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

CNSC Hearing Reference 24-H5

Sara Libman, Legal Counsel

Dr. M.V. Ramana

June 19, 2024

Canadian Environmental Law Association

EQUITY. JUSTICE. HEALTH.

Photo: Sara Libman

cela.ca

Canadian Environmental Law Association (CELA)

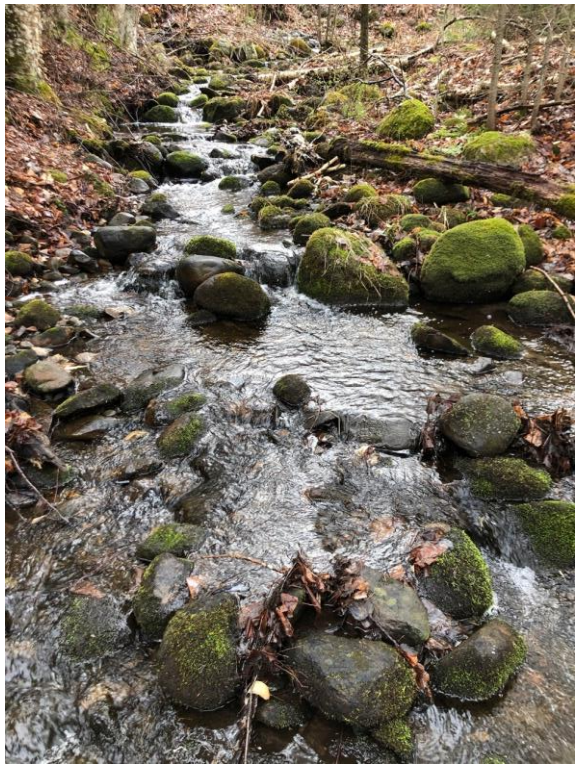

Photo: Kelly Mathews

- Specialty legal aid clinic dedicated to environmental equity, justice, and health
- Founded in 1970, funded by Legal Aid Ontario since 1978
- CELA provides free legal services relating to environmental justice in Ontario, including representing qualifying low-income and vulnerable communities in the courts and before tribunals. CELA also provides free summary advice to the public and engages in legal education and law reform initiatives.

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

I. Interest and Expertise of the Intervenors

Durham Nuclear Awareness (DNA) is a citizens' group with a longstanding interest in the Darlington Nuclear Generating Station and 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.

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. Much of these concerns stem from emergency planning for nuclear accidents.

Expert Retained for Technical Review:

Dr. M.V. Ramana is a Professor and the 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 published several peer-reviewed papers and reports on SMRs and has expertise in analyzing the multiple risks associated with these and accompanying adverse environmental effects.

II. Scope of Review

Photo: Sara Libman

- Reviewed OPG's documents which have been made publicly available, as well as the CNSC staff Commission Member Document (CMD) prepared in response to OPG's application.
- Considered 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 (per **section 24(4)**).
- Expands on Intervenors' previously expressed concerns surrounding the renewal and extension of operations at Pickering.

III. Preliminary Concerns: Transparency, Accessibility and Disclosure of Documents

The Intervenors encountered several barriers to ensuring that the hearing process is transparent and accessible for members of the public to adequately engage with the licensing amendment materials (see *recommendations 1-4*):

1. **Issue of ease of access of documents**: OPG's written submission does not hyperlink the numerous references made, neither within the report nor the references section.

2. **A lack of procedural fairness** associated with the volume of complex technical documents for the licence amendment vs the time and participant funding available to review the information.

3. **Documents were not readily available for review prior to the hearing**. *Example*: the decision timeline set out in Periodic Safety Review 2-B (PSR2-B) undercuts any possibility of meaningful public input during this hearing.

4. **Lack of transparency surrounding document retrieval from OPG**. As indicated at a workshop hosted by OPG in March 2024, OPG had not thought about how members of the public & intervenors would access certain documents, and had initially instructed intervenors to submit FOI requests to access documents from OPG.

The Intervenors 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 Intervenors 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.

IV. Summary of Findings (1)

Photo: Ajman Ladher

- **The CNSC should deny OPG's request to extend the operations of Pickering Units 5-8 to December 31, 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]...*"

IV. Summary of Findings (2)

The Intervenors identified several areas of concern that would contravene the objective of the CNSC, namely:

A. **Inadequate emergency planning and evacuation planning measures**;
   - Recommendations 5-6

B. **Risks associated with Pickering's ageing parts and facilities**;
   - Recommendation 7

C. **History of poor performance at Pickering**;
   - Recommendations 8-9

D. **Inadequate consideration of climate change impacts**
   - Recommendations 10-11

V. Detailed Findings

A. Inadequate Emergency Planning and Evacuation Planning Measures (1)

- One of the primary concerns of the Intervenors collectively is ensuring there is adequate emergency planning measures in place to protect the public.
- 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 <u>not</u> acceptably low.
- The state of emergency preparedness in Durham Region and beyond is not sufficient for dealing with the large population that would require evacuation in the event of a severe accident.
  - As of 2021, the population of the Toronto census metropolitan area was 6.2 million (nearly 17% of the entire population of Canada)
  - Between 2016 and 2021, the population of the Durham Region Census Division grew by 7.3 percent. This rapid growth means that plans for emergency management can quickly become obsolete.

A. Inadequate Emergency Planning and Evacuation Planning Measures (2)

- 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. The U.S. Nuclear Regulatory Commission recommended that U.S. citizens living with 80 kilometers of the Fukushima plants evacuate the area.
- The Intervenors reiterate CELA's recommendation from 2017 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.
- 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.

A. Inadequate Emergency Planning and Evacuation Planning Measures (3)

- Another area of concern arising from OPG's application is the failure to carefully sufficiently consider potential accidents with large offsite releases.
  - OPG's application does not adequately consider severe accidents, unexpected chains of events or consequences of human error.
- When assessing internal and external hazards that may result in large offsite releases, certain hazards 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*.
- Risk assessments are often unreliable because they cannot account for "unknown unknowns" and estimates of very low probabilities of accidents are not credible.
  - 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.
- 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 Intervenors 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.

B. Risks Associated with Ageing Parts and Facilities (1)

- We emphasize 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.
  - 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.**

B. Risks Associated with Ageing Parts and Facilities (2)

- 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.
- 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.
  - Pickering units 5 through 8 have been operating for 42 years, 41 years, 40 years, and 39 years.
  - Old nuclear plants are particularly susceptible to accidents, the likelihood of which can be described by something called the **bathtub curve**. 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 aging related wear and tear starts increasing. **In other words, the dangers of continuing operations are high and increasing**.

B. Risks Associated with Ageing Parts and Facilities (3)

- 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. This has led to an evaluation of its safety.
  - 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. 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.

C. Poor Performance at Pickering Nuclear Generating Station (1)

- 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.
  - 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.
- 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.

C. Poor Performance at Pickering Nuclear Generating Station (2)

- The CNSC Staff CMD highlighted several concerns indicating poor performance at Pickering.
  - In the application of the "as reasonably low as achievable" (ALARA) principle—which is a requirement under the *Radiation Protection Regulations*, through a desktop inspection in December 2022, CNSC staff identified non-compliant findings of low and negligible safety significance: *OPG did not have the governance support documents in place to drive the creation and content of this plan.*
  - 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.
  - CNSC staff have noted that in previous years (2021 and 2022), Pickering failed to meet CNSC staff standards for the Security SCA.
    - "Enhanced regulatory scrutiny" for Pickering resulted 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. (the issuance of AMPs by the CNSC is uncommon)
- 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.

D. Inadequate Consideration of Climate Change Impacts (1)

- Climate change, water, and nuclear power interact with each other, creating an **adaptation-mitigation dilemma**, "which signals that existing and projected climate change threatens the operations and safety of existing plants and poses other challenges to efforts to adapt to climate change. Thus existing nuclear power plants may not represent a good technology for mitigation of climate change." - (Natalie Kopytko, John Perkins, Climate change, nuclear power, and the adaptation–mitigation dilemma, Energy Policy, Volume 39, Issue 1, 2011, Pages 318-333, ISSN 0301-4215)
- 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.
- **Heightened water stress**, either from reduced availability or competing uses, is a concern since nuclear reactors require significant amounts of water for cooling purposes.
- 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. While the current proposed extension is for a much shorter time, the trend is clear.

D. Inadequate Consideration of Climate Change Impacts (2)

- 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 and heat waves.
- 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.
  - 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.
  - 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.
- As climate change intensifies, such shut downs will become more common and result in revenue being lost.

D. Inadequate Consideration of Climate Change Impacts (3)

- While OPG's application discusses the mitigation of algae accumulation, OPG does not provide plans to address and prevent other impacts of climate change from shutting down 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
- We are 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.
- **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 and equipment that ensure safe operation.**"
  - 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.**

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.

VI. Order Requested

Order Requested

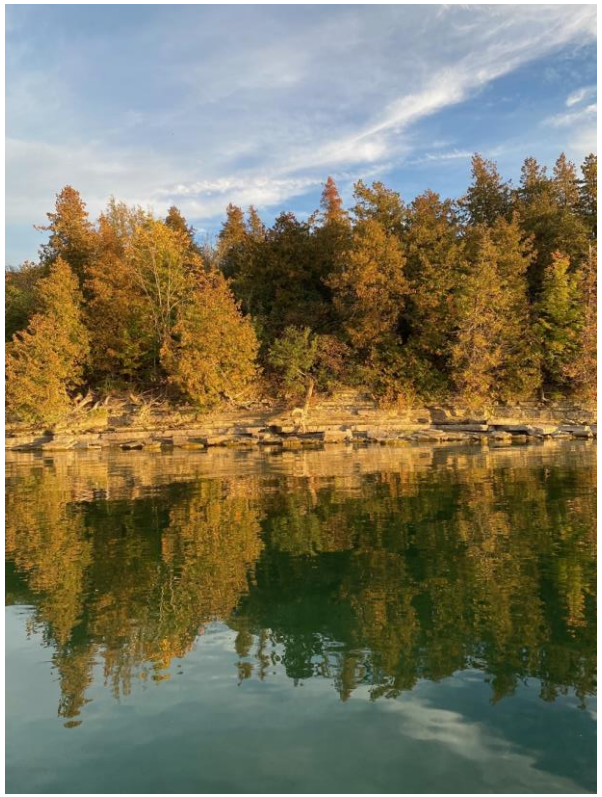

Photo: Rick Lindgren

1. Denying OPG's request to amend the PROL of Pickering Nuclear Generating Station to operate units 5-8 to December 31, 2026; and
2. Denying OPG's request to amend the PROL to increase the pressure tube operating limit to 305,000 EFPH.

Thank you.

Appendix A: List 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 plans to climate change hazards, similar to those shown in the GAO report.