publications/PDF/OPEX_2023_web.pdf.

³² Radiation Protection Regulations, under the *Nuclear Safety and Control Act* (SOR/2000-203)

³³ CNSC Staff CMD, p 49.

While the non-compliance with the ALARA principle's application was deemed to be of "low" and "negligible" safety significance by CNSC staff, the failure to have a properly developed ALARA plan in place is concerning, as these plans are intended to ensure that contamination levels and radiation doses received by individuals are monitored, controlled and maintained as low as reasonably achievable. By failing to implement such important safety plans, the Intervenors are concerned that allowing Pickering to continue operations beyond 2024, poses a risk that important health and safety measures and plans will fall to the wayside. As Pickering continues to age and reach the end of its operational lifespan, there are concerns surrounding worker complacency resulting in further non-compliances. The Intervenors submit that the CNSC should not discount the non-compliance with important safety measures.

Yet another non-compliance highlighted within the CNSC staff CMD concerned the maintenance of fire emergency response equipment and the utilization of firefighting equipment and tools.³⁴ While OPG has implemented corrective action plans to address these non-compliances, it is concerning that fire emergency equipment within a nuclear power plant was not being properly maintained.

CNSC staff have noted that in previous years (2021 and 2022), Pickering failed to meet CNSC staff standards for the Security SCA. Due to an increase in regulatory scrutiny, the CNSC staff note that they are satisfied that OPG is "adequately addressing the identified issues," and "overall, CNSC staff conclude that OPG's programs within the security SCA are adequate for continued commercial operations until the end of 2026."³⁵ This "enhanced regulatory scrutiny" involved the issuance of an Administrative Monetary Penalty (AMP) to OPG in 2023 as a result of a failure to comply with a licence condition in relation to its security program at the Pickering and Darlington Nuclear Generating Stations. The AMP was issued to promote compliance and deter recurrence."³⁶ The issuance of an AMP by the CNSC is uncommon, so the requirement to issue a monetary penalty to encourage OPG to maintain compliance at not one but two nuclear power plants does not exude confidence in the ability to maintain proper safety measures at Pickering for two more years beyond the current licence.

While most instances of non-compliance at Pickering have been deemed by CNSC staff to be low risk, the frequency of these occurrences in Pickering's later stages of its operation suggest that safety measures are not being treated as a top priority in day-to-day operations at Pickering. The Intervenors submit that the Commission needs to consider these instances of non-compliance, and balance their frequency of occurrence with the risk of accidents impacting the environment and the public.

³⁴ *Ibid* at p 64.

³⁵ *Ibid* at p 69.

³⁶ *Ibid* at p 69-70.

Recommendation No. 8: Given the poor performance of Pickering’s reactors, the CNSC should deem units 5-8 as having reached the end of their operational phase, and deny a further extension of their operations.

Recommendation No. 9: The Commission should consider these instances of non-compliance, their frequency of occurrence, the age of the plant, and the consequences of a severe accident with large offsite releases that would impact the environment and the public.

D. The Pickering Nuclear Generating Station is not prepared to adapt to and mitigate the impacts of Climate Change

The impacts of climate change on nuclear reactors includes various climate-related hazards such as heat waves, floods, droughts, storms, lightning events and wildfires which can pose challenges to nuclear safety, necessitating enhanced safety assessments and adaptive management strategies.³⁷ Rising temperatures can threaten nuclear reactors, as they rely on large external sources of water for cooling. In the case of Canadian reactors, this water is usually from the Great Lakes, or the Bay of Fundy in the case of Point Lepreau. Heightened water stress, either from reduced availability or competing uses, is a concern since nuclear reactors require significant amounts of water for cooling purposes.³⁸

Higher water temperatures can reduce the thermal efficiency of nuclear reactors. Studies of climate-driven alterations in energy sectors in Ontario, Canada, show anticipated temperature increases and consequent loss of thermal efficiency in the output from reactors will result in reduced generation of electricity of somewhere between 1.5 and 2.5 percent by the 2050s, and between 2.5 and 4.0 percent by the 2080s.³⁹ While the current proposed extension is for a much shorter time, the trend is clear.

A second source of reduced output is having to shut down nuclear reactors for shorter or longer periods of time because of extreme weather conditions, including high water temperatures.⁴⁰

³⁷ Linnerud, K., Mideksa, T. K., & Eskeland, G. S. (2011). The impact of climate change on nuclear power supply. *The Energy Journal*, 32(1); Kromp-Kolb, Helga, Nikolaus Muellner, Duck Kim, Jaroslav Holy, Sanna Syri, Jean-Yves Caneill, Gernot Thuma, et al. “Climate Change: Assessment of the Vulnerability of Nuclear Power Plants and Approaches for Their Adaptation.” Paris: Nuclear Energy Agency, OECD, 2021.

³⁸ Linnerud, K. et al.

³⁹ Wang, S., Zhu, J., Huang, G., Baetz, B., Cheng, G., Zeng, X., & Wang, X. (2020). Assessment of climate change impacts on energy capacity planning in Ontario, Canada using high-resolution regional climate model. *Journal of Cleaner Production*, 274, 123026.

⁴⁰ See: Ahmad, Ali. “Increase in Frequency of Nuclear Power Outages Due to Changing Climate.” *Nature Energy* 6, no. 7 (July 2021): 755–62. <https://doi.org/10.1038/s41560-021-00849-y>; see also Ahmad, Ali, Andrei Covatariu, and M. V. Ramana. “A Stormy Future? Financial Impact of Climate Change-Related Disruptions on Nuclear Power Plant Owners.” *Utilities Policy* 81 (April 1, 2023): 101484. <https://doi.org/10.1016/j.jup.2022.101484>.

Reactors have to cease generating power because the required cooling cannot be ensured or because of other operational challenges.

We may already be witnessing such a climate driven impact as increasing temperatures lead to accelerating growth of algae and jellyfish, which can block input of water.⁴¹ Climate impacts have already happened repeatedly at Pickering, most recently in 2018 when heavy rain and warmer temperatures when units 5, 6, 7, and 8 had to be shut down after algae clogged the cooling water intakes.⁴² This has happened in earlier years too including in 2003, when OPG had to shut down Unit 7, and in 2005, when Units 5, 6, and 8 were shut down because of a large incursion.⁴³ Those shut downs prompted OPG to install a diversion net by the water intake and improving its operating procedures, at considerable cost.⁴⁴ But as the subsequent forced shut down of four units in 2018 showed, these changes have not eliminated the problem. As climate change intensifies, such shut downs will become more common and result in revenue being lost.

Within OPG's application, the only climate change mitigation discussion surrounds algae accumulation.⁴⁵ There is no discussion of how OPG plans to address and prevent other impacts of climate change from shutting down the Pickering reactors. For example, extreme weather events such as floods, heatwaves, wildfires, lightning events or extreme heat events are not discussed within the "Equipment Reliability and Climate Change" section of OPG's application. The Intervenor is concerned that Pickering is not currently equipped to address the impacts of climate change, and granting an additional 2 years of operation time for units 5-8 will not improve OPG's (lack of) mitigation measures. The Intervenor submit that without robust climate change mitigation strategies in place, it would be irresponsible for the Commission to extend the operation period for units 5-8 beyond 2024.

In April 2024, the U.S. Government Accountability Office (GAO) released a report titled "Nuclear Power Plants: NRC Should Take Actions to Fully Consider the Potential Effects of Climate Change." The GAO notes that "climate change is likely to exacerbate natural hazards—such as floods and drought. The risks to nuclear power plants from such hazards include damage to systems

⁴¹ Lin, H., Zhang, S., Cao, R., Yu, S., Bai, W., Zhang, R., ... & Zhang, X. (2023). A review on the risk, prevention and control of cooling water intake blockage in coastal nuclear power plants. *Nuclear Engineering and Technology*.

⁴² Dalton, David. "Four Pickering Units Safely Shut Down After Algae Clogs Cooling Water Intakes." *NucNet*, February 22, 2018. <https://www.nucnet.org/news/four-pickering-units-safely-shut-down-after-algae-clogs-cooling-water-intakes>.

⁴³ Hamilton, Tyler. "Algae Prompt Reactor Shutdown." *Toronto Star*, August 10, 2007. https://www.thestar.com/business/algae-prompt-reactor-shutdown/article_eafac9ca-d686-5e22-ab91-5300e2f5e1b0.html.

⁴⁴ Kopytko, Natalie. "Spineless Attacks on Nuclear Power Plants Could Increase." *Bulletin of the Atomic Scientists*, February 19, 2015. <https://thebulletin.org/2015/02/spineless-attacks-on-nuclear-power-plants-could-increase/>.

⁴⁵ OPG CMD at p 94-95.

and equipment that ensure safe operation.”⁴⁶ The GAO noted that the Nuclear Regulatory Commission (NRC) does not fully consider potential increases in risk from climate change, and therefore recommended the NRC assess whether its existing processes adequately address climate risks and develop and implement a plan to address any gaps identified.⁴⁷ The Intervenors recommend that the CNSC conduct an assessment and mapping of vulnerability of Canadian nuclear power plans to climate change hazards, similar to the one recommended in the GAO report.

Recommendation No. 10: Without robust climate change mitigation strategies in place, it would be irresponsible for the Commission to extend the operation period for units 5-8 beyond 2024.

Recommendation No. 11: The CNSC should conduct an assessment and mapping of vulnerability of Canadian nuclear power plans to climate change hazards, similar to those shown in the GAO report.

VI. CONCLUSION

For the foregoing reasons provided in this submission, DNA, SHA, and CELA submit it would be contrary to the responsibility of the Commission to protect the environment and ensuring the health and safety of persons if it were to allow Pickering Units 5-8 to operate beyond 2024, and recommend the CNSC issue an order:

- (1) Granting Durham Nuclear Awareness, Slovenian Home Association, and the Canadian Environmental Law Association the status of intervenor;
- (2) Granting Durham Nuclear Awareness, Slovenian Home Association, and the Canadian Environmental Law Association the opportunity to make an oral presentation at the January 2024 public hearing;
- (3) Denying OPG’s request to amend the PROL of Pickering Nuclear Generating Station to operate units 5-8 to December 31, 2026; and
- (4) Denying OPG’s request to amend the PROL to increase the pressure tube operating limit to 305,000 EFPH.

⁴⁶ U.S. Government Accountability Office, “Nuclear Power Plants: NRC Should Take Actions to Fully Consider the Potential Effects of Climate Change.” GA-24-106326 (2 April 2024), online: https://www.gao.gov/products/gao-24-106326?utm_campaign=usgao_email&utm_content=topic_naturalresources&utm_medium=email&utm_source=go_vdelivery

⁴⁷ *Ibid.*

Sincerely,

On behalf of

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
DURHAM NUCLEAR AWARENESS
SLOVENIAN HOMEOWNERS ASSOCIATION

A handwritten signature in black ink that reads "Sara Libman". The signature is written in a cursive style and is positioned above a solid horizontal line.

Sara Libman
Legal Counsel

APPENDIX A - SUMMARY OF RECOMMENDATIONS

Recommendation No. 1: To increase transparency, the Intervenors submit that OPG should be required to make references easily accessible via hyperlinks within documents.

Recommendation No. 2: To ensure there is meaningful public engagement and input during public hearings such as this to extend the operations at an ageing nuclear power plant, it is essential that there is ample time provided for the public to have access to and read through essential documents and reports before a decision can be made to approve licencing amendments and renewals.

Recommendation No. 3: An FOI request is an unacceptable process for obtaining materials for a public hearing, and should not be the process suggested to member of the public seeking additional documents.

Recommendation No. 4: Proponents should be required to, at a minimum, ensure there is a contact point to quickly and easily request documents for a public hearing. Furthermore, to best achieve procedural fairness, a proponent should be required to host a public accessible database of all referenced documents (with the exception of those with security-sensitive content) to ensure members of the public have quick and easy access to documents without awaiting a response from a proponent employee.

Recommendation No. 5: The province should expand the current 50 km secondary zone to 100 km from every Ontario and non-Ontario reactor, and provide for education, outreach, preparation, inventories, communication channels, contingency planning and other efforts needed to be prepared to restrict ingestion and provide alternative food and water in the case of a severe offsite accident.

Recommendation No. 6: CNSC should declare that the accident analysis prepared for Pickering is inadequate and it cannot come to a determination that the risk associated with extending units 5-8 would not pose a risk to human health and the environment.

Recommendation No. 7: The Commission should deny the application for a further extension of the aging units since allowing the NGS to continue operating beyond 2024 would irresponsibly place the environment and the public at risk.

Recommendation No. 8: Given the poor performance of Pickering's reactors, the CNSC should deem units 5-8 as having reached the end of their operational phase, and deny a further extension of their operations.

Recommendation No. 9: The Commission should consider these instances of non-compliance, their frequency of occurrence, the age of the plant, and the consequences of a severe accident with large offsite releases that would impact the environment and the public.

Recommendation No. 10: Without robust climate change mitigation strategies in place, it would be irresponsible for the Commission to extend the operation period for units 5-8 beyond 2024.

Recommendation No. 11: The CNSC should conduct an assessment and mapping of vulnerability of Canadian nuclear power plants to climate change hazards, similar to those shown in the GAO report.