



**Written Submission from the
Canadian Association of Nuclear
Host Communities and the
Municipality of Clarington**

**Mémoire de la
Canadian Association of Nuclear
Host Communities et de la
Municipalité de Clarington**

In the matter of the

À l'égard d'

Ontario Power Generation Inc.

Application to renew power reactor
operating licence for the Darlington
Nuclear Generating Station

Ontario Power Generation Inc.

Demande concernant le renouvellement
du permis d'exploitation d'un réacteur de
puissance pour la centrale nucléaire de
Darlington

**Commission Public Hearing
Part-2**

**Audience publique de la Commission
Partie-2**

June 24-26, 2025

24-26 juin 2025

Mayor Adrian Foster

Mayor of Clarington

Chair of the Canadian Association of Nuclear Host Communities (CANHC)

Clarington, Ontario

Canadian Nuclear Safety Commission (CNSC)

280 Slater Street

Ottawa, Ontario

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Dear Members of the Canadian Nuclear Safety Commission,

As the Mayor of Clarington, home to Darlington Nuclear Generating Station (DNGS), and the Chair of the Canadian Association of Nuclear Host Communities (CANHC), I am writing to express our support for Ontario Power Generation's (OPG) Power Reactor Operating Licence (PROL) renewal application for the DNGS, for a period of 30-years.

Clarington has long been a proud nuclear host community and dedicated partner in the advancement of nuclear energy, recognizing its critical role in providing clean, reliable, and sustainable power. DNGS has been a cornerstone of our community, contributing significantly to our local economy and providing numerous employment opportunities.

The review of OPG's application highlights the DNGS's adherence to safety and control areas, its impressive performance record, and successful refurbishment efforts. DNGS has consistently ranked as a top-performing nuclear facility globally, with significant operational achievements and enhancements in human performance, operational safety, and waste management. The addition of auxiliary shutdown cooling pumps and advancements in reactivity management demonstrate OPG's proactive approach to enhancing operational safety and efficiency.

We appreciate the CNSC's rigorous oversight and commitment to safety, and we are confident that this submission aligns with the highest standards of nuclear safety and environmental stewardship. The continuous safety analysis conducted by OPG ensures compliance with safety standards, including updates to safety analysis protocols in light of climate change considerations.

As the host community, we eagerly anticipate continued and meaningful engagement with OPG throughout the term of this license. It is crucial that OPG maintains its social license to operate by engaging meaningfully with stakeholders, addressing community concerns, and upholding the highest standards of safety and environmental stewardship. This ongoing engagement will remain a critical requirement of our support.

We understand that transitioning from a 10-year to a 30-year licensing period will not affect this expectation.

As discussed with staff at both the CNSC and OPG, we anticipate that scoped RORs (Regulatory Oversight Reviews) will prove helpful in informing and engaging Clarington throughout the extended licence. We continue in our belief that OPG's support of a dedicated staff position at the Region of Durham will be necessary to identify the issues and concerns that impact Clarington, Pickering, and Durham Region with this increasingly complex file.

In closing, I will reiterate our support of the application to renew the Power Reactor Operating Licence for the Darlington Nuclear Generating Station for a 30-year term.

We thank you for the ability to comment on this issue and look forward to continued collaboration with the CNSC in achieving our shared goals.

Sincerely,

Adrian Foster

Mayor of Clarington

Chair of the Canadian Association of Nuclear Host Communities (CANHC)

REVIEW

Darlington Nuclear Generating Station Power Reactor Operating Licence Renewal Application

Introduction and scope

In May 2024, Ontario Power Generation (OPG) submitted to the Canadian Nuclear Safety Commission (CNSC) a Power Reactor Operating Licence (PROL) renewal application for its Darlington Nuclear Generating Station (DNGS). Located on the shore of Lake Ontario, in the Municipality of Clarington, DNGS comprises four CANDU reactors (and associated facilities and structures) and is capable of generating 3,524 MW of electricity. The extant DNGS PROL (13.03/2025) at the time of application (subsequently amended in 2025 to permit the production of additional medical radioisotopes) is due to expire on November 30, 2025. Unlike previous renewals, submitted on a 10-year drumbeat, OPG has this time requested a 30-year licence term, from December 1, 2025, through November 30, 2055.

In its application, OPG describes in detail how it will, or will continue to, adequately address the 14 safety and control areas (SCA) that provide the basis for licensing. These SCA's are Management System; Human Performance; Operating Performance; Safety Analysis; Physical Design; Fitness for Service; Radiation Protection; Conventional Health and Safety; Environmental Protection; Emergency Preparedness and Fire Protection; Waste Management; Security; Safeguards and Non-Proliferation; and Packaging and Transport. This review scrutinises the licence renewal application and the supplemental update from OPG in response to CNSC comments and reflecting progress on activities since the application was submitted. Other reports disseminated by the CNSC in their Commission Member Documents (CMD) were used for reference, where appropriate. This review will outline key findings, commenting on the adequacy of the application, and any notable strengths, weaknesses, or oversights on behalf of the Canadian Association of Nuclear Host Communities and the Municipality of Clarington.

Key findings

Commercial operations commenced at DNGS in 1990, the last unit coming online in 1993. In the three decades since, the World Association of Nuclear Operators (WANO) has consistently ranked the station as one of the top performing nuclear power plants (NPPs) globally, breaking the world record for continuous operational days (1,106) in 2021. In 2016, OPG began a refurbishment program to replace major safety-significant and aging-susceptible components, amongst other things. Refurbishment of units 2 and 3 has been successfully completed and the units returned to service. Refurbishment of the remaining two units is underway, with the final unit expected to be returned to service by end-2026. After circa 30-years operation, the refurbishment essentially provides a reset of many essential components to their pre-operational state. Assuming that past operating

experience is a good predictor of future performance, this would suggest that replaced components will remain fit-for-service for circa 30-years, aligning well with the requested 30-year licence term.

Whilst a 30-year licence is novel for Canada, it is increasingly common elsewhere in the world. For example, in the United States, initial licence terms of up to 40-years are granted by the Nuclear Regulatory Commission (NRC). Whilst in Europe, a number of NPPs have been licenced beyond 30-years, in the renewal application the terms 'lifetime' and 'licence period' seem conflated. As NPPs in other countries reached their design lifetimes, singly or in combination, things like better diagnostics and monitoring, proactive maintenance, refurbishment, and plain and simple operating experience, have confidently allowed plant lifetime extensions well past 30-years, but not necessarily for individual 30-year terms.

With regards to SCA's, OPG's licence renewal application is, in essence, just requesting permission to continue currently licensed operations for another 30-years and therefore requires no significant changes to the stations licencing basis. It is an application to carry on. The first SCA, management system, sets out principles by which activities must be conducted and documentation produced or followed. OPG, in its application, has outlined the programs and procedures at DNGS, standards to be met, and the reporting that must be undertaken. As expected, after three decades of operations, OPG has a very mature management system that can only be modified via a written notification of change process specified in its licence condition handbook (LCH). As the CNSC must approve changes, and as is the case today, these changes may occur throughout the term of the licence, stakeholders should be confident that there is no reduction in rigour by moving to a 30-year licence. In fact, in the application, OPG has articulated improvements it has made (or is making), in light of operating experience and changing best practices, through its continuous improvement programs. Particular emphasis was placed on cybersecurity, nuclear security, and safety culture, assessed on a five-yearly basis.

Regarding the human performance management SCA, OPG describes the improvements it made during the current licence term. A fail-safe strategy implemented in 2022 has ensured that through provision of additional barriers, capacity and defences, mitigation of human error was further reduced. The effectiveness of this strategy has been evidenced by DNGS being deemed top in class in terms of Site Event Free Day Resets (SEFDR) – the time at which a consequential event resets the counter to zero – with a record 1074 days between SEFDR's. Even without this record, the number of SEFDR's in a year was never more than 3, and often zero, per year during the current licence term. According to OPG's Supplemental Update in December 2024, one SEDFR occurred since the licence renewal application was submitted. Note that a 'consequential event' sounds more ominous than it really is. It simply means that an error of some sort meant that one layer of the protective onion did not satisfy whatever metric it was meant to, not that the station was at any meaningful risk. Despite their exceptionally good human performance, OPG

describe how their continuous improvement program aims to further reduce the SEFDR rate through implementation of additional human performance tools aligned with industry best practices, in particular event prevention tools they term Core 4+. OPG continue to follow a systematic approach to training (SAT) and will bolster this through additional just-in-time pre-job skills refresh. OPG also describe the rigorous procedures they have in place to ensure they always have the minimum complement of qualified personal on shift at any point in time. In November 2024 it was affirmed by the Federal Court of Appeals that OPG could enforce mandatory alcohol and drug testing of staff.

In terms of the operating performance SCA, OPG describe how, during refurbishment, they were able to install two additional, conceptually different, auxiliary shutdown cooling (ASDC) pumps in each unit to be a back up for the main shutdown cooling (MSDC) pumps in the event of an outage. Remote from the MSDC pumps, there is a prime example of how diversity of parts means the likelihood of a common-cause failure is prevented and, in this case, adds resilience to ensure temperatures in Primary Heat Transport (PHT) systems will not exceed stated limits when units are not operating normally. Due to high prior performance, OPG also describe how they were able to raise their reactivity management index (RMI) in 2023. Reactivity is a measure of how near or far fissile material (here, in the form of nuclear fuel) is from the point of criticality (the point when fissile material is exactly able to sustain a fission chain reaction). In the reactor core, or in storage, reactivity is controlled within a given range, or below a given limit, respectively, through various means. Raising the RMI highlights the fact that OPG have been very good at controlling reactivity, so much so that they can hold themselves to an even stricter target. Other improvements to operating performance include trialling electronic based procedures (rather than paper), something that will need to be approved by the CNSC before they can start being issued, and optimising the work done during (and to reduce) outages. OPG also articulates how the DNGS reactor safety program remains effective. Whilst only a snapshot of improvements described in the licence renewal application are captured here, the commitment of OPG to continuous improvement is clear.

Stemming from Operating Performance, Periodic Safety Reviews (PSR's) are required by the CNSC every ten years. PSR's are part of the process that ensures the design, condition, and operation of units, and the station as a whole, is adequate and comply with appropriate codes and standards. The most recent DNGS PSR (D-PSR) identified twelve strengths where DNGS exceeded the requirements. From the D-PSR flows an Integrated Implementation Plan (IIP), cataloging required improvements against shortfalls.

Due to its emotive name, safety analysis is a significant focus of stakeholder interest. This SCA is the evaluation of hazards from plant operations coupled with the assessment of how effective preventative and mitigative measures are in reducing the effects of these hazards. What is important to remember is that safety analysis is not an activity that is done once, it is done continuously and is essential for justifying the DNGS safety case

and defining the safe operating envelope of the plant. A number of interrelated activities are conducted. Deterministic Safety Analysis (DSA) is a systematic process that confirms the design and safety requirements of the plant are met, and to develop operational limits such that the public is protected. OPG continues to follow the applicable REGDOC (and its updates) updating its compliance implementation plans on a decadal basis, the most recent update being in 2023. DSA accounts for the aging of components (in particular in the PHT system) and the associated impacts on operational safety margins. Given refurbishment included the replacement of significant parts of the PHT in all units, impacts of aging will have been reset to zero in many circumstances. The new Pressure Tubes (PT's) are rated for 250k Effective Full Power Hours (EFPH).

Safety analysis also includes hazard screening analysis, conducted of a five-yearly basis, at time of application the most recent being done in 2019. The 2019 analysis was an improvement over that done previously as it considered more extensive combinations of external hazards – including the impact of human actions. As of December 2024, OPG stated in their Supplemental Update that hazard analysis was underway ahead of Probabilistic Safety Analysis (PSA) in 2025. This update considers hazards resulting from incremental climate change, so stakeholder concerns that climate change impacts (which could be considerably more over a 30-year term than over a 10-year term) could present unknown risks will be averted. In December 2024, OPG also stated that the potential hazard to the DNGS of construction and operation the BWRX-300 Small Modular Reactor on the adjacent Darling New Nuclear Site was being considered. Evaluated on a five-yearly basis, PSA considers the impacts and consequences resulting from single-point vulnerabilities. OPG needs CNSC endorsement of its PSA methods prior to commencing analysis (so that the CNSC is satisfied that the methods are appropriate), the metrics for evaluation being the incidence of Severe Core Damage or Large Release Frequencies. In all cases, probabilities are extremely remote.

Criticality Safety Analysis, the evaluation of potential criticality risks for fissile materials (particularly when outside a reactor core), is not a significant concern for CANDU-based Nuclear Generating Stations like DNGS due to utilisation of natural uranium and depleted uranium fuel (the latter not being able to achieve criticality under any circumstances). Whilst OPG explains that fresh natural uranium fuel can achieve criticality in presence of unpoisoned heavy water (D2O), and is therefore stored far from it, it implies that natural uranium fuel can only become critical in D2O. Whilst a minor point in the context of the renewal application as a whole, this is actually false given the fact that natural uranium has been used extensively in graphite moderated reactors. OPG should have specified that their statement was applicable only to DNGS, or that other suitable moderators (like graphite) are not present at DNGS. Finally, addressing the 16 known CANDU Safety Issues (CSI's) identified by the CNSC, OPG has articulated how it has controls in place for their management and the maintenance of safety margins

The fifth SCA, Physical Design, is largely unchanged from previous licence applications given the plant is already in existence. That being said, as alluded to with respect to the aforementioned SCA's, continuous improvement necessitates that changes have been (and will continue to be) made following approved processes and after applicable review. Whilst there have been no changes to the fuel design over the previous licence term, significant upgrades have been made in large part due to refurbishment. This includes the new PT walls being made slightly thicker and installation of improved spacers less prone to degradation. Other improvements include software updates post-refurbishment of Unit 3 that now allow for greater utilisation of fuel through better shuffling, along with a move to Enriched Boric Acid (rather than Natural Boric Acid) in-moderator poisons for better reactivity control and longer maintenance windows (time between maintenances). Improvements to the reactor and coolant systems will continue during the requested 30-year licence term. Reflecting periodic updates to codes and standards, seismic PSA is conducted every five years to ensure structures stay safe against design basis earthquakes. Similarly, every five years, Fire Protection Assessments are done. The Nuclear Fire Protection Program is audited every three years in accordance with national standards, the most recent audit having been in 2023. OPG's Supplemental Update in December 2024 provided more detail on site characterisation (in particular flood hazards), environmental qualification of equipment, and electromagnetic compatibility assessment.

Assuring continued fitness for service, is the focus of the sixth SCA. Spanning all aspects of the plant, the most visceral focus of this is equipment reliability, in particular of Systems Important to Safety (SIS) and Components Important to Safety (CIS). OPG describe how they document this in an Annual Risk and Reliability Report (ARRR) that is submitted to the CNSC. OPG will continue to ensure the reliability and performance of SIS, CIS, and other things through a robust maintenance program that is reviewed every five years and includes both predictive and preventative actions. This program includes plans to manage aging and life cycle management of major components. Corrective maintenance at DNGS meets or exceeds industry targets. Maintenance goes hand-in-hand with monitoring and inspection and, in accordance with Canadian standards, OPG will continue to follow Periodic Inspection Plans (PIP), some looking at thousands of locations across all units on a ten-yearly cycle, others checking the condition of concrete containment and other non-containment structures on a more frequent basis or opportunistically during planned outages. No safety significant systems, structures or components appear to miss out, with even those that are difficult to access being inspected at least once every twelve years.

With respect to Radiation Protection, Conventional Health and Safety, and Environmental Protection, the seventh, eighth and ninth SCA's, there are few significant findings that influence whether or not a 30-year licence renewal should be approved. Lessons learned, improved tooling, robotics, and prior practice all work together to reduce worker doses. Collective doses measured during recent years not being reflective of normal operations

were due to refurbishment activities. The Supplemental Update added detail of radiation protection instrument selection and calibration. Continuous improvement and a plan-do-check-review mindset have ensured zero lost time injuries over a five-year period prior to the licence renewal application being submitted. The DNGS Environmental Management System will continue to be audited on a three-yearly basis, and the Environmental Risk Assessment updated every fifth year, per requirements. Protective of human and ecological receptors in surrounding areas thus far, there is no obvious reason that can be seen to suggest that operations at DNGS going forward will be less protective. Nonetheless, engagement of OPG with First Nations stakeholders will continue, as will the environmental monitoring activities mandated in the DNGS licence requirements, the results of which are reported annually to the CNSC. Whilst a defect at the DNGS Tritium Removal Facility (TRF) led to a tritium release above the Environmental Action Level (but still far below the Derived Release Limit) during the current licence term, and despite the arising of a few minor refrigerant leaks, these are not indicative of a fundamental flaw at DNGS and corrective actions remedied them. DNGS is compliant with groundwater protections standards. In terms of Emergency Management and Fire Protection, the tenth SCA, there are robust and well-practiced plans in place, with major exercises being performed every third year, something that will continue for the renewal term.

An emotive subject for some, Waste Management is the eleventh SCA. In addition to a conventional waste management program, OPG continues to follow a mature, effective Nuclear Waste Management Program at DNGS, limiting production of radioactive wastes where possible, and controlling the handling, storage and disposal of materials. Low-Level Waste (LLW), which is sometimes volume reduced, along with Intermediate Level Waste (ILW), will continue to be managed as they are now, making use of the Western and Darlington Waste Management Facilities. There is sufficient storage capacity for thirty more years' operation, or until a permanent disposal site is available – the latter being necessary irrespective of granting a 30-year licence. Waste volumes will fall substantially once refurbishment activities at DNGS are complete. To account for storage of used fuel on-site until the Nuclear Waste Management Organisation (NWMO) has completed its Deep Geological Repository (DGR), a fourth storage building for Dry Storage Containers (DSC) will be constructed for use past 2031. Looking at the drumbeat of new storage building construction over the lifetime of DNGS thus far, it would appear that a new storage building is required every 10-15 years. This being the case, if operations at DNGS are extended through 2055 (as would be the case if a 30-year licence is granted), it is probable that a fifth storage building would be necessary. With a fifth storage building not being mentioned in the application, it is likely that storage building four will be oversized to take the station through to its planned end of life, but this is not known for sure from the information provided. OPG will continue to update the Preliminary Decommissioning Plan (PDP) for DNGS and provide the requisite financial guarantee every five years.

With regards to the twelfth SCA, security, as the design basis threat going forward is the same, the only notable change is OPG's increased focus on cybersecurity. Similarly, the Safeguards and Non-Proliferation SCA for DNGS is unchanged, OPG continuing to account for nuclear materials in accordance with CNSC and IAEA requirements and expectations. Minor clarifications on security and safeguards and non-proliferation were provided by OPG in their Supplemental Update. No mention was made of the OPG employee charged with passing safeguarded information shortly before the licence renewal application was submitted. Finally, aside from procuring an improved transport package (in 2025), there are no changes of consequence to the Packaging and Transport SCA, hundreds of shipments of radioactive materials having been shipped or received by DNGS without incident over the previous licence period.

The station received major improvements for both safety and performance reasons during the current term, the IIP responsible for these being substantially complete at the time of licence renewal application (and further still on submission of the Supplemental Update). In addition to refurbishment of DNGS Units 1-4, the on-site Tritium Removal Facility (TRF) has also received substantial improvements since the last licence renewal was granted. These improvements have allowed a greater volume of tritiated water to be processed by OPG (over a billion, billion Becquerels of tritium having been removed from heavy water). OPG intends to operate the TRF through 2060, five years past the end of DNGS power operations, which will require several upgrades delivered in six (projected) TRF outages, each of 6-10 months, between 2026 and 2038. The facility being somewhat standalone, these are very unlikely to pose any hazard to the DNGS operations or public safety.

It is noted that, despite DNGS being operated by Ontario Power Generation for over three decades, OPG still demonstrates a commitment to engagement and reconciliation.

Conclusions

The DNGS Power Reactor Operating Licence renewal application is uncontentious, with OPG essentially requesting permission to carry on doing what they have been doing. They have captured all the areas where improvements have been made over the last decade, and where further improvements will be made going forward. There are no observations or oversights of concern. OPG has adequately described each SCA, shown that SCA's had been updated to current applicable standards (or were in the process of being), and explained how they managed and continue to manage changes. OPG also demonstrated its commitment to investment. Building on over 30-years' safe operation at DNGS, the refurbishment of all units, and learning from precedent elsewhere; with OPG's embedding of continuous improvement in their procedures and their ongoing compliance activities, the requested 30-year licence renewal term seems reasonable. Whether it be a 10- or 30-year licence, stakeholders should be assured that all the same safety-related activities will be continuing on the same drumbeat as required by the regulator and stated

in the DNGS licence conditions. On this point, the net difference to applying for a 10-year licence is that all these efforts will (likely) not be captured in a singular application again, and perhaps most importantly for some stakeholders, opportunities to participate in the licensing process will be lacking. That said, opportunities to engage on matters of safety significance and regulatory compliance, e.g., on the annual Regulatory Oversight Report process, will remain.

In conclusion, it is the opinion of SMR Insights that both CAHNC, and the Municipality of Clarington, should have no concerns endorsing OPG's requested 30-year DNGS Power Reactor Operating Licence renewal application.

References

CD# NK38-CORR-00531-25450 P "Darlington Nuclear Generating Station Power Reactor Operating Licence Renewal Application", OPG, May 2024.

CD# NK38-CORR-00531-25844 P "Supplemental Update in Support of the Power Reactor Operating Licence Renewal Application", OPG, December 2024.