Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 25-H101.4

Date: 2025-05-05

Written Submission from the City of Pickering and the Canadian Association of Nuclear Host Communities

Mémoire de la Ville de Pickering et de la Canadian Association of Nuclear Host Communities

In the matter of

À l'égard d'

Ontario Power Generation Inc.

Ontario Power Generation Inc.

Application to amend the Pickering Waste Management Facility to authorize construction and operation of the Pickering component storage structure

Demande de modification du permis de l'installation de gestion des déchets de Pickering pour autoriser la construction et l'exploitation de la structure de stockage des composants de Pickering

Public Hearing - Hearing in writing based on written submissions

Audience Publique - Audience par écrit fondée sur des mémoires

July 2025

Juillet 2025

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Canada

CANADIAN ASSOCIATION OF
NUCLEAR HOST COMMUNITIES
www.canhc.ca

May 5, 2025

Participant Funding Program Administrator
Canadian Nuclear Safety Commission
280 Slater Street
Ottawa, ON K1P 5S9

To the Commission:

Please find attached the Canadian Association of Nuclear Host Communities' consultant's report by Dr. Kirk Atkinson, Ontario Tech University, regarding Ontario Power Generation's application to amend the Pickering Waste Management Facility licence to authorize the construction and operation of the Pickering Component Storage Structure.

CANHC fully supports the approval of OPG's application. We would like to thank the CNSC for the opportunity to comment on these matters.

Sincerely,

Adrian Foster
Chair, Canadian Association of Nuclear Host Communities

City of PICKERING

Office of the Mayor

Sent by email

May 2, 2024

Participant Funding Program Administrator
Canadian Nuclear Safety Commission
280 Slater Street
Ottawa, ON K1P 5S9
pfp@cnsc-ccsn.gc.ca

Subject: Letter of Support – Ontario Power Generation
- Pickering Waste Management Facility (CMD 25-H101)
File: A-1000-002

Please accept this letter as an indication of my support for Ontario Power Generation (OPG) and its Licence Amendment Application to the Canadian Nuclear Safety Commission (CNSC) to amend the Pickering Waste Management Facility licence to authorize the construction and operation of the Pickering Component Storage Structure.

As a longstanding and trusted partner in our community, OPG has demonstrated a commitment to environmental stewardship, safety, and responsible nuclear waste management practices. The proposed Pickering Component Storage Structure is a critical element of the Pickering Nuclear Generating Station refurbishment project, expected to commence in 2027. This facility will play a pivotal role in securely housing essential components, ensuring that refurbishment efforts proceed efficiently while maintaining rigorous safety and environmental standards.

The City of Pickering acknowledges the importance of sustainable and responsible infrastructure investments, and we recognize the positive impact this project will have on our local economy, workforce, and long-term energy stability. Furthermore, we trust that the CNSC will give this application due consideration, recognizing OPG's record of operational excellence and commitment to safety.

The City of Pickering, as a member of the Canadian Association of Nuclear Host Communities (CANHC), participated in a review of OPG's license application and related documentation from the CNSC. CANHC engaged Dr. Kirk Atkinson as a technical expert for this assessment, and the City has

thoroughly reviewed his findings, recognizing their depth and accuracy. A summary of Dr. Atkinson's report is attached below for further reference.

We welcome further discussions on this matter and extend our full support for the approval of this amendment.

Yours truly

Kevin Ashe
Mayor, City of Pickering

Attachment

Copy: Adrian Foster, Chair of CANHC

Members of Council
Chief Administrative Officer
Director, Economic Development

REVIEW

Pickering Waste Management Facility - Application for Waste Facility Operating Licence WFOL-W4-350.00/2028 Amendment to Construct and Operate the Pickering Component Storage Structure

Introduction and scope

In May 2024, Ontario Power Generation (OPG) submitted to the Canadian Nuclear Safety Commission (CNSC) a request to amend the Waste Facility Operating Licence (WFOL-W4-350.00/2028) for its Pickering Waste Management Facility (PWMF). The reason for this amendment is to permit the construction and operation of a Pickering Component Storage Structure (PCSS), a third facility at PWMF intended for the storage of low- and intermediate level wastes (LLW and ILW) arising from refurbishment of PNGS Units 5-8 and decommissioning of PNGS Units 1-4. Located in the City of Pickering, the PWMF currently operates two facilities, each in a different location. Phase I is located in the protected area of Pickering Nuclear Generating Station (PNGS) itself, southeast of PNGS Unit 8, next to the station's eastern fence. It provides interim storage of PNGS used fuel in Dry Storage Containers (DSCs) in two Storage Buildings (SB), along with irradiated Pickering A reactor components in Dry Storage Modules (DSMs). Used for DSC overflow storage, phase II is located in the East Complex. Anticipated to be approximately 3,700 square metres (40,000 square feet) in area, the PCSS will be located on the northern edge of Phase II, 500 metres northeast of DSC SB 3 and north of the planned SB 5.

This review scrutinises the licence amendment package provided to the CNSC, outlining key findings and commenting on its adequacy, strengths, weaknesses, or oversights, if found, on behalf of the Canadian Association of Nuclear Host Communities (CANHC) and the City of Pickering.

Key findings

Due to the timescales for refurbishment and decommissioning at PNGS, OPG requires the PCSS to be operational by Spring 2027 – two years after the CNSC hearing in writing. The ILW will predominantly be reactor facing components (steam generators, pressure tubes, feeders and calandria tubes) replaced during refurbishment, and will be stored in Retube Waste Containers (RWC). OPG has experience of this from Darlington Nuclear Generating Station (DNGS) refurbishment. All radioactive wastes stored at the PCSS will remain there until permanent disposal or long-term storage facilities are available on an roughly mid-century timescale (ILW is the purview of the Nuclear Waste Management Organisation, whilst LLW is the responsibility of OPG).

Being part of PWMF, construction and operation of the PCSS will be governed by OPG's Engineering Change Control (ECC) process and the design conformant with the PWMF licence conditions handbook (LCH).

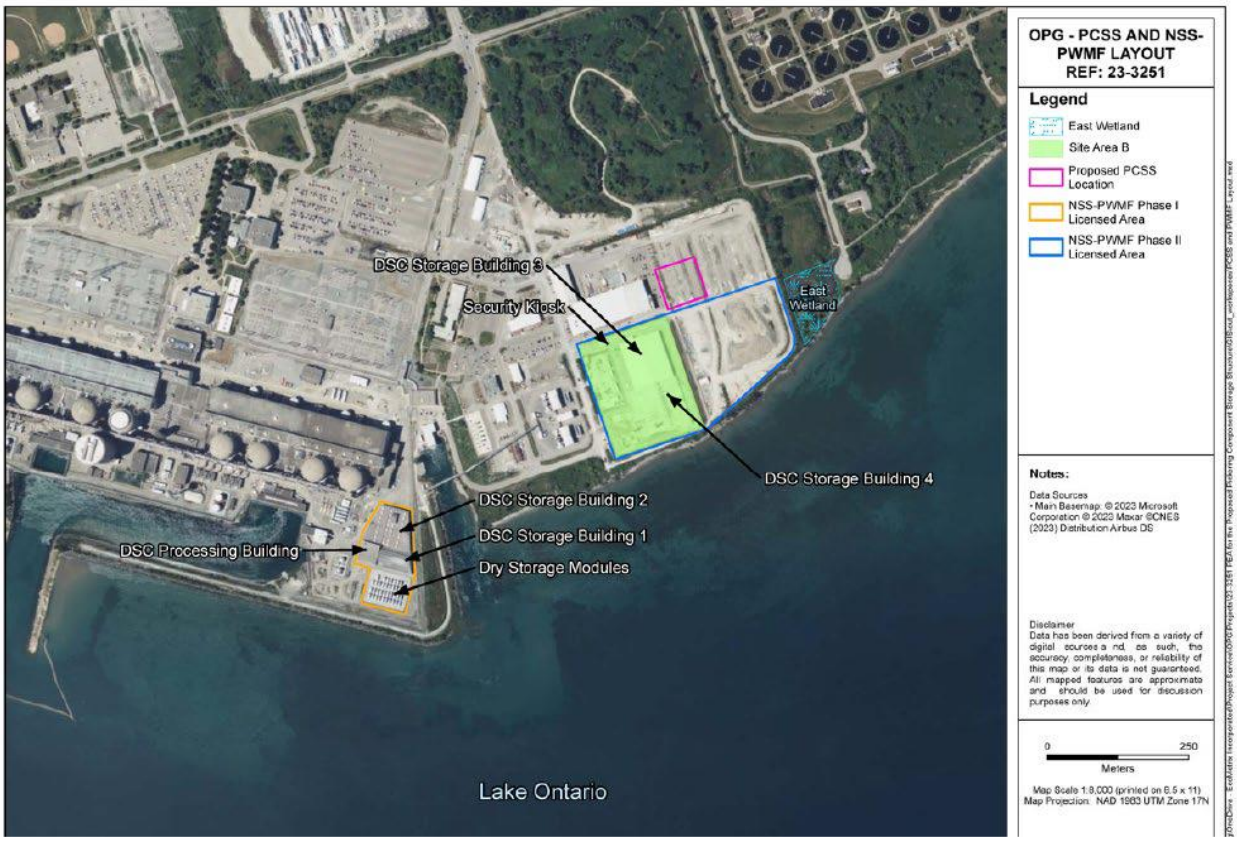

Figure 1: Location of proposed Pickering Component Storage Structure (PCSS) shown in pink. (Image taken from CD# 92896-CORR-00531-01544 P)

In terms of the 14 safety and control areas (SCA) in the Nuclear Safety and Control Act and used for licensing no changes are required to the Management System or Human Performance SCAs. In term of the Operating Performance, there will be some updates to policies and principles as it will be a new facility with new activities, each having safety considerations. It should be noted that the new activities are not significantly different to those OPG undertook at DNGS. No changes are necessary to regulatory reporting.

Regarding the Safety Analysis SCA, the detailed safety assessment was performed by Kinectrics (under subcontract from OPG) and considered three things: normal operations, accidents/malfunctions, and whether doses and hazards from the proposed PCSS will be As Low As Reasonably Achievable (ALARA). This latter concept attempts to balance risks against costs. The aim of the safety assessment was to determine whether the presence and operation of the PCSS would materially change the bounding safety assumptions for the PWMF as a whole. For normal operations, namely radioactive materials (principally ILW) properly stowed in containers within the PCSS, a range of Monte Carlo simulations were performed (using the well-validated MCNP code) to assess dose rates within, and external to, the facility itself. These in turn were used to calculate predicted dose rates to

members of the public and Nuclear Energy Workers (NEW's). Each container modelled will, by design, satisfy OPG's dose rate acceptance criteria and hence this was assumed in various scaling employed in modelling efforts. The MCNP modelling approach appears both conventional and conservative, albeit there are some redactions within the licence amendment application. Due to the final design of the PCSS not being complete at time of original submission, Kinectrics initially considered a base case with three modified configurations (shielded roof, shielded overhead door, and lower than anticipated steam generator dose rate) for sensitivity bounding analysis and to give recommendations to inform detailed design work. The layout of containers within the proposed PCSS was also considered as it can have implications on shielding effectiveness (containers can act as shadow shields to other containers, improving shielding effectiveness). Dose rate tallies were taken at relevant locations adjacent to or around the proposed facility, extending out into Lake Ontario. In a later revision of their assessment, Kinectrics appears to have recognised potential risk from decay neutrons (in activated materials or perhaps via photoemission), and hence, making use of the ORIGEN-S computer code, updated their analysis to include neutron dose rates along with correcting inventory predictions for radioactive decay.

When assessing normal operations, it is implicitly assumed that storage containers, and the shielding provided by the building itself, are intact. Due diligence therefore requires situations where this is not the case to be considered. This is where accident/malfunction analysis comes into play. As many types of abnormal condition can be hypothesised, determining what is credible and ensuring that the analysis that follows is sufficiently bounding is important. Consequently, and as expected, Kinectrics performed an adequate screening analysis to determine the frequency of Anticipated Operational Occurrences (AOO), Design-Basis Accidents (DBA), and Design Extension Conditions (DEC). Such events could range from, say, broken or misplaced seals, all the way through to an aircraft inadvertently crashing into the facility, fracturing storage containers. The latter could be an example of design basis accident (the type of accident designed against). All of these abnormal conditions lead to the same type of hazard, albeit of differing magnitudes and differing probabilities, namely loss of shielded containment of radioactive materials and hence, along with a reduction in shielding effectiveness, the potential for releases to the environment. In their analysis, to generate representative radiological source terms, Kinectrics used gamma ray spectrometry survey results to establish realistic bounding inventories for components, and information from other storage facilities for others. These were used to calculate airborne release fractions and resultant doses. The industry standard ADDAM-IST code was used to determine doses due to atmospheric release, the most viable exposure pathway for members of the public. The approach used to predict doses to NEW's was slightly more involved given workers have more significant exposure pathways compared to people beyond living close to the site boundary. It should be noted that OPG sets a stricter than necessary target dose rate at the site boundary, it

being one tenth that required by the regulator, for an assumed occupancy. All computer codes appear to have been sufficiently qualified for use in the ways described and appear to have been used appropriately. A list of reasonable assumptions is provided.

While chronic dose rates from emissions were determined to be well below required limits, except in one case (lower than expected steam generator activity with a shielded roof), gamma ray dose rates around the PCSS were initially determined to exceed acceptance criteria for normal operations. Several suggestions to mitigate this were made to OPG, including better assessment of source terms, optimisation of placement of containers, and better determination of fence placement around the PCSS building (the PCSS perimeter, not the fences around the Pickering site). In Revision 4 of their report, accounting for the aforementioned suggestions and phasing the transfer of used components (in particular steam generators), with adequate shielding (including some borated polyethylene to stop neutrons) they were able to show a viable configuration that met acceptance criteria with <0.0005 mSv/hour around the PCSS perimeter (so that a non-NEW, working 2000 hours a year at that perimeter would not receive a dose in excess of 1 mSv in that year). Risks for abnormal occurrences during on-site transfer of containers were either screened out due to their likelihood being very low (order of one-in-a-million) or adequately mitigated by existing or proposed measures. The same was largely true for handling and storage, although a few notable abnormal conditions could not be screened out. These few cases predominantly involve dropping of containers or other direct impacts (like PCSS collapse). In all these cases, resultant doses were found to be below regulatory limits for both members of the public and nuclear energy workers (<1 mSv/year and <50 mSv/year, respectively). ALARA analysis results concluded that allocating tasks to multiple workers and/or using temporary shielding (blankets) to reduce dose rates to NEW's during certain activities. This is not a significant hazard to the public. There will be no radiological risks from the PCSS during its construction.

The PCSS Physical Design appears straightforward and will be done to all applicable regulations, codes and standards. Site preparation (e.g., excavation) and construction of the proposed PCSS appear conventional. There are no impacts or changes that impact this or the sixth SCA, fitness for service. The seventh SCA, Radiation Protection, will be satisfied (influenced by the aforementioned safety analysis) and Radiation Protection Regulations complied by way of adequate shielding and operational controls. Doses around PWMF will continue to be monitored with thermoluminescent dosimeters (TLD's) or similar. There will be no changes in the approach to Conventional Health and Safety.

Considerations pertaining to Environmental Protection, the ninth SCA, are more extensive even though there appear to be no changes to the environmental management system (and associated processes), derived release limits (DRL's), action levels, or internal investigation levels (IIL's). Clearly though, as PCSS will be a new facility, with different activities compared to those undertaken at PWMF today, its risks to the environmental,

as assessed through detailed environment risk assessment (ERA) and subsequent follow up, cannot be ignored. Unlike an operating nuclear reactor, new quantities of radioactive materials will be not generated by, or in, PCSS, nor will any effluents be released during normal storage. The principal environmental risk during normal operation comes solely from the emitted gamma ray fields around the radioactive materials in storage. However, being designed to hold them, the impact of these fields can be mitigated through shielding. Ecometrix performed a predictive ERA for the proposed PCSS and concluded that human and ecological radiation risks were negligible, predicted doses being of the order one hundredth the regulatory limits or benchmarks. No meaningful human or ecological risks over and above those already recognised for PWMF were identified.

Of course, it is implicit that by being capable of storing radioactive materials from PNGS, the PCSS will facilitate PNGS Units 5-8 refurbishment wherein similar types and volumes of (future) radioactive wastes will be produced. Production of new radioactive wastes is not within the scope of this PWMF licence amendment application and will, if pertinent, be captured in applications pertaining to the PNGS Power Reactor Operating Licence.

Regarding the Emergency Management and Fire Prevention SCA, arrangements will be unchanged as a result of PCSS. Whilst the Waste Management SCA might be presumed to be impacted by construction and operation of the PCSS, interim storage of L- and ILW follows the Canadian Standards Association (CSA) N292 standards and will not change the documented PWMF licensing basis. Similarly, with respect to decommissioning, only small updates to the Preliminary Decommissioning Plan (PDP) and associated financial guarantees are needed. There are no changes required to the PWMF licensing basis that pertains to Security, Safeguards and Non-Proliferation, or Packaging and Transport.

Per the LCH, OPG is required to submit to the CNSC design requirements, environmental management and construction verification plans for PCSS before any construction can commence and cannot start operations until the CNSC is satisfied with commissioning of the facility. It should be noted that, perhaps due to its maturity at the time of submission and/or because it might contain prescribed information, the full PCSS design itself was not provided to intervenors to review.

Conclusions

Although the final design it not available, and there were redactions within it; after carefully reviewing OPG's licence amendment package for the construction and operation of the PCSS, it appears that it will have only a negligible impact on the licensing basis of the PWMF in which it will sit. Moreover, independent analysis conducted on behalf of OPG by Kinectrics and Ecometrix, has been able to show that the risks to human health and the environment from PCSS are not significant. Annual chronic doses to members of the public from emissions during normal operations will be well below acceptance criteria, and with adequate shielding, thoughtful placement of waste storage containers and steam

generators, and phasing the transfer of said containers across site to the PCSS (which allows time for radioactive decay), will lead to gamma ray (and neutron) dose rates at the PCSS perimeter fence meeting the required acceptance criteria (<0.0005 mSv/hour). In addition to this, even under the worst postulated accident condition, doses to the public and PWMF workers will remain well bounded by regulatory limits (<1 mSv/year and <50 mSv/year, respectively).

None of these findings is a surprise. The PCSS will just be a facility for storing radioactive materials and components. It is not a reactor, nor is it a processing facility, and thus it is decoupled from other activities at PNGS and can be constructed without major impact elsewhere on site. The biggest risk is likely not one related to safety, but one related to electricity supply. Non- or delayed approval of the PWMF WFOL amendment will likely result in there being insufficient storage capacity available for replaced components and other radioactive wastes arising from refurbishment of PNGS Units 5-8 which, in extremis, could result in a lack of electrical generating capacity in Ontario in the 2030's. The impacts on decommissioning would be less severe.

In conclusion, it is the opinion of SMR Insights that both CANHC, and the City of Pickering, if they so choose, should have no concerns in endorsing OPG's request to amend its Pickering Waste Management Facility Operating Licence to permit the construction and operation of the Pickering Component Storage Structure.

References

CD# 92896-CORR-00531-01544 P "Licence Compliance Matrix – Nuclear Safety Control Act and Associated Regulations", OPG, 2024.

CD# 92896-CORR-00531-01544 P "Licence Impact Assessment in Support of Construction and Operation of the Pickering Component Storage Structure at Pickering Waste Management Facility", OPG, 2024.

CD# 92896-CORR-00531-01544 P "Pickering Component Storage Structure Safety Assessment 92896-REP-01320-00019 R000", Kinectrics, March 2024.

CD# 92896-CORR-00531-01544 P "Predictive Environmental Risk Assessment for Pickering Component Storage Structure 92896-REP-07701-00019 R001", Ecometrix, November 2023.

CD# 92896-CORR-00531-01606 Licence Impact Assessment in Support of Construction and Operation of the Pickering Component Storage Structure at the Pickering Waste Management Facility

CD# 92896-CORR-00531-01606 P Pickering Component Storage Structure Safety Assessment 92896-REP-01320-00019 R002, Kinectrics, November 2024.