



**Written submission from
Ontario Power Generation**

**Mémoire d'
Ontario Power Generation**

In the Matter of

À l'égard d'

Ontario Power Generation

Ontario Power Generation

**Ontario Power Generation – Application to
change the licensing basis for the Pickering
Waste Management Facility**

**Ontario Power Generation – Demande
visant à modifier le fondement
d'autorisation de l'installation de
gestion des déchets de Pickering**

Public Hearing – Hearing in writing based on
written submissions

Audience publique – Audience fondée sur
des mémoires

June 2024

Juin 2024

December 22, 2023
CD# 92896-CORR-00531-01530 P

Ms. Malaika Bacon-Dussault
Acting Commission Registrar,
Canadian Nuclear Safety Commission
P.O. Box 1046
280 Slater Street
Ottawa, Ontario, K1P 5S9

Dear Ms. Bacon-Dussault:

OPG - Addendum to the Application for Amendment to the Pickering Waste Management Facility, Waste Facility Operating Licence WFOL-W4-350.00/2028

The purpose of this letter is to submit to the Canadian Nuclear Safety Commission, referred to as “the Commission”, an addendum to the application for and amendment to the Pickering Waste Management Facility (PWMF), Waste Facility Operating Licence (WFOL) WFOL-W4-350.00/2028, to be able to store minimum 6-year cooled fuel from Pickering NGS.

OPG’s request for an amendment to the PWMF WFOL WFOL-W4-350.00/2028, to be able to store minimum 6-year cooled fuel (Reference 1), remains unchanged. OPG had previously communicated the operational need for this activity in Reference 2.

To support the OPG Safe Storage Project for Pickering NGS, additional space in the Pickering NGS-B Irradiated Fuel Bay (IFB-B) is required in order to accept the discharged used fuel from the required core defuel. As PWMF is currently waiting for IFB-B used fuel to mature to the 10-year required period before transferring, there is a need to accept younger fuel to allow for the additional space. At this time, however, OPG is only licensed to process and store minimum 10-year cooled fuel at all its Nuclear Waste Facilities.

Attachment 1 provides the updated compliance matrix for the Nuclear Safety and Control Act, and the associated regulations required for the amendment of the PWMF WFOL to be able to store minimum 6-year cooled fuel.

Attachment 2 provides updates to enhance the information provided in Reference 1 to the description and key attributes of the storage of minimum 6-year cooled fuel and documents the licensing impact assessment on all 14 Safety and Control Areas of PWMF’s WFOL. The following documents support this assessment:

- Enclosure 1 provides W-CORR-00531-01662, “*Storage of Dry Storage Containers (DSCs) containing less than 10 year old used fuel bundles at the*

Pickering Waste Management Facility (PWMF)” which was previously provided as Enclosure 1 of Reference 1,

- 92896-REP-01320-00012 R000, “*Safety Assessment Storing Lower Aged Fuel in PWMF SB3*” (previously provided as Enclosure 2 of Reference 1),
- 92896-REP-03200-00009 R000, “*Dose Rate Assessment Considering Lower Aged Fuel in PWMF SB3*” (previously provided as Enclosure 3 of Reference 1),
- Enclosure 2 provides 92896-MDR-79171-00001, “*Modification Design Requirements for Loading, Transferring, Processing and Storing Minimum 6-year-old Fuel at NSSP*”.

00104-CORR-79171-0139942, “*Additional Information Concerning Thermal Gradients Pertaining to Dry Storage Containers (DSCs)*” is an assessment of the findings of a previously trialed Dry Storage Container (DSC) containing 6-year cooled fuel in 1998. CNSC staff requested this evaluation in Reference 3 and it was provided to CNSC staff as Enclosure 4 of Reference 1. Prior to that, OPG had submitted technical assessments to CNSC staff related to the storage of minimum 6-year cooled fuel (Enclosures 1 and 2 of Reference 4).

The design considerations of the storage of minimum 6-year cooled fuel complies with all applicable regulatory requirements. The safety assessment, which is referred to as the “safety case”, demonstrates that the storage of minimum 6-year cooled fuel will have no significant impact on the continued safe operation of the PWMF, nor on public, employee, and environmental safety.

OPG is targeting to start loading DSCs with minimum 6-year cooled fuel by July 2024. After an initial loading of two to four DSCs to confirm temperature and dose measurements, a full campaign of loading minimum 6-year cooled fuel is targeted to commence by the first quarter of 2025.

In summary, OPG remains committed to the safe operation of the PWMF and re-affirms that minimum 6-year cooled fuel can be stored safely as presented in the associated safety case.

Should you have any questions, please contact Ms. Liliana Moraru, Manager, Regulatory Affairs - Strategic Projects, at (905) 260-4089 or liliana.moraru@opg.com.

Sincerely,



Kapil Aggarwal, M. Eng., P. Eng
Vice President
Nuclear Sustainability Services
Ontario Power Generation Inc.

Encl

cc: N. Petseva - CNSC (Ottawa)
T. Kalindjian - CNSC (Ottawa)
R. Buhr - CNSC (Ottawa)
R. van Hoof - CNSC (Ottawa)

- References:
1. OPG Letter, K. Aggarwal to D. Saumure, "OPG – Change Request Application for Amendment to the Pickering Waste Management Facility (PWMF) Waste Facility Operating Licence WFOL W4-350.00/2028 ", June 20, 2023, e-Doc# 7068976, CD# 92896-CORR-00531-01478.
 2. OPG Letter, J. Van Wart to N. Greencorn, "Notice of Intent to Store Minimum 6-Year Old Used Fuel at the Pickering Waste Management Facility", February 1, 2022, e-Doc# 6730024, CD# W-CORR-00531-01801.
 3. CNSC Letter, T. Kalindjian to K. Aggarwal, "CNSC Staff Review of OPG Responses to CNSC Staff Comments – Proposal to Store Minimum 6-Year Old Cooled Used Fuel at the Pickering Waste Management Facility", December 20, 2021, e-Doc# 6687357, CD# 92896-CORR-00531-01443.
 4. OPG Letter, K. Aggarwal to T. Kalindjian, "OPG Response to CNSC Staff Comments on OPG's Proposal to Store Minimum 6-Year Old Cooled Fuel at the Pickering Waste Management Facility", June 14, 2021, e-Doc# 6585972, CD# 92896-CORR-00531-01430.

ATTACHMENT 1

OPG letter, K. Aggarwal to M. Bacon-Dussault, "OPG – Addendum to the Application for Amendment to the Pickering Waste Management Facility, Waste Facility Operating Licence WFOL-W4-350.00/2028"

CD# 92896-CORR-00531-01530 P

Licence Compliance Matrix – Nuclear Safety Control Act and Associated Regulations

Prepared By: C. Barua

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ATTACHMENT 1

Licence Compliance Matrix – Nuclear Safety Control Act and Associated Regulations

This Attachment, along with the accompanying letter and Attachment 2 of this submission, provides the information required by the Nuclear Safety and Control Act and the applicable Nuclear Regulations made pursuant to the Act, and constitutes an application by OPG to amend the current Pickering Waste Management Facility (PWMF) Waste Facility Operating Licence WFOL-W4-350.00/2028.

The tables below are divided by applicable Regulation and demonstrate how OPG has addressed each applicable regulatory requirement of the subject Regulation.

Nuclear Safety and Control Act		
Section	Requirement	OPG Response
Licences		
24(2)	<p>Application <i>The Commission may issue, renew, suspend in whole or in part, amend, revoke, or replace a licence, or authorize its transfer on receipt of an application:</i></p> <p><i>(a) in the prescribed form;</i></p>	<p>This submission (letter and attachments) provides the information required by the Nuclear Safety and Control Act (referred to as the Act) and the applicable Regulations made pursuant to the Act and provides supplemental information in support of OPG’s application for licence amendment.</p> <p>This requirement has been met.</p>
	<p><i>(b) containing the prescribed information and undertakings and accompanied by the prescribed documents; and</i></p>	<p>See response above under clause 24 (2) (a).</p>
	<p><i>(c) accompanied by the prescribed fee.</i></p>	<p>OPG is in good standing with respect to the provision of CNSC licensing fees and will provide any additional fees associated with this WFOL amendment request, if requested.</p>
24(4)	<p>Conditions for issuance, etc. <i>No licence may be issued, renewed, amended or replaced - and no authorization to transfer one given - unless, in the opinion of the Commission, the applicant:</i></p> <p><i>(a) is qualified to carry on the activity that the licence will authorize the licensee to carry on; and</i></p>	<p>OPG understands that qualification will be determined through consideration by the Commission of this application and the associated supporting material, as well as deliberation through the Commission decision-making process.</p> <p>OPG is qualified to safely undertake the additional activities associated with the storage of minimum 6-year cooled fuel at PWMF.</p>
	<p><i>(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety</i></p>	<p>Attachment 2 of this submission documents the assessments and provisions in support of the licence amendment request. Specifically:</p>

Nuclear Safety and Control Act		
Section	Requirement	OPG Response
	<i>of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.</i>	<ul style="list-style-type: none"> • documents worker health and safety provisions. • documents assessments and impact on environmental protection. • documents the security considerations. • documents the impact on Canada's international obligations related to safeguards and nonproliferation
25	<p>Renewal, etc. <i>The Commission may, on its own motion, renew, suspend in whole or in part, amend, revoke or replace a licence under the prescribed conditions.</i></p>	OPG understands this requirement and will continue to comply.
26	<p>Prohibitions <i>Subject to the regulations, no person shall, except in accordance with a licence:</i></p> <p style="padding-left: 40px;"><i>(a) possess, transfer, import, export, use or abandon a nuclear substance, prescribed equipment or prescribed information;</i></p> <p style="padding-left: 40px;"><i>(b) mine, produce, refine, convert, enrich, process, reprocess, package, transport, manage, store or dispose of a nuclear substance;</i></p> <p style="padding-left: 40px;"><i>(c) produce or service prescribed equipment;</i></p> <p style="padding-left: 40px;"><i>(d) operate a dosimetry service for the purposes of this Act;</i></p> <p style="padding-left: 40px;"><i>(e) prepare a site for, construct, operate, modify, decommission or abandon a nuclear facility; or</i></p> <p style="padding-left: 40px;"><i>(f) construct, operate, decommission or abandon a nuclear-powered vehicle or bring a nuclear-powered vehicle into Canada.</i></p>	OPG staff understand these requirements and will continue to comply.

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
Licences – General Application Requirements		
3(1)	<p><i>An application for a licence shall contain the following information:</i></p> <p><i>(a) the applicant's name and business address;</i></p>	<p>Applicant's name and business address:</p> <p>Ontario Power Generation, Inc 700 University Avenue, Toronto, Ontario, M5G 1Z5</p> <p>Official Language: English</p> <p>Contact person, signing authority and licence holder:</p> <p>Kapil Aggarwal Vice President Nuclear Sustainability Services, Ontario Power Generation Telephone: 416-402-6484</p>
	<p><i>(b) the activity to be licensed and its purpose;</i></p>	<p>OPG requests an amendment to the PwMF WFOL, WFOL-W4-350.00/2028, to authorize the storage of minimum 6-year cooled fuel from Pickering NGS.</p>
	<p><i>(c) the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;</i></p>	<p>100 Dry Storage Containers (DSCs) containing minimum 6-year cooled used fuel from Pickering NGS. These 100 DSCs are included in the current approved total for PwMF (and are not considered additional to the inventory).</p>
	<p><i>(d) a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;</i></p>	<p>A description of the PwMF is provided in Attachment 2 of this submission.</p>
	<p><i>(e) the proposed measures to ensure compliance with the Radiation Protection Regulations, the Nuclear Security Regulations and the Packaging and Transport of Nuclear Substances Regulations, 2015;</i></p>	<p>OPG understands this requirement and will remain in compliance with the current licence conditions documented in WFOL-W4-50.00/2028 and with the Radiation Protection Regulations, the Nuclear Security Regulations, and the Packaging and Transport of Nuclear Substances Regulations as described in Attachment 2 of this submission.</p>

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<i>(f) any proposed action level for the purpose of section 6 of the Radiation Protection Regulations;</i>	The requested WFOL amendment will not require changes to the radiation protection action levels.
	<i>(g) the proposed measures to control access to the site o the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;</i>	The requested WFOL amendment will not require changes to the measures to control PWWF site access, the nuclear substance, prescribed equipment or prescribed information.
	<i>(h) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;</i>	The requested WFOL amendment will not require changes to the measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information.
	<i>(i) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;</i>	The requested WFOL amendment to authorize the storage of minimum 6-year cooled fuel at PWWF is supported by a robust safety case that is summarized in Attachment 2 of this submission.
	<i>(j) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;</i>	This waste will be managed in accordance with OPG’s current programs and processes. No hazardous waste will be generated from the storage of minimum 6-year cooled fuel.
	<i>(k) the applicant’s organizational management structure insofar as it may bear on the applicant’s compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;</i>	The organizational management structure will not change as a result of the requested licence amendment.
	<i>(l) a description of any proposed financial guarantee relating to the activity to be licensed; and</i>	OPG understands the regulatory requirements for a financial guarantee. The financial guarantee for PWWF will not change as a result of the requested WFOL amendment.
	<i>(m) any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or</i>	OPG understands this requirement and will continue to comply.

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<i>prescribed information to be encompassed by the licence.</i>	
(1.1)	<p><i>The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant</i></p> <p><i>(a) is qualified to carry on the activity to be licensed;</i></p> <p><i>(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.</i></p>	<p>OPG understands this requirement and will continue to comply.</p>
Application for Amendment, Revocation or Replacement of Licence		
6	<p><i>An application for the amendment, revocation or replacement of a licence shall contain the following information:</i></p> <p><i>(a) a description of the amendment, revocation or replacement and of the measures that will be taken and the methods and procedures that will be used to implement it;</i></p> <p><i>(b) a statement identifying the changes in the information contained in the most recent application for the licence;</i></p> <p><i>(c) a description of the nuclear substances, land, areas, buildings, structures, components, equipment and systems that will be affected by the amendment, revocation or replacement and of the manner in which they will be affected; and</i></p>	<p>Attachment 2 of this submission documents the description of the amendment and of the measures that will be taken and the methods and procedures that will be used to implement it.</p> <p>Attachment 2 of this submission documents the changes that will be required to any licensing basis documents.</p> <p>The minimum 6-year cooled fuel will be stored within a specified array in PWMF Storage Building (SB) #3, a shielded building. The minimum 6-year cooled fuel will be stored in the same DSCs that are being used to store minimum 10-year cooled fuel.</p> <p>Initial loading of two to four DSCs containing minimum 6-year cooled fuel is proposed to commence in July 2024. After obtaining indicators related to temperature and dosage, the full campaign of storing minimum 6-year cooled fuel will commence.</p>

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<i>(d) the proposed starting date and the expected completion date of any modification encompassed by the application.</i>	
Incorporation of Material in Application		
7	<i>An application for a licence or for the renewal, suspension in whole or in part, amendment, revocation or replacement of a licence may incorporate by reference any information that is included in a valid, expired or revoked licence.</i>	OPG understands and has provided applicable references to information contained in the existing licence and Licence Conditions Handbook.
Obligations		
12(1)	Obligations of Licensees <i>Every licensee shall</i>	OPG understands the requirements and will continue to comply. Specifically:
	<i>(a) ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence;</i>	The regulatory requirement will not change as a result of the requested licence amendment.
	<i>(b) train the workers to carry on the licensed activity in accordance with the Act, the regulations made under the Act and the licence;</i>	OPG staff will be trained on operation and maintenance activities associated with the requested licence amendment.
	<i>(c) take all reasonable precautions to protect the environment and the health and safety of persons and to maintain the security of nuclear facilities and of nuclear substances;</i>	Refer to section LC 9.1 in Attachment 2 of this submission for details on environmental protection. Refer to section LC 12.1 in Attachment 2 of this submission for further details on the impact to security.
	<i>(d) provide the devices required by the Act, the regulations made under the Act and the licence and maintain them within the manufacturer's specifications;</i>	OPG understands this requirement and will continue to comply.
	<i>(e) require that every person at the site of the licensed activity use equipment, devices, clothing and procedures in accordance with the Act, the regulations made under the Act and the licence;</i>	OPG understands this requirement and will continue to comply.

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<i>(f) take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment as a result of the licensed activity;</i>	OPG understands this requirement and will continue to comply. Refer to section LC 9.1 in Attachment 2 for further details on security.
	<i>(g) implement measures for alerting the licensee to the illegal use or removal of a nuclear substance, prescribed equipment or prescribed information, or the illegal use of a nuclear facility;</i>	OPG understands this requirement and will continue to comply. Refer to section LC 13.1 in Attachment 2 of this submission for further details on security.
	<i>(h) implement measures for alerting the licensee to acts of sabotage or attempted sabotage anywhere at the site of the licensed activity;</i>	OPG understands this requirement and will continue to comply.
	<i>(i) take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement;</i>	OPG understands this requirement and will continue to comply. Refer to section LC 13.1 in Attachment 2 of this submission for further details on safeguards.
	<i>(j) instruct the workers on the physical security program at the site of the licensed activity and on their obligations under that program;</i>	OPG understands this requirement and will continue to comply. Refer to section LC 12.1 in Attachment 2 of this submission for further details on security.
	<i>(k) keep a copy of the Act and the regulations made under the Act that apply to the licensed activity readily available for consultation by the workers.</i>	OPG understands this requirement and will continue to comply.
12(2)	<i>Every licensee who receives a request from the Commission or a person who is authorized by the Commission for the purpose of this subsection, to conduct a test, analysis, inventory or inspection in respect of the licensed activity or to review or to modify a design, to modify equipment, to modify procedures or to install a new system or new equipment shall file, within the time specified in the request, a report with the Commission that contains the following information:</i>	OPG understands this requirement and will continue to comply. Testing and commissioning procedures and reports associated with the storage of minimum 6-year cooled fuel will be made available to facilitate the regulatory role of CNSC staff.

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<p><i>(a) confirmation that the request will or will not be carried out or will be carried out in part;</i></p> <p><i>(b) any action that the licensee has taken to carry out the request or any part of it;</i></p> <p><i>(c) any reasons why the request or any part of it will not be carried out;</i></p> <p><i>(d) any proposed alternative means to achieve the objectives of the request; and</i></p> <p><i>(e) any proposed alternative period within which the licensee proposes to carry out the request.</i></p>	
Transfers		
13	<p><i>No licensee shall transfer a nuclear substance, prescribed equipment or prescribed information to a person who does not hold the licence, if any, that is required to possess the nuclear substance, prescribed equipment or prescribed information by the Act and the regulations made under the Act.</i></p>	<p>OPG understands this requirement and will continue to comply.</p>
Notice of Licence		
14	<p><i>(1) Every licensee other than a licensee who is conducting field operations shall post, at the location specified in the licence or, if no location is specified in the licence, in a conspicuous place at the site of the licensed activity,</i></p> <p><i>(a) a copy of the licence, with or without the licence number, and a notice indicating the place where any record referred to in the licence may be consulted; or</i></p> <p><i>(b) a notice containing</i></p> <p style="margin-left: 20px;"><i>(i) the name of the licensee,</i></p> <p style="margin-left: 20px;"><i>(ii) a description of the licensed activity,</i></p>	<p>OPG understands this requirement and will continue to comply with this requirement.</p>

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<p><i>(iii) a description of the nuclear substance, nuclear facility or prescribed equipment encompassed by the licence, and</i></p> <p><i>(iv) a statement of the location of the licence and any record referred to in it.</i></p> <p><i>(2) Every licensee who is conducting field operations shall keep a copy of the licence at the place where the field operations are being conducted.</i></p> <p><i>(3) Subsections (1) and (2) do not apply to a licensee in respect of</i></p> <p><i>(a) a licence to import or export a nuclear substance, prescribed equipment or prescribed information;</i></p> <p><i>(b) a licence to transport a nuclear substance; or</i></p> <p><i>(c) a licence to abandon a nuclear substance, a nuclear facility, prescribed equipment or prescribed information.</i></p>	
Publication of Health and Safety Information		
16	<p><i>(1) Every licensee shall make available to all workers the health and safety information with respect to their workplace that has been collected by the licensee in accordance with the Act, the regulations made under the Act and the licence.</i></p> <p><i>(2) Subsection (1) does not apply in respect of personal dose records and prescribed information.</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>OPG's Health and Safety Policy is posted on the OPG intranet website.</p>
Obligations of Workers		
17	<i>Every worker shall:</i>	OPG understands this requirement and will continue to comply.

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<p><i>(a) use equipment, devices, facilities and clothing for protecting the environment or the health and safety of persons, or for determining doses of radiation, dose rates or concentrations of radioactive nuclear substances, in a responsible and reasonable manner and in accordance with the Act, the regulations made under the Act and the licence;</i></p> <p><i>(b) comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment;</i></p> <p><i>(c) promptly inform the licensee or the worker's supervisor of any situation in which the worker believes there may be</i></p> <p style="padding-left: 40px;"><i>(i) a significant increase in the risk to the environment or the health and safety of persons,</i></p> <p style="padding-left: 40px;"><i>(ii) a threat to the maintenance of the security of nuclear facilities and of nuclear substances or an incident with respect to such security,</i></p> <p style="padding-left: 40px;"><i>(iii) a failure to comply with the Act, the regulations made under the Act or the licence,</i></p> <p style="padding-left: 40px;"><i>(iv) an act of sabotage, theft, loss or illegal use or possession of a nuclear substance, prescribed equipment or prescribed information, or</i></p> <p style="padding-left: 40px;"><i>(v) a release into the environment of a quantity of a radioactive nuclear substance or hazardous substance that</i></p>	

General Nuclear Safety and Control Regulations		
Section	Requirement	OPG Response
	<p><i>has not been authorized by the licensee;</i></p> <p><i>(d) observe and obey all notices and warning signs posted by the licensee in accordance with the Radiation Protection Regulations; and</i></p> <p><i>(e) take all reasonable precautions to ensure the worker's own safety, the safety of the other persons at the site of the licensed activity, the protection of the environment, the protection of the public and the maintenance of the security of nuclear facilities and of nuclear substances.</i></p>	

Class 1 Nuclear Facility Regulations		
Section	Requirement	OPG Response
Licence Applications – General Requirements		
3	<p><i>An application for a licence in respect of a Class 1 nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations:</i></p> <p><i>(a) a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;</i></p>	<p>The requested WFOL amendment will not require changes to the description or plans of the PWMF site from the licence renewal application (Reference [1-1]).</p>
	<p><i>(b) plans showing the location, perimeter, areas, structures and systems of the nuclear facility;</i></p>	
	<p><i>(c) evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed;</i></p>	<p>The requested WFOL amendment will not require changes to site ownership as provided in Attachment 1 of Reference [1-1].</p>
	<p><i>(d) the proposed management system for the activity to be licensed, including measures to promote and support safety culture;</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 1.1 in Attachment 2 of this submission for further details on management system.</p>
	<p><i>(d.1) the proposed human performance program for the activity to be licensed, including measures to ensure workers' fitness for duty.</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 2.1 in Attachment 2 of this submission for further details on human performance and fitness for duty.</p>
	<p><i>(e) the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;</i></p>	<p>The requested WFOL amendment will not require changes to the name, form, characteristics and quantity of any hazardous substances from the licence renewal application (Reference [1-1]).</p>
	<p><i>(f) the proposed worker health and safety policies and procedures;</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to sections LC 7.1 and LC 8.1 in Attachment 2 of this submission for further details on radiation protection and conventional health and safety respectively.</p>

Class 1 Nuclear Facility Regulations		
Section	Requirement	OPG Response
	<i>(g) the proposed environmental protection policies and procedures;</i>	OPG understands this requirement and will continue to comply.
	<i>(h) the proposed effluent and environmental monitoring programs;</i>	Refer to section LC 9.1 in Attachment 2 of this submission for further details on environmental protection including environmental monitoring.
	<i>(i) if the application is in respect of a nuclear facility referred to in paragraph 2(b) of the Nuclear Security Regulations, the information required by section 3 of those Regulations;</i>	OPG understands this requirement and will continue to comply. Refer to section LC 12.1 in Attachment 2 of this submission for further details on security program.
	<i>(j) the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and</i>	The requested WFOL amendment will not require changes to the community relations or Indigenous Nations engagement programs. Refer to sections 3.2 and 3.3 of Attachment 3 of the licence renewal application (Reference [1-1]).
	<i>(k) the proposed plan for the decommissioning of the nuclear facility or of the site.</i>	OPG understands this requirement and will continue to comply. Refer to section LC 11.2 in Attachment 2 of this submission for further details on decommissioning plans.
Licence to Operate		
6	<i>An application for a licence to operate a Class 1 nuclear facility shall contain the following information in addition to the information required by section 3:</i> <i>(a) a description of the structures at the nuclear facility, including their design and their design operating conditions;</i> <i>(b) a description of the systems and equipment at the nuclear facility, including their design and their design operating conditions;</i>	The requested WFOL amendment will not require changes to the description, design or design operating conditions of PWMF structures or systems. Refer to sections 1.0 and 2.5 of Attachment 3 of the licence renewal application (Reference [1-1]).
	<i>(c) a final safety analysis report demonstrating the adequacy of the design of the nuclear facility;</i>	OPG understands this requirement and will continue to comply.

Class 1 Nuclear Facility Regulations		
Section	Requirement	OPG Response
		Refer to section LC 4.1 in Attachment 2 of this submission for further details on safety analysis.
	<i>(d) the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 3.1 in Attachment 2 of this submission for further details on operating performance.</p>
	<i>(e) the proposed procedures for handling, storing, loading and transporting nuclear substances and hazardous substances;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 14.1 in Attachment 2 of this submission for further details on packaging and transport.</p>
	<i>(f) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 13.1 in Attachment 2 of this submission for further details on safeguards.</p>
	<i>(g) the proposed commissioning program for the systems and equipment that will be used at the nuclear facility;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 3.1 in Attachment 2 of this submission for further details on operating performance.</p>
	<i>(h) the effects on the environment and the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 7.1, LC 8.1 and LC 9.1 in Attachment 2 of this submission for further details on radiation protection, conventional health and safety respectively and environmental protection.</p>

Class 1 Nuclear Facility Regulations		
Section	Requirement	OPG Response
	<p>(i) <i>the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;</i></p> <p>(j) <i>the proposed measures to control releases of nuclear substances and hazardous substances into the environment;</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 9.1 in Attachment 2 of this submission for further details on environmental protection.</p>
	<p>(k) <i>the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of national security, including measures to</i></p> <p style="padding-left: 40px;">(i) <i>assist off-site authorities in planning and preparing to limit the effects of an accidental release,</i></p> <p style="padding-left: 40px;">(ii) <i>notify off-site authorities of an accidental release or the imminence of an accidental release,</i></p> <p style="padding-left: 40px;">(iii) <i>report information to off-site authorities during and after an accidental release,</i></p> <p style="padding-left: 40px;">(iv) <i>assist off-site authorities in dealing with the effects of an accidental release, and</i></p> <p style="padding-left: 40px;">(v) <i>test the implementation of the measures to prevent or mitigate the effects of an accidental release;</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 10.1 in Attachment 2 of this submission for further details on emergency preparedness.</p>

Class 1 Nuclear Facility Regulations		
Section	Requirement	OPG Response
	<i>(l) the proposed measures to prevent acts of sabotage or attempted sabotage at the nuclear facility, including measures to alert the licensee to such acts;</i>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 12.1 in Attachment 2 of this submission for further details on security program.</p>
	<p><i>(m) the proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers; and</i></p> <p><i>(n) the results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.</i></p>	<p>OPG understands this requirement and will continue to comply.</p> <p>Refer to section LC 2.2 in Attachment 2 of this submission for further details on training program.</p>

Radiation Protection Regulations		
Section	Requirement	OPG Response
4	<p><i>Every licensee must implement a radiation protection program and must, as part of that program,</i></p> <p><i>(a) keep the effective dose and equivalent dose received by and committed to persons as low as reasonably achievable, taking into account social and economic factors, through the implementation of</i></p> <p style="padding-left: 40px;"><i>(i) management control over work practices,</i></p> <p style="padding-left: 40px;"><i>(ii) personnel qualification and training,</i></p> <p style="padding-left: 40px;"><i>(iii) control of occupational and public exposure to radiation, and</i></p> <p style="padding-left: 40px;"><i>(iv) planning for unusual situations; and</i></p> <p><i>(b) ascertain the quantity and concentration of any nuclear substance released as a result of the licensed activity</i></p> <p style="padding-left: 40px;"><i>(i) by direct measurement as a result of monitoring, or</i></p> <p style="padding-left: 40px;"><i>(ii) if the time and resources required for direct measurement as a result of monitoring outweigh the usefulness of ascertaining the quantity and concentration using that method, by estimating them.</i></p>	<p>OPG has a well-established radiation protection program that complies with all elements of the Radiation Protection Regulations.</p> <p>Further details are provided in Section LC 7.1 on OPG’s Radiation Protection considerations for the loading of minimum 6-year cooled fuel.</p>

Nuclear Security Regulations

OPG will continue to adhere to all facets of the Nuclear Security Regulations and keep in place all current security processes in the handling and storage of used fuel from Pickering NGS.

References: [1-1]. OPG letter, L. Swami to M. Leblanc, "Application for Renewal of Pickering Waste Management Facility", CD# 92896-CORR-00531-01031, October 28, 2016.

ATTACHMENT 2

OPG letter, K. Aggarwal to M. Bacon-Dussault, "OPG – Addendum to the Application for Amendment to the Pickering Waste Management Facility, Waste Facility Operating Licence WFOL-W4-350.00/2028"

CD# 92896-CORR-00531-01530 P

Licence Amendment Application for the Storage of Minimum 6-Year Cooled Fuel at the Pickering Waste Management Facility

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Checked By: H. Innis/K. Lynchahon

ATTACHMENT 2



**LICENCE AMENDMENT APPLICATION FOR
THE STORAGE OF MINIMUM 6-YEAR COOLED FUEL
AT THE PICKERING WASTE MANAGEMENT FACILITY**



Introduction

Background

The purpose of this attachment is to provide information in support of OPG's request for amendment to the Pickering Waste Management (PWMF) Waste Facility Operating Licence (WFOL), WFOL-W4-350.00/2028, to allow for the storage of minimum 6-year cooled fuel from Pickering Nuclear Generating Station (PNGS).

Description of PWMF – Used Fuel Dry Storage

The PWMF is located within the traditional territory of the Michi Saagiig Anishinaabe people. These lands are covered by the Williams Treaty between Canada and the Mississauga and Chippewa Nations. The PWMF operates under a Waste Facility Operating Licence (WFOL). At the PWMF, OPG processes and stores dry storage containers (DSCs) containing used nuclear fuel (high-level radioactive waste) generated at the PNGS, that has cooled for a minimum of ten years in the fuel bays at PNGS.

The dry storage of used fuel at the PWMF spans over 2 physically separate areas - Phase I and Phase II - within the overall boundary of the Pickering site. Phase I is located within the protected area of the PNGS and consists of the DSC Processing Building and two DSC storage buildings (Storage Buildings #1 and #2). Phase II of the PWMF is located northeast of Phase I and is contained within its own protected area, but within the boundary of the Pickering site. Phase II contains Storage Building #3 and #4. The PWMF currently has the capacity to store 1,778 DSCs. The transfer route of the loaded DSCs from the PWMF Phase I to the PWMF Phase II is solely on OPG property.

The information provided in this Attachment is divided into three sections as follows:

Section 1: Provides the need to store minimum 6-year cooled fuel at PWMF to support the Safe Storage Project at PNGS Units 5-8, and operational considerations for this activity.

Section 2: Summarizes regulatory compliance for the storage of minimum 6-year cooled fuel at PWMF and impact on OPG's governance, programs and processes for each of PWMF's WFOL's fourteen (14) Safety and Control Areas (SCA).

Section 3: Summarizes public, Indigenous Nations and Métis engagement related to this application for a licence amendment.

OPG is responsible for the continued safe operation of the PWMF and confirms that the storage of minimum 6-year cooled fuel will be implemented based on a robust safety case and proven engineering methods.

OPG has concluded that the proposed activities to support the storage of minimum 6-year cooled fuel will not compromise continued safe operation of the PWMF. OPG has and will continue to follow a robust and well-established Engineering Change Control (ECC) process and will continue to provide information to CNSC staff to assist in fulfillment of their regulatory oversight role.

The storage of minimum 6-year cooled fuel at PWMF is an important initiative to support the OPG Safe Storage Project for PNGS. The objective is to **only** accept minimum 6-year cooled fuel at PWMF from PNGS Units 5-8 (and **not** PNGS Units 1 and 4).

Section 1: Summary of Proposed Activity Requiring Licence Amendment

To support the OPG Safe Storage Project for PNGS, additional space in the PNGS-B Irradiated Fuel Bay (IFB-B) is required in order to accept the discharged used fuel from the required core defuel. As PWMF is currently waiting for IFB-B used fuel to mature to the 10-year required period before transferring, there is a need to accept younger fuel (minimum 6-year cooled fuel) to allow for the additional space. However, OPG is currently licensed to only process minimum 10-year cooled fuel at all Nuclear Waste Facilities. In order to store younger (i.e., minimum 6-year cooled fuel), OPG must apply for a License Amendment for the PWMF's WFOL (WFOL-W4-350.00/2028).

Master EC# 154806, "Loading, Processing and Storing a Maximum of 100 Dry Storage Containers (DSCs) (at one time) that Contain Used Fuel with a Minimum Cooling Period of 6 Years of Age in PWMF" was initiated to support the PNGS-B and PWMF operational need. The modification includes loading, transferring, processing and storage of up to 100 DSCs from the IFB-B that contain used fuel with a minimum cooling period of 6 years as well as the rearrangement of a number of the existing DSCs in Storage Building 3 (SB3) to accommodate the incoming DSCs. The younger used fuel will be loaded into DSCs in the IFB-B, transferred to the PWMF for processing, moved into the IAEA Surveillance Area in Storage Building 1 (SB1) for the application of safeguard seals and transferred for storage into SB3. Once all fuel in a DSC reaches the minimum cooling period of 10 years, the DSC can be treated the same as existing DSCs in the Used Fuel Storage Buildings at PWMF (and would not be considered part of the inventory of 100 DSCs containing minimum 6-year cooled fuel). Based on the analysis performed, it was determined that no design changes are required to the DSC to accept the storage of minimum 6-year cooled fuel within the DSC and stored in the PWMF storage buildings.

OPG targets to start commissioning DSCs containing minimum 6-year cooled fuel in July 2024, with the aim to initially gather predictive indicators around temperature and dosage. If this initial campaign proves successful (indicators are agreeable with modelling predictions) and doesn't present unforeseen challenges, the full campaign to store the minimum 6-year cooled fuel would commence in Q1 of 2025.

Safety Case

Safety is OPG's number one priority, proven over many years of both reactor operation and radioactive waste management and storage. OPG is responsible for continued safe operation of the PWMF and confirms that the minimum 6-year cooled fuel modifications at PWMF will be implemented based on a robust safety case and in accordance with OPG's Engineering Change Control process, which is supported by safety assessments 92896-REP-01320-

00012, “*Safety Assessment Storing Lower Aged Fuel in PWMF SB3*” and 92896-REP-03200-00009, “*Dose Rate Assessment Considering Lower Aged Fuel in PWMF SB3*” (Enclosures 2 and 3 of Reference [2-1] respectively) that demonstrate continued safe facility operation, public and worker safety, and environmental protection.

The safety case for the storage of minimum 6-year cooled fuel at PWMF can be defined based on the following elements:

- 1) Design: OPG has and will continue to follow its Engineering Change Control process, as described in N-PROG-MP-0001, “*Engineering Change Control*”, for ensuring the design complies with applicable PWMF Licence Condition Handbook, LCH-W4-350.00/2028, regulatory requirements and that configuration management for the station is maintained.
- 2) Continued Safe Operation: Safety analysis (Enclosure 1 of this submission) demonstrates that the storage of minimum 6-year cooled fuel at PWMF will have a negligible effect on safe operation of PWMF, and on public and worker safety.
- 3) Environmental Protection: An assessment of existing environmental-related submissions to the CNSC (environmental assessments, environmental risk assessment and predictive environmental effects assessment) (Enclosure 1 of this submission) concludes that the storage of minimum 6-year cooled fuel at PWMF will have negligible impact on the environment.
- 4) Licensing Basis: The storage of minimum 6-year cooled fuel at PWMF will have negligible impact on PWMF’s licensing basis, governance, programs and processes. Attachment 1 provides the compliance matrix for the “*Nuclear Safety Control Act*” and associated regulations required for the amendment of the PWMF WFOL to add the proposed new activity.

Overall, there are no notable safety or operational issues that result from storing minimum 6-year cooled fuel at PWMF.

Section 2: Safety and Control Areas

This section provides the impact assessment of the proposed new activity on PWMF’s licensing basis for each of the PWMF WFOL Safety and Control Areas (SCAs).

OPG is responsible for the continued safe operation of the PWMF and confirms that all modifications made with respect to the storage of minimum 6-year cooled fuel, will be implemented based on a robust safety case and in accordance with OPG’s ECC process and that is supported by safety assessments, which demonstrate continued safe operation of the PWMF, public safety, worker safety and environmental protection.

LC 1.1 Management System

Licence Condition 1.1 states “*the licensee shall implement and maintain a management system*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

OPG’s proven Nuclear Management System provides a framework that establishes the processes and programs required to ensure OPG achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

List of Management System Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Management System Requirements for Nuclear Facilities	CSA N286 (2012)	Continued compliance as applied to all aspects of operation and modifications at PWMF.

Quality Assurance. CSA Standard N286-12 Compliance

PWMF is compliant with CSA Standard N286-12, “*Management system requirements for nuclear facilities*”. The Nuclear Charter, N-CHAR-AS-0002, “*Nuclear Management System*”, establishes the Nuclear Management System for OPG Nuclear. The Nuclear Management System will not change as a result of the proposed storage of minimum 6-year cooled fuel at PWMF.

Nuclear Safety Culture

OPG routinely monitors the health of its nuclear safety culture through Nuclear Safety Monitoring Panels. These panels were established based on the industry best practices documents in the Nuclear Energy Institute's NEI-09-07, “*Fostering a Strong Nuclear Safety Culture*”. The Nuclear Safety Monitoring Panel examines information from a variety of the processes that have been implemented, such as the corrective action process, the human performance program, audits and self-assessments, external inspections such as CNSC inspections or industry evaluations, employee concerns, and business performance monitoring. This information is evaluated against the traits of a healthy nuclear safety culture to identify strengths and areas for focused attention within the organization. The panel is composed of all of the managers and senior leadership within NSS. The panel evaluates the information and approves any initiatives or reinforces communications as needed.

Impact of the Storage of Minimum 6-Year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWMF’s Management System and identifies the impact of storing minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWMF's Management System Licensing Basis Documents

OPG Management System Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Items and Services Management	OPG-PROG-0009	No Change
Health and Safety Managed Systems	OPG-PROG-0005	No Change
Nuclear Management Systems Organization	N-STD-AS-0020	No Change
Nuclear Safety Culture Assessment	N-PROC-AS-0077	No Change
Nuclear Safety Oversight	N-STD-AS-0023	No Change
Nuclear Safety Policy	N-POL-0001	No Change
Nuclear Management System	N-CHAR-AS-0002	No Change

LC 1.2 Management of Contractors

Licence Condition 1.2 states “*the licensee shall ensure that every contractor at the facility complies with this licence*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

Vendors and contractors are qualified by OPG Supply Chain Quality Services under a process that ensures that the contractors have developed and implemented a management system that meets the applicable requirements outlined in the CSA Standard N286 series of standards. OPG is ultimately responsible for ensuring that all on-site contractor activities comply with OPG's safety requirements. Day-to-day operations at the PWMF are generally maintained by full-time staff of OPG.

LC 2.1 Human Performance Program

Licence Condition 2.1 states “*the licensee shall implement and maintain a human performance program*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

Human performance relates to reducing the likelihood of human error in work activities. It refers to the outcome of human behaviour, functions and actions in a specified environment, reflecting the ability of workers and management to meet the system's defined performance under the conditions in which the system will be employed.

List of Human Performance Management Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Fitness for Duty: Managing Worker Fatigue	CNSC REGDOC-2.2.4 (2017)	Continued compliance, no impact.
Fitness for Duty, Volume II: Managing Alcohol and Drug Use, Version 2	CNSC REGDOC- 2.2.4 (2017)	Continued compliance, no Impact.
Safety Culture	CNSC REGDOC-2.1.2 (2018)	Continued compliance, no impact.

Human Performance Program

The objective of OPG's Human Performance program, N-PROG-AS-0002, "*Human Performance*" is to reduce human performance events and errors by managing defences in pursuit of zero events of consequence.

The Human Performance program integrates proactive (prevention) and reactive (detection and correction) human performance initiatives, which includes the following:

- Providing oversight and mentoring of department human performance.
- Identifying emerging human performance issues and determining strategies for related improvement.
- Approving site-wide human performance improvement initiatives and measures and overseeing implementation progress.
- Use of the human performance toolbox, prevent event tools.
- Identifying and implementing human performance improvement communication, education, and training opportunities.

The site strategic plan provides guidance to the leadership team on the requirements for the development and implementation of an integrated site and department human performance strategic plan. Department managers and supervisors develop a human performance plan that sets clear direction and priorities to achieve common goals.

Fitness for Duty

As part of OPG's fitness for duty program, OPG has in place a Continuous Behaviour Observation Program which trains supervisors and managers to monitor workers for signs of fatigue or other factors which could adversely impact worker performance.

OPG has in place hours of work requirements that are documented in N-PROC-OP-0047, "*Hours of Work Limits and Managing Worker Fatigue*" that sets limits for the number of hours within a specified time period that station staff can work. The limits, which are in place to guard

against fatigue in the workplace, are very strict in comparison to other jurisdictions.

The storage of minimum 6-year cooled fuel will not impact OPG's fitness for duty program or compliance to hours-of-work requirements.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWF's Human Performance Program Licensing Basis Documents

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Human Performance program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of Minimum 6-year Cooled Fuel on PWF's Human Performance Management Licensing Basis Documents

OPG Human Performance Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Human Performance	N-PROG-AS-0002	No Change
Hours of Work Limits and Managing Worker Fatigue	N-PROC-OP-0047	No Change

LC 2.2. Training Program

Licence Condition 2.2 states "*the licensee shall implement and maintain a training program*" and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

Personnel at the PWF will be fully trained on the loading of minimum 6-year year cooled fuel and also on mitigative measures for backout when required. All required staff will be fully trained before the first DSC containing minimum 6-year cooled fuel is commissioned.

List of Training Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Personnel Training	CNSC REGDOC-2.2.2 (2016)	Continued compliance, no impact.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWMF's Training Program Licensing Basis Documents

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWMF's Training program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of Minimum 6-year Cooled Fuel on PWMF's Training Program Licensing Basis Documents

OPG Human Performance Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Systematic Approach to Training	N-PROC-TR-0008	No Change
Training	N-PROG-TR-0005	No Change

LC 3.1 Operating Performance

Licence Condition 3.1 states "*the licensee shall implement and maintain an operating program, which includes a set of operating limits*" and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

Operational Analysis

Processing minimum 6-year cooled fuel is essentially the same as processing 10-year cooled fuel. The trialing of the initial two to four DSCs will be tested for various indicators, including temperature and dosage. That may dictate required changes to staff requirements around personal protective equipment, worker proximity to hazards and instruments used (which would then be reflected in the appropriate operational procedures). Loading of DSCs is not expected to change in any way. DSCs that contain minimum 6-year cooled fuel have been analyzed for the anticipated temperatures throughout the DSC. Based on conservative bounding scenario assumptions, it has been conservatively identified that contact temperatures could potentially reach approximately 85 degrees Celsius (°C), which impacts worker safety in handling the DSC. The increased temperatures potentially impact interfacing equipment such as Advanced Inspection and Maintenance (AIM) equipment and International Atomic Energy Agency (IAEA) equipment including seals and NDE profiling.

Based on OPEX from 1998, DSC 0024 contained four full modules (384 bundles) of 6-year cooled fuel and had temperature probes fixed to the DSC. Temperature measurements were much lower than the conservative design analysis from 2022. These temperatures are documented in OPG Controlled Document 00104-CORR-79171-0139942 "*Additional*

Information Concerning: Thermal Gradients Pertaining to Dry Storage Containers (DSCs)" (Enclosure 4 of Reference [2-1]) (2005) and summarized in Figure 1 below. Based on this OPEX, it is anticipated that contact temperatures will not be as high as analyzed.

Measured Temperatures of DSC with 6 Y/O Fuel

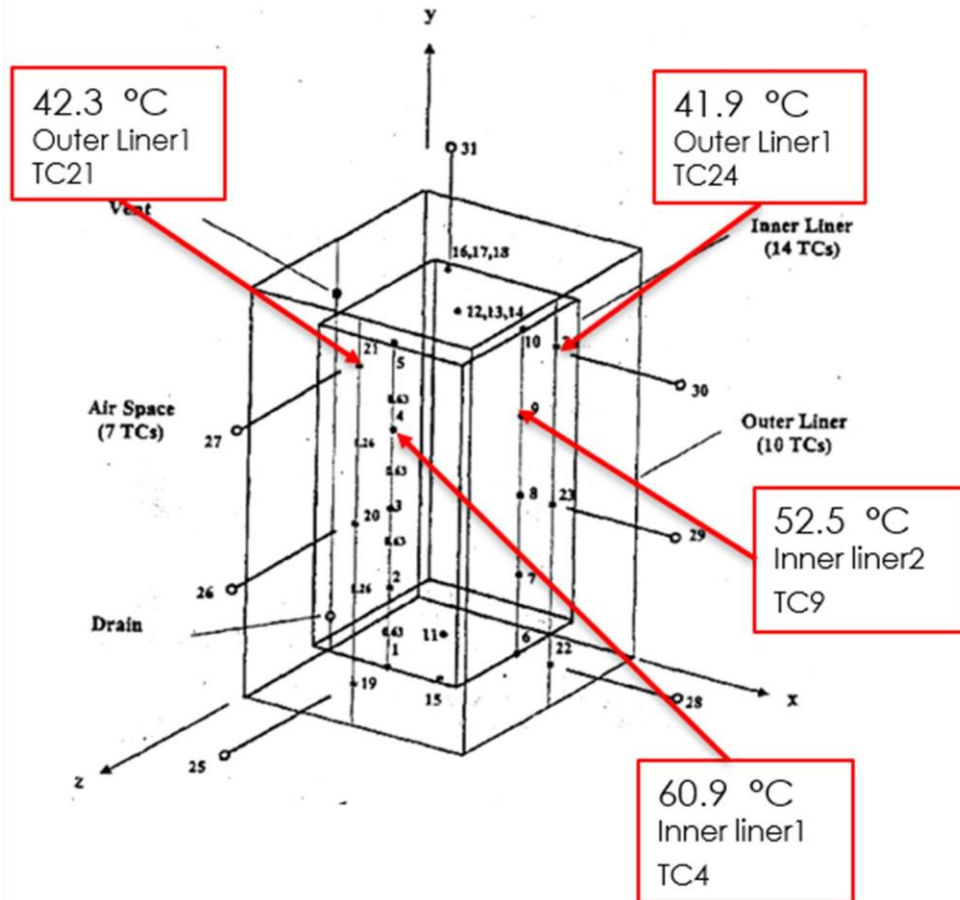


Figure 1: Measured Temperatures in DSC 0024

Commissioning Plan

Operationally, only one DSC is required to be loaded with 6-year cooled fuel to commission the modification. However, to avoid reverse loading (see Reverse Loading below), a conservative approach is recommended to be used. A potential option would be to load and vacuum dry the commissioning DSCs, starting with 9-year cooled fuel and working down to 6-year cooled fuel while measuring temperatures and dose rates. Based on OPG report with Controlled Document 92896-REP-79171-00001, "NSATD-0232 Thermal Analyses for Pickering Waste Management Facility Storage Building 3", the time taken for the outer liner of the DSC to reach equilibrium temperature is of the order of three weeks on average. Therefore, this option will take several months to complete the commissioning.

Acceptable temperatures are driven by Advance Inspection and Maintenance (AIM) and IAEA

equipment at specific DSC locations outlined in Table 1 below:

Table 1 - IAEA/AIM Equipment Temperature Limits

Container Location	Equipment	Temp. Limit	Analyzed Temp.	OPEX Temp. DSC 0024
Weld Flange	AIM – Phased Array Ultrasonic Testing – (PAUT)	50 °C	~ 85 °C	~ 45 °C
Weld Flange	IAEA - Laser Container Mapping Verification	Deformation ~60 °C (Estimate)	~ 85 °C	~ 45 °C
Seal Tubes	IAEA -Fiber Optic Seals	Degradation ~70 °C (Estimate)	~100 °C	< 62 °C

IAEA temperature limits in Table 1 are estimates since they are not allowed to be identified. Estimates listed in Table 1 are based on discussions with IAEA.

AIM Equipment

As part of the commissioning, the intent is to ensure that the temperatures meet AIM equipment requirements before proceeding with the welding and continuation of processing the DSC to interim storage. The AIM equipment has a temperature limitation 50°C, shown in Table 1 above. If temperatures are measured less than 50°C, then nothing changes except conventional and Radiation Protection (RP) safety aspects. The AIM Acquisition Procedure would remain unaltered and there would be no issue.

Options have been considered for cooling the DSC flange if temperatures are measured in excess 50°C. Details on flange cooling are discussed below. If temperatures exceed 50°C, and the flange cooling methods are ineffective then the DSC will be Reverse loaded (discussed below).

Flange cooling: options for cooling the DSC flange are available if temperatures are measured in excess 50°C. Having an effective means to cool the DSC temperatures reduces the risk of having to resort to the back-out option (Reverse Loading).

IAEA Equipment

Temperature limits for IAEA are listed in Table 1 above. The impact of higher temperatures on IAEA safeguards and security interfacing equipment is being evaluated and discussion with the IAEA and CNSC is in progress. There is a risk that some IAEA equipment used for the sealing processes is not designed for the increased temperatures that could be observed.

Current proposal to the IAEA is to:

- Load and Vacuum Dry commissioning DSC with minimum 6-year cooled fuel.
- Within Camera View – Allow DSC to reach maximum temperature (not welded).
- Allow for residency time of three weeks to allow for DSC to reach equilibrium temperature, measure temperatures and doses.

- If temperatures are conducive for Fiber Optic seals: complete DSC processing. Confirm weld flange temperatures before sealing with IAEA.
- If temperatures exceed limits outlined in Table 1 above, OPG suggest tri-seals to be applied (i.e., LMCV, FBOS, & Metallic). Monitor health seals during regular IAEA visits. OPG will also explore using mixed age modules.
- If the above commissioning DSC is excessively hot, then the DSC will need to be reverse loaded (see below, Reverse Loading). DSC temperatures will be controlled operationally – for example through the mixed age module loading.

Based on discussions, the IAEA have agreed to support the commissioning DSC test case to see if the actual temperatures are similar to the calculated temperatures or more similar to OPEX of DSC 0024. An Operating Memo is currently being prepared to provide the changes to documents required to operationalize the change. This will be completed prior to commissioning of the first DSC.

Reverse Loading

If the temperatures are higher than the limits required as discussed above, there will need to be a backout option to reverse load the DSC back to the IFB-B. A reverse loading plan is being developed to outline the steps required to reverse load a DSC loaded with 6-year cooled fuel. The plan will include lessons learned and OPEX from the 2012 event documented in Station Condition Record N-2012-00289, “*Supertool Malfunctions While Loading DSC*”. This DSC had to be emptied. The reverse loading plan will be issued before the loading of any DSCs containing minimum 6-year cooled fuel. OPG will provide the reverse loading plan to CNSC staff by March 22, 2024.

Impact of the Storage of Minimum 6-Year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF’s Operating Performance and identifies the impact of the storage of minimum 6-year cooled fuel on these programs. Identified changes in new revisions of licensing basis documents will be submitted by written notification to the CNSC per the requirements of the PWF LCH LC G2.

Impact of the Storage of Minimum 6-Year Cooled Fuel on PWF’s Operating Performance Related Licensing Basis Documents

OPG Document Title	OPG Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Application for Renewal of Pickering Waste Management Facility Operating Licence	92896-CORR-00531-01031	No Change

Additional Information to Support the Application for Renewal of Pickering Waste Management Facility Operating Licence	92896-CORR-00531-01075	No Change
Nuclear Waste Management	W-PROG-WM-0001	No Change
Operating Policies and Principles, Pickering Waste Management Facility	92896-OPP-01911.1-00001	To be updated by March 15, 2024.
Pickering Waste Management Facility – Safety Report	92896-SR-01320-10002	No Change*

*An addendum to 92896-SR-01320-10002 will be provided to CNSC staff by September 30, 2024, after the trialing of the initial DSCs containing minimum 6-year cooled fuel.

Impact of the Storage of Minimum 6-Year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Operating Performance and identifies the impact of the storage of minimum 6-year cooled fuel on these programs.

Impact of the Storage of Minimum 6-Year Cooled Fuel on PWF's Operating Performance Related Licensing Basis Documents

OPG Document Title	OPG Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Conduct of Regulatory Affairs	N-PROG-RA-0002	No Change
Performance Improvement	N-PROG-RA-0003	No Change
Preliminary Event Notification	N-PROC-RA-0020	No Change
Operating Policies and Principles, Pickering Waste Management Facility	92896-OPP-01911.1-00001	To be updated by March 15, 2024, prior to commissioning of the first DSC with minimum 6-year cooled fuel.

The following documents related to operations (but not included in the licensing basis) will also be updated prior to the commissioning of the first DSC containing minimum 6-year cooled fuel:

Document Number	Document Title
92896-MAN-79171-00001	IFB Loading
W-WOEP-79171-000010	Dry Storage Container Reverse Loading
W-PROC-WM-0082	Eastern Waste Acceptance Criteria for Used Fuel Dry Storage Containers
92896-OP-35540-00001	Pickering Waste Management Facility (PWMF) General
92896-OP-79171-00001	Pickering Waste Management Facility Operating Procedure Dry Storage Container Processing
92896-SR-01320-10002	Pickering Waste Management Facility – Safety Report
92896-OP-35570-00001	International Atomic Energy Agency Safeguards (*If required based on commissioning results)
92896-OP-79171-00003	DSC Loading PNGS 058 Irradiated Fuel Bay (IFB-B)
92896-OP-79171-00004	DSC Loading Auxiliary Irradiated Fuel Bay

LC 3.2 Reporting Requirements

Licence Condition 3.2 states “*the licensee shall implement and maintain a program for reporting to the Commission or a person authorized by the Commission*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

List of Reporting Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Public Information and Disclosure	CNSC REGDOC-3.2.1 (2018)	Continued compliance, no impact.
Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills	CNSC REGDOC-3.1.2 (2018)	Continued compliance, no impact.

Quarterly and Annual Operational Reporting

Quarterly and Annual operational reporting will continue as currently conducted and will account for the DSCs containing minimum 6-year cooled fuel.

LC 4.1 Safety Analysis Program

Licence Condition 4.1 states “*the licensee shall implement and maintain a safety analysis program*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

Safety Assessment

As concluded in the safety analysis provided in Enclosure 2 of Reference [2-1]: the safety assessment demonstrates compliance with the radiation safety requirements during normal operation of the PWF when SB3 is in service. With the addition of the 100 DSCs containing minimum 6- year cooled fuel, the annual public dose estimates have increased compared to that of the existing PWF configuration. The maximum annual dose to individual member of the public with the addition of these 100 DSCs is still a small percentage of the 1 mSv limit. Due to the specialized array of storing the DSCs containing minimum 6-year cooled fuel, the target dose rate to the public of 0.5mSv will also be met. With respect to malfunction and accident scenarios, the estimated bounding doses to members of the public are less than the 1 mSv acceptance criterion. The dose to workers following a postulated accident scenario is found to be much less than the 50 mSv limit. It is concluded that the dose consequences to workers and members of the public as a result of credible postulated malfunction / accident scenarios meet all acceptance criteria.

Enclosures 2 and 3 of Reference [2-1] were previously provided to CNSC staff in 2020 (Enclosure 3 and 2 of Reference [2-2] respectively) before it was determined that a Licence Amendment would be required to store minimum 6-year cooled fuel. OPG will undertake a code applicability report of the Safety Analysis by March 15, 2024. 92896-MDR-79171-00001, “*Modification Design Requirements for Loading, Transferring, Processing and Storing Minimum 6-year-old Fuel at NSSP*” (Enclosure 2 of this submission) specifies the design requirements to ensure the impact of loading, transferring, processing, and storing minimum 6-year cooled fuel have been assessed for DSCs with respect to the structural integrity, shielding and containment functions of the DSC under normal and accident conditions. 00104-CORR-79171-0139942, “*Additional Information Concerning Thermal Gradients Pertaining to Dry Storage Containers (DSCs)*” (Enclosure 4 of Reference [2-1]) contains information (previously requested by the CNSC) regarding the trialing of a single DSC containing 6-year cooled fuel in 1998.

List of Safety Analysis Program Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
General principles for the management of radioactive waste and irradiated fuel	CSA N292.0 (2014)	Minimum 6-year cooled fuel safety assessments were conducted in compliance with applicable requirements
Interim dry storage of irradiated fuel	CSA N292.2 (2013)	Minimum 6-year cooled fuel safety assessments were conducted in compliance with applicable requirements
Management of low- and intermediate-level radioactive waste	CSA N292.3 (2014)	Minimum 6-year cooled fuel safety assessments were conducted in compliance with applicable requirements
Quality assurance of analytical, scientific, and design computer programs	CSA N286.7 (2016)	Minimum 6-year cooled fuel safety assessments were conducted in compliance with applicable requirements

Impact of the Storage of Minimum 6-Year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Safety Analysis program and identifies the impact of storing minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWF's Safety Analysis Licensing Basis Documents

OPG Safety Analysis Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Pickering Waste Management Facility – Safety Report	92896-SR-01320-10002	An addendum will be provided to CNSC staff by September 30, 2024, after the trialing of the initial DSCs containing minimum 6-year cooled fuel.

LC 5.1 Design Program

Licence Condition 5.1 states “*the licensee shall implement and maintain a design program*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

List of Design Program Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Fire protection for facilities that process, handle, or store nuclear substances	CSA N393 (2013)	No impact from the storage of minimum 6-year cooled fuel.
National Building Code of Canada (2020)	NRC	The PWMF SB's design complies with the requirements in this national code.
National Fire Code of Canada (2020)	NRC	The PWMF SB's design complies with the requirements in this national code.

Facility and DSC Design

The storage of minimum 6-year cooled fuel will not require any change to the facility design. The DSC currently used for minimum 10-year cooled fuel will also be used for the storage of minimum 6-year cooled fuel.

Impact of the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWMF's Design Program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

**Impact of the Storage of Minimum 6-year Cooled Fuel on PWF's Design Program
Related Licensing Basis Documents**

OPG Physical Design Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Conduct of Engineering	N-STD-MP-0028	No Change
Configuration Management	N-STD-MP-0027	No Change
Design Management	N-PROG-MP-0009	No Change
Engineering Change Control	N-PROG-MP-0001	No Change

LC 5.2 Pressure Boundary

Licence Condition 5.2 states “*the licensee shall implement and maintain a training program*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

List of Pressure Boundary Program Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Power Piping	ASME (2010)	No impact from the storage of minimum 6-year cooled fuel.
Boiler, pressure vessel, and pressure piping code	CSA B51 (2009 and Update No. 1)	No impact from the storage of minimum 6-year cooled fuel.
General requirements for pressure-retaining systems and components in CANDU nuclear power plants	CSA N285.0 (2008 and Updates No. 1 and 2; and Annex N of N285.0-12 and Update No. 1)	No impact from the storage of minimum 6-year cooled fuel.

Impact of the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Design Program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-Year Cooled Fuel on PWF's Design Program Related Licensing Basis Documents

OPG Physical Design Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Index to OPG Pressure Boundary Program Elements	N-LIST-00531-10003	No Change
Pressure Boundary Program Manual	N-MAN-01913.11-10000	No Change
Authorized Inspection Agency Service Agreement	N-CORR-00531-20012	No Change
Design Registration	N-PROC-MP-0082	No Change
Pressure Boundary	N-PROC-MP-0004	No Change
System and Item Classification	N-PROC-MP-0040	No Change

LC 6.1 Fitness for Service Program

Licence Condition 6.1 states "*the licensee shall implement and maintain a fitness for service program*" and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application remains valid.

List of Fitness for Service Program Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Aging Management	CNSC REGDOC-2.6.3 (2014)	The storage of minimum 6-year cooled fuel will be incorporated into the aging management program as applicable as part of the ECC process.

Impact of the Storage of Minimum 6-Year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Fitness for Service and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-Year Cooled Fuel on PWF's Aging Management Program Related Licensing Basis Documents

OPG Fitness for Service Licensing Basis Document Title	OPG Document Number	Impact from Storage of Minimum 6-Year Cooled Fuel
Conduct of Engineering	N-STD-MP-0028	No Change
Design Management	N-PROG-MP-0009	No Change
Equipment Reliability	N-PROG-MA-0026	No Change
Integrated Aging Management	N-PROG-MP-0008	No Change
Nuclear Waste Management	W-PROG-WM-0001	No Change
Ontario Power Generation Dry Storage Container – Base (Underside) Inspection Plan	00104-PLAN-79171-00002	No Change
Used Fuel Dry Storage Container Aging Management Plan	00104-PLAN-79171-00001	No Change

OPG will be undertaking a condition assessment report using the indicators from the initial trialing of the two to four DSCs to assess any degradation mechanism and any impact on the aging/service life while storing minimum 6-year cooled fuel. This report is expected to be completed by December 2024 and any new findings from this condition assessment report will be reviewed and incorporated into the DSC aging management plan accordingly.

LC 7.1 Radiation Protection

Licence Condition 7.1 states “*the licensee shall implement and maintain a radiation program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

As per OPG's N-PROG-RA-0013, “*Radiation Protection*”, the overriding objective of the Radiation Protection (RP) program at OPG is the control of occupational and public exposure to

radiation. For the purposes of controlling radiation doses to workers and the public, this program has five implementing objectives:

- Keeping individual radiation doses below regulatory limits
- Avoiding unplanned radiation exposures
- Keeping individual risk from lifetime radiation exposure to an acceptable level
- Keeping collective radiation doses ALARA, social and economic factors taken into account
- Keeping public exposure to radiation well within regulatory limits.

Higher Dose Rates

Higher dose rates from the minimum 6-year cooled fuel DSCs directly impacts workers and equipment that interface with the DSC. It has been analyzed that the anticipated dose rates would be approximately 2.5 times higher in comparison to the storage of 10-year cooled fuel. This is manageable with a different Radiation Exposure Permit (REP) to address worker safety; and no meaningful impact on OPG equipment. Dose rates will be managed with the As Low as Reasonably Achievable (ALARA) principles associated with an updated REP.

New REPs for workers interfacing with the minimum 6-year cooled fuel will be developed and implemented prior to commissioning of any DSCs containing minimum 6-year cooled fuel.

OPG will perform detailed measurements during initial placement of the loaded DSCs containing minimum 6-year cooled fuel to compare against estimated values using various types of gamma meters (i.e., energy compensated Geiger Mueller, Ion chamber) at multiple locations and distances from the DSCs. An 'as found' dose-rate criteria of approximately 150 $\mu\text{Sv/h}$ at near contact and approximately 80 $\mu\text{Sv/h}$ at 1 m will be considered in line with estimated values, modelled uncertainty and nominal variance in field accuracy of the various instruments used. If 'as found' gamma radiation readings are appreciably above estimated values, further evaluation of the propagated impact on subsequent storage will be taken (i.e., impact on storage strategy of higher than estimated DSCs to bounding safety case analysis). Short term/immediate actions will include unique identification of minimum 6-year cooled fuel DSCs and radiation protection controls to ensure workers dose are ALARA (e.g. place affected DSCs in low traffic areas, utilize surrounding low dose rate DSCs to act as shielding). OPG will provide the results of the confirmatory dose rate surveys to CNSC staff immediately after the initial commissioning loading of DSCs.

The bounding case of storing all 100 DSCs containing minimum 6-year cooled fuel in PWMF SB 3 in the locations assessed is acceptable. This is the worst-case ratio of 100/380 (where 480 DSCs are in storage in PWMF SB3). However, this is highly unlikely.

OPG confirms that the planned pattern shown in Figures 7 and 8 of Enclosure 2 of Reference [2-1] remain valid, and that the neither the figures or assessed pattern for storage has been reassessed or updated the past three years. The pattern shown still bounds the expected conditions for storage at the expected time of loading the DSCs containing the minimum 6-year cooled fuel. OPG will be performing a dose assessment based on the measured dose rates and/or doses received to workers from DSC processing activities immediately after the loading of two to four trial DSCs.

Estimated Public Dose

Estimated public doses have been analyzed in Enclosure 2 of Reference [2-1] (section 5.3.3) and in Enclosure 3 of Reference [2-1] (section 4.3.2). Both analyses assess that the dose to public, as a result of the storage of minimum 6-year cooled fuel in SB3, remains far below regulatory limits.

Based on previous correspondence with the CNSC, and reaffirmed in this application, dose rates will be measured during the initial placement of minimum 6-year cooled fuel and actions will be taken are taken prior to the dose rate criterion being exceeded.

Dose Rates and Temperature Impact on the Public and Environment

Analysis has been conducted on the indirect impact that dose rates and temperatures would have on OPG equipment and the public/environment. The transfer of the DSC from IFB-B to the processing building, then to interim storage in SB1 and lastly to its final destination in SB3. This increase in dose and temperature has been analyzed to be within the regulatory limits for the public and environment (including all Action Levels stated in the PWMF LCH).

The existing TLDs around PWMF Phase I and Phase II will measure the dose rates, which are reported quarterly to the CNSC in the facility Operations Report. Monitoring of these results will confirm the impact on the regulatory dose rates. However, as SB3 is a shielded building, it is not anticipated to be a concern.

Thermal Analysis for PWMF SB3 storing minimum 6-year cooled fuel has been completed during design. DSCs containing minimum 6-year cooled fuel will be placed in the middle of SB3. An increase in dose and temperature has been analyzed to be within the regulatory limits to the public and environment. Temperature monitoring inside SB3 will be in place prior to the commissioning of any DSCs containing minimum 6-year cooled fuel.

List of Radiation Protection Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Radiation Protection Regulations	SOR/2000-203	Continued compliance as documented in Attachment 1

Impact of the Storage of Minimum 6-Year Cooled Fuel on PWMF's Radiation Protection Program Related Licensing Basis Documents

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWMF's Radiation Protection and identifies the impact of the storage of minimum 6-year cooled fuel on these programs.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Radiation Protection and ALARA Licensing Basis Documents

OPG Radiation Protection Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Occupational Radiation Protection Action Levels for Nuclear Waste Management Facilities	N-REP-03420-10011	No Change
Radiation Protection	N-PROG-RA-0013	No Change

LC 8.1 Conventional Health and Safety

Licence Condition 8.1 states “*the licensee shall implement and maintain a conventional health and safety program*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

Regulatory Requirements Related to Conventional Health and Safety

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
General Nuclear Safety and Control Regulations	SOR/2000-202	Continued compliance as documented in Attachment 1

Ensuring Conventional Safety Performance

The foundation of OPG's Health and Safety Management System is OPG-POL-0001, “*Employee Health and Safety Policy*” which describes the approach and commitments to conventional health and safety for the organization, and the requirements and accountabilities of all employees.

OPG's program document OPG-PROG-0005, “*Environment Health and Safety Managed Systems*” governs the design and execution of OPG's Health and Safety Managed Systems in accordance with OPG-POL-0001. The Health and Safety Managed System program and supporting governing documents establish process requirements that protect employees by ensuring they are working safely in a healthy and injury-free workplace. It also outlines the responsibilities of various levels in the organization to ensure activities are performed to meet the requirements of OPG's Health and Safety Policy.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Conventional Safety program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Conventional Safety Program Licensing Basis Documents

OPG Conventional Safety Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Employee Health and Safety Policy	OPG-POL-0001	No Change
Health and Safety Management System Program	OPG-PROG-0010	No Change

LC 9.1 Environmental Protection

Licence Condition 9.1 states “*the licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

List of Environmental Protection Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Environmental Protection: Environmental Principles, Assessments and Protection Measures	REGDOC-2.9.1, Section 4.6 (2016)	Environmental-related assessments were conducted in accordance with requirements
Environment management of nuclear facilities: Common requirements of the CSA N288 series of Standards	CSA N288.0 (2022)	Environmental-related assessments were conducted in accordance with requirements
Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities	CSA N288.1 (2014 R2019)	Environmental-related assessments were conducted in accordance with requirements

Performance Testing of Nuclear Air-Cleaning Systems at Nuclear Facilities	CSA N288.3.4 (2013 R2018)	Environmental-related assessments were conducted in accordance with requirements
Environmental monitoring program at class I nuclear facilities and uranium mines and mills	CSA N288.4 (2010 R2015)	Environmental-related assessments were conducted in accordance with requirements
Effluent monitoring programs at class I nuclear facilities and uranium mines and mills	CSA N288.5 (2022)	Environmental-related assessments were conducted in accordance with requirements
Environmental risk assessments at class I nuclear facilities and uranium mines and mills	CSA N288.6 (2012 R2017)	Environmental-related assessments were conducted in accordance with requirements
Groundwater protection programs at Class I nuclear facilities and uranium mines and mills.	CSA N288.7 (2015 R2020)	Environmental-related assessments were conducted in accordance with requirements
Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities	CSA N288.8 (2017 R2022)	Environmental-related assessments were conducted in accordance with requirements

Effluent and Emissions Control (Releases)

OPG is committed to complying with the requirements of the CSA Standard N288 series documents, as required in the PWMF LCH. The licensee shall control radiological releases to ALARA, thereby minimizing dose to the public resulting from PWMF operation.

The PWMF adheres to approved Derived Release Limits (DRLs) under PNGS, which are defined in CSA Standard N288.1 as the release rate that would cause an individual of the most highly exposed group to receive and be committed to a dose equal to the regulatory annual dose limit, due to release of a given radionuclide to air or surface water during normal operation of a nuclear facility over the period of a calendar year.

Because radiological releases are very small in comparison with the Derived Release Limits (DRLs) and Action Levels, lower Internal Investigation Levels (IILs) are used to demonstrate and maintain adherence to the ALARA principle. There will be no changes to the DRLs, Action Levels or IILs as a result of the storage of minimum 6-year cooled fuel. Consistent with current performance, the cumulative public dose resulting from the storage of the minimum 6-year cooled fuel will remain well below 1% of the regulatory public dose limit of 1,000 μ Sv per year.

Under normal operating conditions, no airborne emissions are expected from loaded DSCs during transfer from the Fueling Facility Auxiliary Areas to the PWMF. Airborne releases are also unlikely to arise under normal operating conditions during storage of seal welded DSCs. There is a small potential for airborne emissions resulting from DSC processing operations such as welding and vacuum drying. The DSC processing building has a dedicated active ventilation system with HEPA filtration. The active ventilation exhaust from the DSC Processing Building has historically been monitored for radioactive particulates for

confirmation purposes. The historical monitoring confirms that particulate emissions are negligible.

Releases of HTO, Kr-85, and C-14 from the DSCs are not expected, but a conservative scenario has been assessed to demonstrate that dose from releases would be very low. Specific monitoring for HTO, Kr-95 and C-14 is not required per N-STD-OP-0031, "*Monitoring of Nuclear and Hazardous Substances in Effluents*".

Environmental Management System (EMS)

OPG's OPG-POL-0021, "*Environmental Policy*" requires that OPG maintain an Environmental Management System (EMS) consistent with the ISO 14001, "*Environmental Management System Standard*".

Operation of the PWWF will continue to be in accordance with OPG's EMS as described in OPG-PROG-0005, "*Environment Health and Safety Managed Systems*" and OPG-POL-0021. The EMS provides specific direction on how the Environmental Policy is implemented while meeting the expectations of OPG-POL-0032, "*Safe Operations Policy*", N-POL-0001, "*Nuclear Safety & Security Policy*", and N-CHAR-AS-0002, "*Nuclear Management System*".

Continued Validity of Prior Submissions to the CNSC/Licensing Documents

Enclosure 1 of this submission contains an assessment that reviewed the following current licensing documents: Environmental Assessments (EAs):

- Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002
- Refurbishment and Continued Operation of Pickering B Nuclear Generating Station Environmental Assessment. December 2007. NK30-REP-07701-00002

Environmental Risk Assessment (ERA) and Predictive Effects Assessment (PEA):

- ERA for Pickering Nuclear. Feb 2018. P-REP-07701-00001 R001
- PEA for Pickering Nuclear Safe Storage. April 2017. P-REP-07701-00002 R000

Operating Licences and Handbooks:

- Nuclear Power Reactor Operating Licence. Pickering Nuclear Generating Station. PROL 48.00/2028.
- Pickering Nuclear Generating Station Nuclear Power Reactor. Licence Conditions Handbook. LCH-PR-48.00/2028-R000.
- Waste Facility Operating Licence. Pickering Waste Management Facility. WFOL-W4-350.0/2028.
- Pickering Waste Management Facility. Licence Conditions Handbook. LCH-W4-350.00/2028.

As a result, OPG concluded that a stand-alone environmental submission to CNSC is not required since loading, transporting, and storage of minimum 6-year cooled fuel is considered to be within the scope of the relevant project EAs and falls within the conditions of the

Pickering Nuclear and PWF Waste Operating Licences.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Environmental Protection and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Environmental Protection Licensing Basis Documents

OPG Environmental Protection Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Environment Health and Safety Managed Systems	OPG-PROG-0005	No Change
Environment Policy	OPG-POL-0021	No Change
Management of the Environmental Monitoring Program	N-PROC-OP-0025	No Change
Monitoring of Nuclear and Hazardous Substances in Effluents	N-STD-OP-0031	No Change
Environmental Risk Assessment Report for Pickering Nuclear	P-REP-07701-00001	No Change
Derived Release Limits and Environmental Action Levels for Pickering Nuclear	P-REP-03482-00006	No Change

LC 9.2 Environmental Assessment Follow-Up Program

Licence Condition 9.2 states "*the licensee shall implement an environmental assessment follow-up plan*" and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

Enclosure 1 of this submission contains an assessment of the continued validity of the PWF Phase II Site Environmental Assessment (EA) (December 2003) with the storage of minimum 6-year cooled fuel. As a result, the EA Follow-Up Plan also remains valid and will continue to be

conducted as originally committed for SB3.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Environmental Assessment Follow-Up Plan and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Environmental Assessment Follow-Up Plan Licensing Basis Documents

OPG Environmental Protection Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Pickering Waste Management Facility Phase II – Environmental Assessment Follow-Up Plan	92896-REP-07701.8-00001	No Change

LC 10.1 Emergency Preparedness Program

Licence Condition 10.1 states “*the licensee shall implement an emergency preparedness program*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

List of Emergency Management Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Nuclear Emergency Preparedness and Response, Version 2	CNSC REGDOC-2.10.1 (2017)	No change

Nuclear Emergency Preparedness and Response

OPG's Emergency Preparedness program N-PROG-RA-0001, “*Consolidated Nuclear Emergency Plan*”, requires OPG staff to implement and maintain its emergency response capability to protect the public, employees, and the environment in the event of a nuclear emergency.”

Impact of the Storage of Minimum 6-Year Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Emergency Management and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Emergency Management Licensing Basis Documents

OPG Emergency Management and Fire Protection Licensing Basis Document Title	OPG Document Number	Impact
Radioactive Materials Transportation Emergency Response Plan	N-STD-RA-0036	No Change
Consolidated Nuclear Emergency Plan	N-PROG-RA-0001	No Change

LC 10.2 Fire Protection Program

Licence Condition 10.2 states "*the licensee shall implement a fire protection program*" and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

List of Fire Protection Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Fire protection for facilities that process, handle, or store nuclear substances	CSA N393-13 (2013)	No Change
National Building Code of Canada (2020)	NRC	No Change
National Fire Code of Canada (2020)	NRC	No Change

Fire Emergency Preparedness and Response

OPG's Fire Protection program, N-PROG-RA-0012, "*Fire Protection*" establishes provisions to prevent, mitigate and respond to fires such that fire risk to OPG Nuclear workers, public, environment, nuclear physical assets, and power generation, is acceptably low and controlled. There will be no changes to N-PROG-RA-0012 as a result of the storage of minimum 6-year cooled fuel.

Impact of the Storage of Minimum 6-Year Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWSM's Fire Protection and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWSM's Fire Protection Licensing Basis Documents

OPG Emergency Management and Fire Protection Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Fire Protection	N-PROG-RA-0012	No Change

LC 11.1 Waste Management Program

Licence Condition 11.1 states "*the licensee shall implement a waste management program*" and the details in the PWSM Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWSM licence application is still valid.

List of Waste Management Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
General principles for the management of radioactive waste and irradiated fuel	CSA N292.0 (2019)	The storage of minimum 6- year cooled fuel complies with the requirements in this CSA Standard.
Interim dry storage of irradiated fuel	CSA N292.2 (2013)	The storage of minimum 6- year cooled fuel complies with the requirements in this CSA Standard.
Management of low and intermediate-level radioactive waste	CSA N292.3 (2014)	The storage of minimum 6- year cooled fuel complies with the requirements in this CSA Standard.

Impact of the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Waste Management program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWF's Waste Management Licensing Basis Documents

OPG Waste Management Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-Year Cooled Fuel
Segregation and Handling of Radioactive Wastes	N-PROC-RA-0017	No Change
Management of Waste and Other Environmentally Regulated Materials	OPG-STD-0156	No Change
Nuclear Waste Management	W-PROG-WM-0001	No Change
Radiation Protection	N-PROG-RA-0013	No Change

LC 11.2 Decommissioning Plan

Licence Condition 11.2 states "*the licensee shall maintain a decommissioning plan*" and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

List of Decommissioning Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Decommissioning of facilities containing nuclear substances	CSA N294-09 (2009)	The storage of minimum 6-year cooled fuel complies with the requirements in this CSA Standard.

Decommissioning of facilities containing nuclear substances	CSA N294-19 (2019)	The storage of minimum 6-year cooled fuel complies with the requirements in this CSA Standard.
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Preliminary Decommissioning Plan

As the DSC used to store minimum 6-year cooled fuel remains the same, there is no requirement to update the Preliminary Decommissioning Plan (PDP). The current PWMF PDP does not stipulate the age of the fuel being stored within the DSC.

Impact of the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWMF's Decommissioning Plan and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact of the Storage of Minimum 6-year Cooled Fuel on PWMF's Decommissioning Licensing Basis Documents

OPG Waste Management Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Decommissioning Program	W-PROG-WM-0003	No Change
Preliminary Decommissioning Plan Pickering Waste Management Facility	92896-PLAN-00960-00001	No Change

LC 12.1 Security Program

Licence Condition 12.1 states "*the licensee shall implement and maintain a security program*" and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

List of Security Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Nuclear Security Regulations	SOR/2000-209	Compliance documented in Attachment 1
Fitness for Duty, Volume III: Nuclear Security Officer Medical, Physical, and Psychological Fitness	CNSC REGDOC-2.2.4 (2018)	Continued compliance.
High Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices	CNSC REGDOC-2.12.1 (2018)	Continued compliance.
Site Access Security Clearance	CNSC REGDOC- 2.12.2 (2013)	Continued compliance.

Facilities and Equipment

The storage of minimum 6-year cooled fuel will not require changes to security related facilities, equipment or staffing levels at PWF.

Response Arrangements

The storage of minimum 6-year cooled fuel will not require changes to security response arrangements or processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Security program and identifies the Impact from the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Security Program Licensing Basis Documents

OPG Security Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Pickering Waste Management Facility Phase II Security Report	92896-REP-08160-00001	No Change

Pickering Waste Management Facility Security Report Addendum	92896-REP-08160-00001 ADD 001	No Change
Transport Security Plan	TRAN-PLAN-03450- 10000	No Change
Nuclear Security	N-PROG-RA-0011	No Change
Cyber Security	N-PROC-RA-0135	No Change
Nuclear Waste Management Cyber Essential Assets	W-LIST-08161-00001	No Change

LC 12.2 Construction

Licence Condition 12.2 states “*the licensee shall not carry out the activities referred to in paragraph (iii) of Part IV of this licence that relate to completed construction activities in paragraph (iv) of Part IV of this licence until the submission of the proposed security arrangements and measures for the new building, or any potential modifications to the protected area that may be associated with this new building, that is acceptable to the Commission or a person authorized by the Commission*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

No construction activities will be required as a result of the storage of minimum 6-year cooled fuel at PWMF.

LC 13.1 Safeguards Program

Licence Condition 13.1 states “*the licensee shall implement and maintain a safeguards program*” and the details in the PWMF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWMF licence application is still valid.

List of Safeguards and Non-Proliferation Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Safeguards and Nuclear Material Accountancy	CNSC REGDOC-2.13.1 (2018)	Continued compliance

Nuclear Material Accountancy and Control

All reports and information necessary for safeguards implementation and compliance will continue to be provided to the IAEA and CNSC on a timely basis.

Access and Assistance to the IAEA

Canadian facilities are selected at random by the IAEA for physical inspections to confirm compliance with international non-proliferation requirements. The storage of minimum 6-year cooled fuel will have no impact on IAEA inspections or access to IAEA equipment.

Safeguards Equipment, Containment and Surveillance

The storage of minimum 6-year cooled fuel may have some impact on existing IAEA safeguards surveillance monitoring equipment (with respect to temperatures and sealing processes). This is discussed in section LC 3.1 Operating Performance. Analysis in this area continues and OPG continues to work with both the IAEA and CNSC to reach an agreeable outcome.

NuFlash

NuFlash is a system used for tracking nuclear fuel location and storage history. Currently, NuFlash does not allow the preparation of DSC packages for minimum 6-year cooled fuel. The changes required to update the NuFlash database to allow for 100 DSCs to be processed with 6-year to 10-year old fuel will be completed prior to the commissioning of the first DSC containing minimum 6-year cooled fuel.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWWF's Safeguards program and identifies the impact from the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWWF's Safeguards Program Licensing Basis Documents

OPG Safeguards and Non- Proliferation Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Nuclear Safeguards	N-PROG-RA-0015	No Change
Nuclear Safeguards Implementation	N-STD-RA-0024	No Change

LC 14.1 Packaging and Transport Program

Licence Condition 14.1 states “*the licensee shall maintain a packaging and transport program*” and the details in the PWF Licence Conditions Handbook (LCH) outline the regulatory requirements. The information provided in the last PWF licence application is still valid.

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF’s Packaging and Transport program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF’s Packaging and Transport Licensing Basis Documents

OPG Transportation and Packaging Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Radioactive Material Transportation	W-PROG-WM-0002	No Change
Radioactive Materials Transportation Emergency Response Plan	N-STD-RA-0036	No Change
Radiation Protection	N-PROG-RA-0013	No Change

Section 3: Other Matters of Regulatory Interest

Public Information and Engagement

OPG believes in timely open and transparent communication to maintain positive and supportive relationships and confidence of key stakeholders. OPG’s Corporate Relations and Communications organization adheres to the principles and process for external communications as governed by the nuclear standard N-STD-AS -0013, “*Nuclear Public Information and Disclosure*”.

List of Public Information and Disclosure Related Regulatory Requirements

Licensing Basis Document Title	Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Public Information and Disclosure	CNSC REGDOC-3.2.1 (2018)	Continued compliance

Impact from the Storage of Minimum 6-year Cooled Fuel on OPG Governance, Programs and Processes

The table below provides the list of OPG governance, programs and processes that form the licensing basis for PWF's Public Information and Disclosure program and identifies the impact of the storage of minimum 6-year cooled fuel on these programs and processes.

Impact from the Storage of Minimum 6-year Cooled Fuel on PWF's Public Information and Disclosure Licensing Basis Documents

OPG Transportation and Packaging Licensing Basis Document Title	OPG Document Number	Impact from the Storage of Minimum 6-year Cooled Fuel
Nuclear Public Information Disclosure	N-STD-AS-0013	No Change

OPG provides responses to issues and questions raised by stakeholders and the public, and tracks issues and questions to identify trends in order to further refine proactive communications. Two-way dialogue with community stakeholders and residents is facilitated through personal contact, community newsletters, speaking engagements, advertising and educational outreach.

Through this regular outreach of an on-going nature, OPG continues to provide members of the public and interested parties with information regarding activities at the Pickering Waste Management Facility.

Community Committees

The Pickering Community Advisory Council (CAC) meets to exchange information and provide advice to senior station management on station activities as they relate to the adjacent community and public use of the waterfront trail and adjacent lands. Feedback for the waste management facility is obtained through this venue.

OPG also has a representative on the Durham Nuclear Health Committee (DNHC). OPG Nuclear staff make regular presentations to the DNHC on a variety of environmental, community outreach and operational issues. The committee is chaired by the Durham Region Medical Officer of Health.

Community Publications

OPG provides a community newsletter called “Neighbours” on a quarterly basis that are circulated by mail to residents throughout Durham Region (specific to the proximity of the respective nuclear power reactor stations). This provides an update of activities and events that occur at the respective stations.

These forums provide an opportunity for public engagement and information exchange regarding the storage of minimum 6-year cooled fuel at PWWF. Once the Licence Amendment application has been submitted, OPG will communicate the need to store minimum 6-year cooled fuel and status updates to the public through these communication tools.

Indigenous Nations Engagement

OPG acknowledges the Aboriginal and Treaty Rights of Indigenous Nations as recognized in the *Constitution Act, 1982*. Under its Indigenous Relations Policy, OPG regularly undertakes engagement with Indigenous Nations with established or asserted rights and/or interests.

Licence Renewal and the Duty to Consult

This amendment of the PWWF does not create any new adverse impacts on Aboriginal and/or treaty rights held by local Indigenous communities. However, while the duty to consult is not triggered by this activity, OPG will engage local Indigenous communities regardless as part of its preferred practice and in light of their interest in OPG nuclear operations.

Based on work undertaken through Indigenous engagement, OPG believes the following specific Indigenous Nations and communities continue to have a primary Aboriginal and/or treaty rights and interests with respect to OPG’s waste operations at the PWWF:

- Williams Treaties First Nations
- Mohawks of the Bay of Quinte
- Métis Nation of Ontario Region 8

OPG has engaged with these Indigenous Nations throughout 2022 and 2023 in order to provide them with information regarding activities at the PWWF (such as the in-service of SB4 in 2021) and to discuss any identified issues and concerns.

Once this Addendum to the Licence Amendment application to store minimum 6-year cooled fuel is submitted to the CNSC, OPG will engage with the Indigenous Nations identified above during regular scheduled meetings and briefing to share details on the need and scope of this proposal.

Conclusion

The need to store minimum 6-year cooled fuel at PWF is an important initiative within OPG to support the Safe Storage Project at PNGS-B. OPG is requesting an amendment of the PWF WFOL to add a new licensed activity to possess, transfer, package, manage and store minimum 6-year cooled fuel.

OPG is responsible for continued safe operation of the PWF and confirms that the storage of minimum 6-year cooled fuel will be implemented based on a robust safety case. The proposed activities to support the storage of minimum 6-year cooled fuel will not compromise continued safe operation at PWF, public and employee safety, and environmental protection.

The safety case for this project can be summarized as follows:

- Design: OPG has and will continue to follow its Engineering Change Control process, to ensure the design complies with applicable PWF Licence Condition Handbook W4-350.00/2028 regulatory requirements and that configuration management for the facility is maintained.
- Continued Safe Operation: Safety analysis demonstrates that the storage of minimum 6-year cooled fuel will have a negligible effect on safe operation of PWF, and on public and worker safety.
- Environmental Protection: An assessment of existing environmental-related submissions to the CNSC (environmental assessments, environmental risk assessment and predictive environmental effects assessment) concludes that the storage of minimum 6-year cooled fuel at PWF will have negligible impact on the environment.
- Licensing Basis: The storage of minimum 6-year cooled fuel at PWF will have negligible impact on PWF's licensing basis, governance, programs and processes.

References: [2-1]. OPG Letter, K. Aggarwal to D. Saumure, "OPG – Change Request Application for Amendment to the Pickering Waste Management Facility (PWF) Waste Facility Operating Licence WFOL W4-350.00/2028 ", June 20, 2023, e-Doc# 7068976, CD# 92896-CORR-00531-01478.

[2-2]. OPG Letter, K. Aggarwal to G. Steedman, "Proposal to Store Minimum 6-Year Old Used Fuel at the Pickering Waste Management Facility, November 5, 2020, e-Doc# 6416392, CD# 92896-CORR-00531-01397.

ENCLOSURE 1

OPG letter, K. Aggarwal to M. Bacon-Dussault, "OPG – Addendum to the Application for Amendment to the Pickering Waste Management Facility, Waste Facility Operating Licence WFOL-W4-350.00/2028"

CD# 92896-CORR-00531-01530 P

Storage of Dry Storage Containers (DSCs) containing less than 10 year old used fuel bundles at the Pickering Waste Management Facility (PWMF)

W-CORR-00531-01662

(26 total pages)

OPG Proprietary

Date: July 27, 2020

File No.: W-CORR-00531-01662

Lise Morton
VP Nuclear Waste Management
177 Tie Road, B21
Tiverton, On
N0G 2T0

Dear Lise Morton

Subject: Storage of Dry Storage Containers (DSCs) containing less than 10 year old used fuel bundles at the Pickering Waste Management Facility (PWMF)**References:**

1. Letter from D. Howard to K. Talbot, "Pickering Waste Management Facility Thermal Performance Verification Program", dated June 10, 1997. NA44-CORR-N0014035.
2. OPG. Thermal Analysis of an Ontario Power Generation Dry Storage Container Containing Six-Year-Old 28 Or 37 - Element Fuel. Mar 20, 2014. 00104-REP-02308-00007 R00.
3. OPG. Structural Integrity Assessment of a Dry Storage Container Containing Six-Year-Old 28 - Element Fuel. Mar 5, 2014. 00104-REP-79171-00060 R00.
4. OPG. Structural Integrity Assessment of Dry Storage Container (DSC) Containing Six-Year-Old 28-element Fuel Under Postulated On-site Accident Scenarios. Sept 3, 2014. 00104-REP-79171-00061 R00.
5. OPG. Dose Rate Assessment Considering Lower Aged Fuel in PWMF SB3. Jun 15, 2020. 92896-REP-03200-00009 R00.
6. OPG. Email from C. Barua (OPG) to G. Steedman (CNSC). OPG Response To CNSC Question On OPG Submission Cd# 92896-CORR-00531-01355 In Support Of PWMF Safety Report 92896-SR-01320-10002 R006. Jun 29, 2020. 92896-CORR-00531-01381.

Introduction:

The purpose of this memo is to document OPG Environment's recommendation that a stand-alone environmental submission to the CNSC is not needed in order for OPG to perform loading, transfer, and interim storage of used fuel, that has observed a cooling period for a minimum of 6 years, from the Irradiated Fuel Bays (IFBs) to the existing PWMF Used Fuel Storage Building 3 (SB3) (a PWMF Phase II building), until a permanent storage solution becomes available.

The rationale for this decision was based on a review of the following documents:

Environmental assessments (EAs):

- Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002
- Refurbishment and Continued Operation of Pickering B Nuclear Generating Station Environmental Assessment. December 2007. NK30-REP-07701-00002

Environmental Risk Assessment (ERA) and Predictive Effects Assessment (PEA):

- ERA for Pickering Nuclear. Feb 2018. P-REP-07701-00001 R001
- PEA for Pickering Nuclear Safe Storage. April 2017. P-REP-07701-00002 R000

Operating Licences and Handbooks:

- Nuclear Power Reactor Operating Licence. Pickering Nuclear Generating Station. PROL 48.00/2028.
- Pickering Nuclear Generating Station Nuclear Power Reactor. Licence Conditions Handbook. LCH-PR-48.00/2028-R000.
- Waste Facility Operating Licence. Pickering Waste Management Facility. WFOL-W4-350.0/2028.
- Pickering Waste Management Facility. Licence Conditions Handbook. LCH-W4-350.00/2028.

Record of Proceedings and Record of Decision:

- Record of Proceedings, Including Reasons for Decision. May 28, 2004. Subject: Environmental Assessment Screening Report on the proposed expansion of the Pickering Waste Management Facility (Phase II). Available online: <http://www.nuclearsafety.gc.ca/eng/the-commission/pdf/Decision-OPG-PWMF-e.pdf>
- Record of Proceedings, Including Reasons for Decision. December 10, 2008. Subject: Screening Environmental Assessment of the Pickering Nuclear Generating Station B Refurbishment and Continued Operations Project, Pickering, Ontario. Available online: <http://www.suretenucleaire.gc.ca/eng/the-commission/pdf/2008-12-10-Decision-PickeringB-e-Edocs3330500.pdf>

- Record of Decision. April 13, 2017. Subject: Application to Renew the Waste Facility Operating Licence for the Pickering. Available online: <http://nuclearsafety.gc.ca/eng/the-commission/pdf/2017-04-13-Decision-OPG-PickeringWasteManagementFacility-e.pdf>

Relevant sections considered in the above documents are presented in Attachment A (section A1 – A6).

Background:

As a common practice, used fuel from operating units at the Pickering Nuclear Generating Station (PNGS) is cooled in the IFBs for a minimum of 10 years before being transferred into DSCs, and placed into interim storage buildings in the PWWMF. This practice is described in the PWWMF Phase II EA, Pickering B Refurbishment and Continued Operation EA, Pickering Nuclear ERA, Pickering Nuclear Safe Storage PEA, and the Record of Proceedings associated with the EA of the Pickering B Refurbishment and Continued Operations.

Loading and interim storage of a DSC containing four modules of 6-year-old used fuel was successfully completed in May 1998 at the PWWMF. Authorization at the time was given by Atomic Energy Control Board (AECB) (Reference 1). Repeating this infrequent practice in the future will enable OPG to create additional space in the IFB-B to allow for storage of fuel from Unit 5 to 8 to support permanent shutdown of the PNGS and planning of Pickering Safe Storage.

Summarized below is the outcome of the review.

Project scope

There is no change in project scope as described in the EA's. The project scope includes used fuel transfer and interim storage in the PWWMF. It does not specify the age of the fuel allowed for transfer and storage. Refer to attachment A section A1 for more details.

Licensed activities and conditions:

There is no change to licensed activities and conditions. The Pickering Operating Licence and the PWWMF Operating Licence together covers the transport, packaging, management and interim storage of the nuclear fuel. Loading and storing younger used fuel will not deviate from any of the licence conditions. Refer to attachment A section A2 for more details.

Cooling period of used fuel:

Although various documents (i.e. EA's, ERA, PEA, Record of Proceedings) describe how used fuel is cooled in the IFBs for a minimum of 10 years before being loaded, transferred, and stored (see attachment A section A3), it is still possible to initiate and implement a change to this current practice via existing OPG processes (e.g., Engineering Change and Control (ECC)).

Since the change to reduce the cooling period is not considered a 'Designated Project' under the Canadian Impact Assessment Act (IAA), there is no requirement to conduct an EA (or now referred to as an IA) under the Impact Assessment Act. Past EA's were completed as part of the licence application process to support their respective licensing decisions. Once the licensing decisions are made, EAs are not revised.

The 2017 ERA was provided to CNSC to support the PwMF and Pickering operating licence renewal application and an ERA is required to be routinely updated every 5 years as per RegDoc 2.9.1 (Environmental Principles, Assessment and Protection Measures). The routine ERA updates for PN will consider any impacts from recent changes in operational activities including fuel loading, transfer and storage. A decision is expected to be made in 2021 on whether there is a need to update the PEA based on any known activities that may potentially invalidate the bounding scenarios or assumptions made in the PEA. The change identified in this memo will be assessed as part of that decision.

Fuel integrity:

Younger used fuel is expected to have a higher thermal temperature than older used fuel. It is mentioned in the EA (92896-REP-07701-00002) that the temperature of the fuel in dry storage is an important factor in the assurance of fuel integrity and safety and a temperature of up to 300°C can be considered safe. A maximum and conservative fuel sheath temperature of about 272°C is predicted based on a thermal analysis of a DSC containing 6-year-old fuel (Reference 2), which is less than the 300°C limit mentioned in the EA. Thermal stresses produced from 6 year old fuel stored in a DSC is also predicted not to compromise the containment and radiation shielding functions of the DSC under processing and storage accident conditions based on structural integrity analysis completed (Reference 3 and Reference 4).

As long as the fuel sheath temperature remains under the upper limit of 300°C, there should be no additional environmental risks associated with fuel integrity. Refer to Attachment A section A4 for more details on the fuel integrity related descriptions found in the EAs.

Dose rates:

DSCs containing younger used fuel may have higher dose rates compared to those without depending on the average age and arrangement of used fuel bundles inside in the DSCs. The predicted dose rates and annual doses from SB3 (from a bounding scenario that includes storage of 100 DSCs containing only 6 year old decayed used fuel in SB3) are still well within the regulatory limit (i.e., 1 mSv/y for a member of the public). Dose rates at the existing protected area fence for the SB3 bounding scenario are expected to remain well within the radiation dose rate targets of $\leq 0.5 \mu\text{Sv/h}$ at the PwMF II perimeter fence and $\leq 100 \mu\text{Sv/y}$ at the PNGS site boundary, as proposed in recent communication with the CNSC (Reference 6). Dose rates at the Phase II protected area fence will continued to be measured and monitored and mitigating actions taken if required.

The storage of younger fuel will not pose an unacceptable risk to workers or members of the public nor will it likely to result in adverse effects on the environment provided that the ECC process and the ALARA principle are followed and that all the relevant conditions under the Pickering Nuclear and PWMF Operating Licences (e.g., to implement and maintain the radiation protection program, environmental protection program, waste management program, and packaging and transport program) continue to be met.

For more details on the dose rate predictions, see shielding assessment for PWMF using lower fuel age in SB3 (Reference 5). For more details on the dose rate related assessments completed in the past EA's and the relevant regulatory limit and targets, see attachment A section A5. For more details on the licence conditions, see attachment A section A1

Conclusion:

A stand-alone environmental submission to CNSC is not required since loading, transporting, and storage of used fuel, 6 year or older, is considered to be within the scope of the relevant project EAs and falls within the conditions of the Pickering Nuclear and PWMF Waste Operating Licences.

Prior to the implementation of the plan to load, transfer, and store younger used fuel, the PWMF Safety Report will be updated and the OPG ECC process will be followed to demonstrate that OPG will be able to maintain an adequate level of safety. Changes to existing governance stemming from the plan to load, transfer and store used fuel with a shorter cooling period than 10 years will also be managed through the ECC process.

Sincerely,



Raphael McCalla
Director
Environment Nuclear

RM/sl

cc. Cammie Cheng
Jason Wight
Paul Crowley
Rafi Asadi
Kapil Aggarwal
Mark Priest
Steve Bagshaw
Mark Ferry
Ram Kalyanasundaram
Cameron Spence

Attachment A
Supporting Information

Section A1

Scope of the Project:

SOURCE: Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002

1.3.1 Scope of the Project

The physical works involved in this project are the storage buildings to be built for the dry storage containers; all facilities, systems and activities required for the construction and operation of PWMF II; and the facilities, systems and activities required for the construction and operation of PWMF Phase II; and the facilities, systems, and activities involved in the transfer of loaded welded DSCs from PWMF I to the storage buildings in PWMF II.

Associated operations and activities that are within the scope of the project include:

- Preparation of systems and facilities involved in the transfer of loaded welded DSCs
 - Transfer of loaded welded DSCs from the Processing Workshop or Storage Buildings 1 and 2 in PWMF I to Storage Buildings 3 and 4 in PWMF II.

SOURCE: Refurbishment and Continued Operation of Pickering B Nuclear Generating Station Environmental Assessment. December 2007. NK30-REP-07701-00002

1.4.2 Scope of the Project

The physical works for the Project are the PNGS B Units 5, 6, 7 and 8 and ancillary systems necessary for their operation through to about 2060.

As outlined in the EA Guidelines (Section 7.0, p.5), the scope of project will consider the following activities related to the continued operation of the refurbished reactors until about 2060, including:

- continued interim storage of used fuel at the Pickering Used Fuel Dry Storage Facility (PUFDSF) within the PWMF;
- interim storage for the additional used nuclear fuel and the refurbishment waste at the PWMF;

Section A2

Licensed activities and conditions

SOURCE: Nuclear Power Reactor Operating Licence Pickering Nuclear Generating Station PROL 48.00/2028

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

- (i) operate the Pickering Nuclear Generating Station (hereinafter “the nuclear facility”) at a site located in the City of Pickering, in the Regional Municipality of Durham, in the Province of Ontario;
- (ii) possess, transfer, use, package, manage and store the nuclear substances that are required for, associated with, or arise from the activities described in (i);
- (vi) transport Category II nuclear material by road vehicle from the nuclear facility spent fuel bay to the onsite waste storage facility;

VI) CONDITIONS:

4. Safety Analysis

4.1 The licensee shall implement and maintain a safety analysis program.

7. Radiation Protection

7.1 The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

9. Environmental Protection

9.1 The licensee shall implement and maintain an environmental protection program which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

11. Waste Management

11.1 The licensee shall implement and maintain a waste management program.

14. Packaging and Transport

14.1 The licensee shall implement and maintain a packaging and transport program.

SOURCE: Licence Conditions Handbook (LCH-PR-48.00/2028-R000) - Pickering Nuclear Generating Station Nuclear Power Reactor Operating Licence

Licence Condition G.1: Nuclear Substances

Activity (ii) in the licence authorizes the licensee to possess, transfer, use, package, manage and store nuclear substances.

Activity (vi) in the licence authorizes the licensee to transport Category II nuclear material i.e. fuel by road from Pickering NGS spent fuel bay to the onsite waste storage facility, The Pickering waste storage facility is licensed separately from the Pickering NGS licence (WFOL-W4-350.02/2018 – e-Doc 4002929). This activity is addressed as part of LC 14.1, which describes the packaging and transport program.

Licence Condition 14.1: Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

Preamble:

Every person who transports radioactive material, or requires it to be transported, shall act in accordance with the requirements of the Transportation of Dangerous Goods Regulations (TDGR) and the Packaging and Transport of Nuclear Substances Regulations, 2015 (PTNSR 2015).

The PTNSR 2015 and the TDGR provide specific requirements for the design of transport packages, the packaging, marking and labeling of packages and the handling and transport of nuclear substances.

The packaging and transport SCA includes the following specific areas (SpAs):

- Package design and maintenance;
- Packaging and transport; and
- Registration for use.

Compliance Verification Criteria:

Licensee Documents that Require Notification of Change		
Document #	Title	Prior Notification
W-PROG-WM-0002	Radioactive Material Transportation	No
N-STD-RA-0036	Radioactive Materials Transportation Emergency Response Plan	No

Package Design and Maintenance:

PTNSR 2015 apply to the packaging and transport of nuclear substances, including the design, production, use, inspection, maintenance and repair of packages, and the preparation, consigning, handling, loading, carriage and unloading of packages. Where necessary, OPG package designs are certified by the CNSC

Packaging and Transport (Program):

The licensee shall implement and maintain a packaging and transport program that will ensure compliance with the requirements of the TDGR and the PTNSR 2015 for all shipments of nuclear substances to and from the Pickering NGS site. Shipments of nuclear substances within the nuclear facility where access to the property is controlled are exempted from the application of TDGR and PTNSR 2015.

Registration and Use:

OPG's packaging and transport program also covers the registration for use of certified packages as required by the regulations.

Guidance:

Org / Document #	Title	Version
CNSC / REGDOC 2.14.1	Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substance Regulations, 2015	2016

SOURCE: Waste Facility Operating Licence Pickering Waste Management Facility – WFOL-W4-350.0/2028

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

- (i) operate the Pickering Waste Management Facility ("the facility") located at the Pickering Nuclear Generating Station, City of Pickering, Regional Municipality of Durham, Province of Ontario;
- (ii) possess, transfer, use, process, package, manage, and store nuclear substances that are required for, associated with or arise from the activities described in (i);
- (iii) transport Category II nuclear materials that are associated with the activities described in (i) on the site of the Pickering Nuclear Generating Station;

VI) CONDITIONS:

4 Safety Analysis

4.1 Safety Analysis Program

The licensee shall implement and maintain a safety analysis program.

7 Radiation Protection

7.1 Radiation Protection

The licensee shall implement and maintain a radiation protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

9 Environmental Protection

9.1 Environmental Protection

The licensee shall implement and maintain an environmental protection program, which includes a set of action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

10 EMERGENCY MANAGEMENT AND FIRE PROTECTION

10.1 Emergency Preparedness Program

The licensee shall implement and maintain an emergency preparedness program.

10.2 Fire Protection Program

The licensee shall implement and maintain a fire protection program.

11 Waste Management

11.1 Waste Management Program

The licensee shall implement and maintain a waste management program.

14 Packaging and Transport

14.1 Packaging and Transport Program

The licensee shall implement and maintain a packaging and transport program.

SOURCE: Pickering Waste Management Facility Licence Conditions Handbook LCH-W4-350.00/2028

Licence Condition 4.1 Safety Analysis Program

Compliance Verification Criteria

Licensee Documents that Require Notification of Change

Doc#	Title	Prior Notice
92896-SR-01320-10002	Pickering Waste Management Facility – Safety Report	Y

Licensing Basis Publications

Org	Doc#	Title
CSA Group	N292.0-14	General principles for the management of radioactive waste and irradiated fuel
CSA Group	N-292.2-13	Interim dry storage of irradiated fuel

The safety analysis report is to confirm that the consequences of a range of events are acceptable. It includes an integrated assessment of the facility to demonstrate, among other things, adequate safety for external events such as fires, floods, and tornados, and adequate protective features to ensure the effects of an event do not impair safety related systems, structures, and components (SSC).

Every 5 years, OPG shall submit a revised safety analysis report for the facility. CNSC staff review the safety analysis report to verify that OPG employs appropriate assumptions, applies adequate scope, and demonstrates acceptable results. The safety analysis report must demonstrate that the radiological consequences of accident scenarios do not exceed public dose limits.

Licensees shall carry out safety analyses to confirm that facility design changes will not result in a reduction of safety compared to the licensing basis, as per LC G.1. The safety analysis report shall:

- demonstrate compliance with public dose limits, the dose-related criteria, structural-integrity related criteria, the limits on process and safety parameters, and safety or safety-related system requirements;
- justify appropriateness of the technical solutions employed in the supporting justification of safety requirements; and,
- complement other analyses and evaluations in defining a complete set of design and operating requirements.

Licence Condition 7.1 Radiation Protection

The Radiation Protection Regulations require that the licensee implement a radiation protection program and also ascertain and record doses for each person who perform any duties in connection with any activity that is authorized by the NSCA or is present at a place where that activity is carried on. This program must ensure that doses to persons (including workers) do not exceed prescribed dose limits and are kept As Low As Reasonably Achievable (the ALARA principle), social and economic factors being taken into account.

The regulatory dose limit to workers and the general public are explicitly provided in sections 13, 14 and 15 of the Radiation Protection Regulations.

Licence Condition 11.1 Waste Management Program

With respect to the storage and management of spent nuclear fuel, the waste management program should reflect the fundamental safety concerns related to criticality, exposure, heat control, containment, and retrievability. That is, the systems that are designed and operated should assure subcriticality, control of radiation exposure, assure heat removal, assure containment, and allow retrievability.

Licence Condition 14.1 Packaging and Transport Program

Compliance Verification Criteria

Licence Documents that Require Notification of Change

Doc#	Title	Prior Notice
W-PROG-WM-0002	Radioactive Material Transportation	N
N-STD-RA-0036	Radioactive Materials Transportation Emergency Response Plan	N
N-PROG-RA-0013	Radiation Protection	Y

Section A3

Description on the cooling duration of used fuel in IFBs:

SOURCE: ERA for Pickering Nuclear. Feb 2018. P-REP-07701-00001 R001

2.2.2.1.1 Used Fuel

Used fuel bundles are initially stored in the irradiated fuel bays for at least 10 years and then transferred to DSCs for interim storage in the PWMF. In the irradiated fuel bay, used fuel bundles are placed into 96-bundle storage modules. Modules with used fuel at least 10 years or older may be loaded into a DSC, which has the capacity to hold four storage modules. The DSC is loaded with the storage modules and the lid is secured while the DSC is submerged in water. The DSC is then removed from the water, drained, the exterior decontaminated, and then the DSC is prepared for on-site transfer to the PWMF for further processing and subsequent interim storage

SOURCE: PEA for Pickering Nuclear Safe Storage. April 2017. P-REP-07701-00002 R000

1.0 Introduction

Following shutdown, the activities at PN Generating Station would involve the four distinct phases outlined below.

- 1) A 2-3 year **Stabilization Phase** per unit to transition each unit, and the station as a whole, from their current operating states to their respective safe storage states. Stabilization activities will include defuelling and dewatering reactor units.
- 2) A 25-30 year **Storage with Surveillance Phase** to allow for natural decay of radioactivity. Activities during this phase include the ongoing operation of the irradiated fuel bays (IFBs) and the continued transfer of spent fuel to dry storage containers (DSCs). Current planning anticipates that used fuel transfer to DSCs will be completed within 10 years of the last unit transitioning to its safe storage state

1.1 Project Overview

Many of the specific details of the Stabilization activities are not finalized; however, assumptions have been made to provide a conservative (i.e., worst case) assessment of effects resulting from the transition and safe storage state.

Activities specific to the Stabilization Phase include:

- removal of all nuclear fuel from the reactor units and transfer to the IFBs and auxiliary irradiated fuel bay (AIFB);

Activities during the Storage with Surveillance Phase include:

- continued operation/surveillance of the IFBs, including transfer of used fuel from the IFBs to DSCs for storage on the PWMF site. It is anticipated that the irradiated fuel bays will be required for up to 10 years of cooling;

1.3 PEA Goals, Approach and Scope

The PEA report does not include the operations at the PWMF as it operates separately under the Waste Facility Operating Licence issued by the CNSC. The PEA report does, however, discuss the waste operation to the extent there are inter-relationships with the Stabilization and Storage with Surveillance activities.

3.0 Stabilization and Storage with Surveillance Activities

The main elements of the Stabilization and Storage with Surveillance Phases include the following.

- Removal of all nuclear fuel from the reactor units and transfer of the fuel to an IFB for approximately up to 10 years of cooling. Continued operation/surveillance of the IFBs and AIFB are required until all irradiated fuel and other components stored in the fuel bays are transferred into DSCs for safe interim storage at the PWMF.

3.13 Pickering Waste Management Facility

Used fuel bundles will continue to be stored in an IFB up to 10 years and then transferred to DSCs for interim storage in the PWMF.

SOURCE: Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002

Section 2.2.2.1 Development Background

Since 1996, used fuel that has been cooled for at least ten years in PN's IFBs has been routinely transferred into DSCs for dry storage at PWMF I.

Appendix C – Community and Stakeholder Consultation

C-6 Newsletters

PWMFII EA NEWS - May 2002, Issue One

When used fuel bundles are removed from the reactors at Pickering Nuclear, they are still highly radioactive. They have to be managed safely and responsibly for a long time. The first step is to cool the fuel bundles under water for up to 10 years in specially engineered used fuel bays. As the Pickering fuel bays become full, it is necessary to transfer the used fuel from the fuel bays to robust concrete and steel containers for dry storage in a specially designed facility on the station site.

C-6 Newsletters

PWMFII EA NEWS - September 2003, Issue Three

The initial used fuel dry storage facility, PWMF I, has been in operation since 1996. The facility uses a dry storage process that is a proven, safe and regulated technology, widely used by other nuclear facilities in Canada, the USA and other countries. The process involves removing used fuel bundles from the water-filled used fuel storage bays (after a minimum of 10 years in those bays) at PN and placing them in specially designed robust steel and concrete containers called "Dry Storage Container" or DSCs. The DSCs are then processed, sealed and transferred to the Used Fuel Dry Storage buildings.

C-7 Project Information Package

When used fuel bundles are removed from the reactors at Pickering Nuclear, they are still highly radioactive. They have to be managed safely and responsibly for a long time. The first step is to cool the fuel bundles under water for up to 10 years in specially engineered used fuel bays. As the Pickering fuel bays become full, it is necessary to transfer the used fuel from the fuel bays into robust concrete and steel containers and store them in a specially designed storage facility on the station site. The containers – called “Dry Storage Containers” (DSCs) - are engineered to last at least 50 years and will provide safe, interim storage until a long-term management program is in place.

Used fuel is stored for at least 10 years under water in fuel bays at Pickering Nuclear. The water keeps the fuel bundles cool and provides an effective radiation shield. This is normal practice at all OPG nuclear stations and elsewhere.

C-11 Presentation to the PN Community Advisory Council (CAC)

Presentation to Community Advisory Council - February 19, 2002

After 10 years, the used fuel may be moved to dry storage, on site but separate from station operations.

Pickering Nuclear Generating Station Community Advisory Council
Pickering Nuclear Information Centre - March 18, 2003
Meeting Highlights

Council Comment and Questions

John Peters and Don Gorber responded to Council comments and questions:

- How did the EA address the effect of radiation over time?

John: The contribution of PWMF II to gamma radiation over time depends on the age of the used fuel when it is loaded into the container. The EA took the worst case for calculating PWMF II contribution per year, fuel that is only 10 years old and put into the facility all at once.

Appendix D - Open House Information Panels

Phase II of the Pickering Waste Management Facility will:

- Be used to store only Pickering used fuel and only after it has spent at least ten years in the existing fuel bays within the stations (wet storage)

Appendix G – Review comments on draft EA Study Report and OPG’s Responses

Comments from IER & Scimus Inc. in association with North-South Environmental on behalf of the City of Pickering, July 2003 on the PWMF II Draft EA Study Report

IER comment:

The total capacity of the storage buildings is 1654 Dry Storage Containers (DSC’s), only 7% more than the total number of DSC’s expected. This does not appear to provide sufficient contingency against unforeseen problems (Section 2.2.1, page 2-1).

OPG response:

OPG maintains an overall nuclear waste system plan which includes all waste streams that it manages. Part of the plan addresses contingency plans for all phases of used fuel management. The dry storage step is only for used fuel that has been cooled for at least 10 years in wet storage, so there is a long lead time in determining requirements for additional storage capacity. If additional storage capacity was needed in the future another storage building could be proposed after 2016 when SB #4 was commissioned, but before 2025 when all the SBs at PN are filled to capacity. No change in the EA Study Report is required.

SOURCE: Refurbishment and Continued Operation of Pickering B Nuclear Generating Station Environmental Assessment. December 2007. NK30-REP-07701-00002

2.12 Basis for the Environmental assessment

Table 2.12-1, referred to as the "Basis for Environmental Assessment", provides a listing and description of each of the works and activities associated with the Project. This information provides the basis for the assessment of the effects on each of the environmental components.

Table 2.12-1 Basis for EA Study

Project Phase / Works and Activities - Interim Storage of Used Fuel at PVMF:

Irradiated fuel is stored in the irradiated fuel storage bay for a minimum period of 10 years before being transferred to Dry Storage Containers (DSCs) for interim storage at PVMF until a long-term storage facility is available.

SOURCE: Record of Proceedings, Including Reasons for Decision. December 10, 2008. Subject: Screening Environmental Assessment of the Pickering Nuclear Generating Station B Refurbishment and Continued Operations Project, Pickering, Ontario

107. To address concerns raised by several intervenors on waste management, the Commission requested that OPG elaborate on the design of the dry-storage container used for used fuel storage and on the fuel cycle after the removal of fuel from the reactor..... To answer the fuel cycle portion of the question, OPG added that the fuel removed from the reactor is stored in water pools at the stations for a minimum of 10 years to allow the fuel to cool to about 0.1 % of the radioactivity levels present at the time of its removal from the reactor. The fuel is then transferred to dry-storage containers for storage until a disposal facility is available.

Section A4

Description on integrity of used fuel:

SOURCE: Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002

2.3.1.1 DSC Design and Operating Conditions

The DSC provides the necessary radiation shielding and containment of radioactive materials. It is designed to provide a storage life of at least 50 years and to meet all shielding and containment integrity requirements over this period.

To permit future retrieval, used fuel bundles in dry storage need to remain structurally intact and retain sufficient strength to sustain the stresses associated with future handling and transport. This requires limiting cladding deformation by creep or other degradation processes such as oxidation in the uranium dioxide fuel pellets. The integrity of used fuel cladding is also a key requirement for radiological safety. The pellet and the zircaloy sheath provide a primary barrier to prevent the release of radionuclides. The DSC provides secondary containment for any radionuclides released by the fuel, in the event that the fuel cladding integrity was compromised.

Both cladding creep and fuel matrix oxidation, the processes that could lead to splitting of the fuel cladding, resulting in release of radionuclides into the DSC cavity, are temperature dependent processes. Therefore, the temperature of the fuel in dry storage is an important factor in the assurance of fuel integrity and safety. The provisions used to maintain used fuel integrity during storage include welded closure of the DSC and the addition of an inert helium atmosphere in the DSC cavity. Oxidation is also limited due to helium.

Analysis and measurements carried out at PUFDSF indicate that the maximum fuel cladding temperature does not exceed 175°C in dry storage. When used fuel is stored in a helium atmosphere, temperatures of up to 300°C can be considered safe for the planned storage period for intact used fuel in DSCs. The upper temperature limit ensures that creep strain remains within acceptable limits. The inert gas precludes oxidation processes. These storage conditions are also considered safe for dry storage of used fuel with minor cladding defects. The above considerations support the conclusion that under normal operating conditions, DSCs provide safe and retrievable storage for OPG's used nuclear fuel.

2.3.1.2 Factors Influencing Long-Term Integrity of the DSC and Used Fuel

The DSC has been designed to provide a storage life that will meet all shielding and containment integrity requirements over a minimum 50 year service life. Investigations were performed during DSC design regarding the integrity and stability of the DSC for different load cases over the 50 year service life. The DSC design is based on analyses of a range of considerations concerning the following:

- decay heat removal
- shielding
- containment
- structural integrity

2.3.1.3 DSC and Fuel Integrity under Credible Malfunction and Accident Scenarios

As part of the design process for the DSC, load scenarios approximating a range of potential accidents and malfunctions were studied. The scenarios included DSCs in a range of dry storage scenarios, and in a range of transfer methods.

Section A5

Dose, radiation, environmental effects, and mitigation:

SOURCE: Pickering Waste Management Facility Phase II Final Environmental Assessment Study Report. December 2003. 92896-REP-07701-00002

2.3.2.2 Radiation and Radioactivity Considerations in PWMF II Design

Radiation Shielding

The radiation dose rate targets for PWMF II, derived for a member of the general public, are as follows:

- $\leq 0.5 \mu\text{Sv/h}$ at the PWMF II perimeter fence, based on maximum 2000 hours per year occupancy for non-Nuclear Energy Workers (non-NEWs),
- $\leq 10 \mu\text{Sv/y}$ contribution at the PNGS exclusion zone boundary; this dose rate target is 1% of the CNSC dose rate limit of 1 mSv/y for a member of the public.

5.2.4.2 Regional/Local Study Area - Workers at PNGS and the PWMF I

The average individual doses to Nuclear Energy Workers (NEWs) at PNGS from both internal (i.e., inhaled or ingested) and external exposure sources were reported at 1.1 mSv/y, and the maximum individual dose was reported at 10 mSv in 2001. These doses are consistent with OPG's Exposure Control Level (ECL) of 10 mSv/y per calendar year, and are well below the CNSC regulatory limit of 50 mSv in any calendar year and 100 mSv over five calendar years (Canada Gazette 2000).

The baseline annual individual doses to workers (NEWs) at the PWMF I were taken from monitoring data. During 2001, nine operators at the PWMF I received an average individual dose of 0.64 mSv with a maximum of 1.94 mSv. Six mechanical maintainers who worked in the PWMF I reported measurable doses, with an average of 0.14 mSv and a maximum of 0.45 mSv (OPG 2002d). These occupational doses are consistent with OPG's ECL, and are well below the regulatory limit of 50 mSv in any calendar year and 100 mSv over five calendar years.

5.2.5.2 Site Study Area

The baseline dose from the existing environment to non-human biota in the Siting Area is attributable to two sources: i) natural background radiation and radioactivity (described in Section 5.2.5.1), and ii) licensed nuclear activities on the site.

Dose rates to biota in the Siting Area from radioactivity releases from the PNGS are attributable to external gamma radiation from radioactive noble gases, and from uptake and internal exposure to tritium and carbon-14; these dose rates were estimated at 0.11 $\mu\text{Gy/d}$. The gamma dose rate (direct and skyshine gamma radiation) in the Siting Area from PWMF I was estimated at 0.03 $\mu\text{Gy/d}$. The total dose rate from these sources was estimated at 0.14 $\mu\text{Gy/d}$ in this assessment.

In conclusion, the baseline dose to terrestrial fauna in the Siting Area was calculated to be 4.1 $\mu\text{Gy/d}$, with over 90% of that contributed by natural background radiation and radioactivity. The corresponding dose to terrestrial flora was estimated in the range 1.8 to 20 $\mu\text{Gy/d}$, also predominantly from natural background

7.3.1 Radiation and Radioactivity: Atmospheric Environment

7.3.1.2 Operations Phase – Likely Environmental Effects

The design of the Storage Buildings will provide for sufficient concrete shielding in the walls up to 30 cm (12") such that the gamma radiation level at the perimeter of the PWMF II site is predicted to be 0.13 $\mu\text{Sv/h}$ (Nuclear Safety Solutions 2003). This level meets the OPG target of $< 0.5 \mu\text{Sv/h}$, corresponding to a dose $< 1,000 \mu\text{Sv/y}$ for 2000 h/y occupancy, the CNSC public dose limit (applicable for non-NEWs).

A dose rate of up to 50 $\mu\text{Sv/h}$ was predicted at the roof (Nuclear Safety Solutions 2003). This value was adopted in this assessment as a conservative estimate (i.e., overestimate) of the corresponding dose rate at the PWMF II. The predicted gamma radiation levels from full Storage Buildings located at Site Area B provides a dose rate of $< 10 \mu\text{Sv/y}$ at the PN east property boundary. This includes both direct and skyshine contributions. This is expected to increase the levels by less than three percent above a baseline of 350 $\mu\text{Gy/y}$ and will be indistinguishable from the temporal and spatial variations in natural background radiation levels at this location.

Identified Mitigation Measures

The gamma radiation from the DSCs was determined to be indistinguishable from background radiation levels at the PN east property boundary. The calculated dose rate meets OPG's dose targets and is well within CNSC's regulatory limit. Therefore, no mitigation measures are required.

7.3.2 Radiation and Radioactivity: Terrestrial Environment

7.3.2.2 Operations Phase – Likely Environmental Effects

The terrestrial environment will be affected by gamma radiation from DSCs. The effect of gamma radiation on the terrestrial environment from the operation of two Storage Buildings containing the full complement of loaded DSCs (approximately 1000) serves as the upper bound for both Project Works and Activities, including transfer of DSCs between PWMF I and PWMF II. The potential effects on birds perching on the roof, on flora and fauna at the exterior walls, and on flora and fauna at the perimeter of the PWMF II site boundary are described below.

Birds may perch on the roof of the Storage Buildings for brief periods, and be exposed to absorbed dose rates of approximately 0.05 mGy/h from gamma radiation. Exposure periods of one or two hours per day would result in dose rates of up to 0.2 mGy/d. This dose rate is less than the no-effect-level of 1 mGy/d reported by UNSCEAR (1996). Based on observations since the beginning of operation of PWMF I in 1996, birds have not nested on the roof of the PWMF I Storage Buildings 1 and 2, and therefore, are not expected to nest on the roof of the PWMF II.

The effects of gamma radiation on flora and on fauna with a limited range (e.g., field mouse) that live in the vicinity of the perimeter of the PWMF II site was evaluated by comparing estimated doses to no-effect levels reported by UNSCEAR. Fauna with a large range spend some of their time at distance from the Storage Buildings in lower radiation fields, and are expected to receive lower daily doses than the biota confined to the areas adjacent to the perimeter of the PWMF II site. Based on the assessment of the gamma radiation levels from loaded DSCs in the PWMF II Storage Buildings at the perimeter of the PWMF II site, the estimated daily dose rate to flora and fauna at that location is approximately 0.004 mGy/d. This is a small fraction of the no-effects level of 1 mGy/d reported by UNSCEAR (1996). This dose rate is expected to be within the range of natural background levels. Thus, the additional dose will be indistinguishable from the temporal and spatial variations in natural background radiation levels at this location.

Identified Mitigation Measures

Since the doses to flora and fauna are expected to be less than no-effect levels reported by UNSCEAR, no mitigation levels are required.

7.3.3 Radiation Doses to Members of the Public

7.3.3.2 Operations Phase - Likely Environmental Effects

Members of the public living and working outside the PN property boundary could potentially be affected by gamma radiation from DSCs during both of the Project Works and Activities listed above. The effect of gamma radiation on members of the public from two Storage Buildings containing the full complement of loaded DSCs (i.e., approximately 1000) serves as an upper bound for effects of both Project Works and Activities under normal operations. To ensure that all members of the public living, working or undertaking recreational activities beyond the PN property boundary are protected, a conservative estimate of the radiation dose to a hypothetical individual located year round at the PN east property boundary was compared to regulatory limits.

At the closest point on the site boundary to the PWMF II on Site Area B, the estimated annual dose from PWMF II, to a hypothetical individual located year round at the PN east property boundary was $< 10 \mu\text{Sv}$ (Nuclear Safety Solutions 2003), which is less than 1% of the CNSC regulatory limit of $1000 \mu\text{Sv/y}$. This annual dose is also below the level of regulatory concern of $10 \mu\text{Sv/y}$ as recommended by the ACRP/ACNS (1988), and meets OPG's target of $< 10 \mu\text{Sv/y}$ for a member of the public.

The baseline dose to the hypothetical individual, as described in Section 5.2.4, is approximately $1,300 \mu\text{Sv/y}$ from natural background radiation, and approximately $4.8 \mu\text{Sv/y}$ from existing licensed operations at PN (OPG 2003d); therefore, the additional dose from the PWMF II project ($< 10 \mu\text{Sv/y}$) is expected to be a very small fraction of the dose from natural background radiation, and will be indistinguishable from the temporal and spatial variations in radiation levels at this location (Figure 7.3-1).

Identified Mitigation Measures

Since it was determined that the additional dose from PWMF II to members of the public living, working or undertaking recreational activities outside the PN property boundary is expected to be a very small fraction of the dose from background radiation, it will be indistinguishable from the temporal and spatial variations in radiation levels. Therefore, no mitigation measures are required.

7.3.4 Radiation Doses to Workers

7.3.4.2 Operations Phase - Likely Environmental Effects

Workers (NEWs) Directly Involved with PWMF II

Doses to workers during normal operation at PWMF II were conservatively estimated on the basis of measured doses to workers at the PWMF I where similar activities to those identified for the PWMF II are carried out.

The individual doses to operators at PWMF II are expected to average 0.64 mSv/y with a maximum of 1.9 mSv/y . Individual doses to mechanical maintainers at PWMF II are expected to average 0.14 mSv/y with a maximum of 0.45 mSv/y . These annual doses to workers at PWMF II from normal operation are expected to be a small fraction of the regulatory limits, and well below OPG's ECL of 10 mSv/y .

PNGS Workers (NEWs)

The additional dose to individual PNGS workers from normal operation of the PWMF II (i.e., $< 0.64 \text{ mSv/y}$) will be in addition to the baseline average annual dose received by PNGS workers of 1.1 mSv/y with a maximum of 10 mSv/y . Therefore, the average individual dose to a PN worker is predicted to be approximately 1.7 mSv/y (i.e., the sum from both activities). This is considered to be an over-estimate as the additional dose to PNGS workers from the PWMF II is expected to be much less than the average dose to workers at PWMF II. The doses from normal operation at PWMF II to PNGS workers (NEWs) are a small fraction of the CNSC's regulatory limit and OPG's ECL. Internal and external doses received by PNGS workers are monitored and reported as part of their cumulative annual dose.

PN Workers (non-NEWs)

PN workers (non-NEWs) who work outside the protected areas of the PWMF II and the PN will be exposed to low levels of gamma radiation from the PWMF II activities listed above and are subject to CNSC's regulatory limits on an annual dose of 1 mSv. The gamma dose rate at the security fence of the PWMF II will be maintained at levels below the OPG target of $< 0.5 \mu\text{Sv/h}$ ($1,000 \mu\text{Sv}$ for a 2,000 hour work year) (Nuclear Safety Solutions 2003). Therefore, the effects of normal operation of PWMF II on PN workers (non-NEWs) are expected to be below the regulatory limit.

Identified Mitigation Measures

Because the estimated doses to workers (both NEWs and non-NEWs) during normal operations at PWMF II were determined to be below CNSC's regulatory limits and below OPG's ECLs, no mitigation measures are required.

8.4 Radiation Dose Related to Radiological Malfunctions and Accidents

The assessment of the effects of radiological malfunctions and accidents focused on the two events during DSC on-site transfer and during DSC storage that have the potential to release radioactivity into the environment. The assessment of the effects of the release of tritium and krypton-85 following the bounding accident is based on releases of 1.4×10^{12} Bq of tritium and 7.8×10^{12} Bq of krypton-85 and is evaluated in a conservative manner.

Likely Environmental Effects

Non-Human Biota

The estimated dose from tritium and krypton-85 released following a bounding accident was calculated to be 0.0094 Gy which is less than 1% of the no-effect level (1 Gy) reported by UNSCEAR (1996).

Members of the Public and PN Non-NEWs

A preliminary estimate of the dose to members of the public at the PN property boundary was conservatively calculated at $1 \mu\text{Sv}$, based on PWMF I Safety Report methodology assumptions. This is a small fraction (0.1%) of the regulatory limit on annual dose to members of the public (Canada Gazette 2000). The estimated dose is below the level of regulatory concern as recommended by the ACRP/ACNS (1988), and the OPG dose target for malfunctions and accidents (i.e., that radiation doses to the public at the PN site boundary, following a postulated abnormal event or credible accident shall not exceed the annual public dose limit of $1,000 \mu\text{Sv}$). Also, the baseline annual dose to members of the public from licensed activities at the PN site is approximately $7 \mu\text{Sv/y}$, and from natural background radiation is approximately $1,300 \mu\text{Sv/y}$.

PWMF II Workers (NEWs)

The dose to workers at the PWMF II from the bounding malfunction and accident was estimated to be $< 6 \text{ mSv}$, based on PWMF I Safety Report methodology assumptions. As discussed previously, the assumptions stated for the accident scenario are very conservative and extremely unlikely to occur. Nevertheless, if the bounding accident was postulated to occur near the end of a dosimetry year, the estimated dose to a worker at PWMF II could be in addition to a typical annual dose of approximately 0.64 mSv/y from normal operation. The total postulated dose for the year would be approximately 7 mSv , less than OPG's ECL of 10 mSv/y and a small fraction of the regulatory limit of 50 mSv in a calendar year, to a maximum of 100 mSv over a five-year period.

PN Workers (NEWs)

The dose to a worker at PN in proximity to a malfunction or accident is expected to be equal to or less than the corresponding dose to a PWMF II worker, i.e., 6 mSv as discussed above.

The individual dose to workers at PN from the bounding accident and malfunction would be in addition to the baseline dose received (average of 1.1 mSv/y). All internal and external doses received by workers at PN are monitored and are reported as part of their cumulative annual dose. If the accident was postulated to occur at the end of a dosimetry year, the average individual dose to a worker at PN is expected to be less than 7 mSv in that year, a small fraction of the regulatory limit. In some years, the annual dose to a few PN workers may approach the ECL of 10 mSv. If one of these workers were assumed to be exposed to the bounding malfunction or accident near the end of a dosimetry year, the total dose in the year could approach 16 mSv. This maximum postulated dose to a worker is also below the regulatory limit of 50 mSv in a calendar year, to a maximum of 100 mSv over a five-year period.

Identified Mitigation Measures

Radiation doses to workers and the public from radiological malfunctions and accidents are expected to be below CNSC's regulatory limits and OPG's ECLs. Also, radiation doses to nonhuman biota are expected to be below no-effects levels reported by UNSCEAR. Therefore, no mitigation measures are required.

9.4.3.2 Other Projects and Activities

PWMF I

The dose rate at the PN east property boundary from PWMF I operations has been estimated at 6×10^{-5} $\mu\text{Sv/h}$ (OPG 2002d), or a dose of 0.05 $\mu\text{Sv/y}$ to a member of the public assuming full occupancy at this location. This is a very small fraction of the CNSC regulatory limit of 1,000 $\mu\text{Sv/y}$ and is well below the level of concern recommended by the ACRP/ACNS.

9.5.1 Members of the Public

9.5.1.2 Identified Mitigation Measures

The estimated cumulative doses to the most exposed members of the public are expected to be small fractions of the CNSC regulatory limits; therefore, no mitigation measures are warranted.

9.5.2 Workers on the PN Property

9.5.2.1 Dose Levels

PWMF II Workers (NEWs)

In conclusion, cumulative radiation doses to PWMF II workers will be carefully controlled and monitored to ensure that OPG's ECL (< 10 mSv/y), which is well below regulatory dose limits, will not be exceeded.

PN Workers (NEWs and Non-NEWs)

In conclusion, cumulative radiation doses to PN workers will be carefully controlled and monitored to ensure that OPG's ECLs (< 1000 $\mu\text{Sv/y}$ to non-NEWs, and < 10 mSv/y to NEWs), which are below regulatory dose limits, will not be exceeded.

9.5.2.2 Identified Mitigation Measures

The estimated cumulative dose to NEWs at the PWMF II and NEWs and non-NEWs at the PN, are expected to be less than CNSC regulatory limits; therefore, no mitigation measures are warranted or required.

9.5.3 Cumulative Dose to Non-Human Biota

The estimated cumulative dose to non-human biota is a small fraction (i.e., 5%) of the no-effects level (1 mGy/d) reported by UNSCEAR (1996) and is less than the corresponding values recommended by CNSC staff in a paper presented at the 2002 Conference on Ecological Risk Assessment in Australia (Bird et al. 2002)

9.5.3.2 Identified Mitigation Measures

The estimated cumulative dose to non-human biota is expected to be less than the no-effects levels reported by UNSCEAR; therefore, no mitigation measures are warranted or required.

SOURCE: Refurbishment and Continued Operation of Pickering B Nuclear Generating Station Environmental Assessment. December 2007. NK30-REP-07701-00002

5.9.2.3 Evaluation of Effects for Continued Operation

The predicted gamma radiation levels from full Storage Buildings provides a dose rate of $\leq 10 \mu\text{Sv/y}$ at the PN property boundary, based on full occupancy 100% of the year. This includes both direct and skyshine contributions. The effect of gamma radiation on the terrestrial environment at the PN property boundary from the Storage Buildings is expected to be $\leq 10\mu\text{Sv/y}$. This effect will be indistinguishable from the temporal and spatial variations in natural background radiation levels at this location.

A dose rate of $50 \mu\text{Sv/h}$ was predicted on the roof of the DSC Storage Buildings from an array of loaded DSCs completely filling the buildings. Nesting of birds on the roofs of storage buildings at PWSMF I and PWSMF II is discouraged by the very nature of the roof design. However, birds may perch on the roof of the Storage Buildings for brief periods, and be exposed to (absorbed) dose rates of approximately 0.05 mGy/h from gamma radiation. Exposure periods of one or two hours per day would result in dose rates of up to 0.1 mGy/d . This dose rate is less than the no effects level of 1 mGy/d reported by UNSCEAR (1996).

The gamma radiation levels from loaded DSCs in PWSMF II Storage Buildings are predicted to produce a dose rate less than $0.5 \mu\text{Sv/h}$ at the perimeter fence of the PWSMF II site. Therefore, the corresponding absorbed dose rates to flora and fauna were estimated at 0.0005 mGy/h . The estimated daily dose rate to flora and fauna at the perimeter of the PWSMF II site is approximately 0.012 mGy/d , and is a small fraction of the no-effects level of 1 mGy/d reported by UNSCEAR (1996). Also, the predicted dose rate is expected to be within the range of natural background, which is 0.004 to 0.02 mGy/d .

5.9.2.4 Identified Mitigation Measures

Similar to the Refurbishment Phase, the storage of the refurbishment waste is expected to have locally elevated gamma radiation levels which are predicted to be less than $0.5 \mu\text{Sv/h}$. This dose rate was established by OPG to ensure that even for 2000 h/y occupancy, the dose to a human would not exceed 1 mSv . In addition, however, a dose rate of $0.5 \mu\text{Sv/h}$ is far below any relevant dose-rate criteria for non-human biota. Moreover, these levels are within the range of levels previously experienced at the PN site. Therefore, with the access to these storage areas closely controlled, there is no additional mitigation needed.

5.9.5.3 Evaluation of Effects for Continued Operation

The annual doses to individual NEWs during normal operation are well below the regulatory limits, a maximum of 50 mSv in a one-year dosimetry period and an average of 20 mSv in a one year dosimetry period (i.e., a cumulative dose of 100 mSv in five one-year dosimetry periods). In addition, doses will be controlled to ALARA using internal dose control limits, such as the ADL and ECL.

Doses to NEWs due to continued operation of the waste management facility will be the same as encountered presently at the PWSMF (i.e., an average individual dose of approximately 0.64 mSv per year per worker). After completing the placement of the refurbishment waste into storage, there will only be maintenance and caretaking activities inside the storage buildings, and thus, future doses to workers at PWSMF are expected to be comparable to existing doses.

5.9.5.4 Identified Mitigation Measures

Radiation doses to NEWs in the Regional and Local Study Areas from the Continued Operation of PNGS B following refurbishment are expected to be indistinguishable from the baseline doses from the PNGS in the Regional and Local Study Areas. Furthermore, the Continued Operation of PNGS B following refurbishment is expected to result in radiation doses to NEWs in the Site Study Area that are well below the corresponding regulatory limits, and within OPG dose targets and ECLs.

As no distinguishable changes in dose levels from baseline conditions are expected during refurbishment or continued operation, additional mitigation measures are not required.

5.9.6.3 Evaluation of Effects for Continued Operation

As mentioned previously, the access and movement of visitors and non-NEW workers on the PN site is controlled by OPG, and the radiation doses to these individuals from licensed activities on the PNGS site are controlled by OPG to ensure that they do not exceed 1 mSv/y, the regulatory limit on annual dose to non-NEWs (Canada Gazette 2000). At the perimeter fence of the PWMF II site, the dose rate is predicted to be less than 0.5 $\mu\text{Sv/h}$ which corresponds to a dose rate of < 1,000 $\mu\text{Sv/y}$ for 2,000 h/y occupancy, the CNSC public dose limit for non-NEWs (Canada Gazette 2000). It is highly unlikely that a non-NEW would spend appreciable time in this area and thus, the doses to non-NEWs are expected to be well below the CNSC public dose limit. Therefore, the radiation doses to non-NEWs from the continued operation are expected to be indistinguishable from the radiation doses from normal operation of the reactors and well below the regulatory limit of 1 mSv/y for non-NEWs.

5.9.6.4 Identified Mitigation Measures

Radiation doses to members of the public in the Regional and Local Study Areas from the continued operation of PNGS B following the refurbishment are expected to be indistinguishable from the baseline doses from the PNGS in the Regional and Local Study Areas. Furthermore, the continued operation following refurbishment is expected to result in radiation doses to visitors and non-NEW workers on the PN site (i.e., in the Site Study Area) that are less than the corresponding regulatory limit for members of the public of 1 mSv/y (Canada Gazette 2000). As no distinguishable changes in dose levels from baseline conditions are expected during refurbishment or continued operation, additional mitigation measures are not required.

Section A6

Description from Record of Proceedings and Record of Decision:

SOURCE: Record of Proceedings, Including Reasons for Decision. May 28, 2004.

Subject: Environmental Assessment Screening Report on the proposed expansion of the Pickering Waste Management Facility (Phase II)

4. Conclusion

The Commission concludes that the environmental assessment Screening Report attached to CMD 04-H7 (as amended) is complete and meets all of the applicable requirements of the Canadian Environmental Assessment Act.

The Commission concludes that the project, taking into account the appropriate mitigation measures identified in the Screening Report, is not likely to cause significant adverse environmental effects.

SOURCE: Record of Proceedings, Including Reasons for Decision. December 10, 2008.

Subject: Screening Environmental Assessment of the Pickering Nuclear Generating Station B Refurbishment and Continued Operations Project, Pickering, Ontario

17. The Commission reviewed the EA Screening Report and concluded that it is complete and in accordance with the requirements of the CEEA.

57. Based on its review of the Screening Report and the above-noted information provided on the record, the Commission concludes that the proposed project, taking into account the mitigation measures, described in section 8 of the EA Screening Report, is not likely to cause significant adverse effects to the environment.

107. To address concerns raised by several intervenors on waste management, the Commission requested that OPG elaborate on the design of the dry-storage container used for used fuel storage and on the fuel cycle after the removal of fuel from the reactor. OPG responded that the dry-storage container was a very robust container consisting of a 13mm-thick steel inner liner and a 13mm-thick steel outer liner with approximately half a metre of high-density reinforced concrete between those two liners. OPG added that the containers, without fuel, weigh approximately 70 tonnes and that they were extremely robust and very similar to those used elsewhere in North America and around the world. OPG noted that they had proven to be adequate for storing spent nuclear fuel for extended periods of time as long as fifty years. To answer the fuel cycle portion of the question, OPG added that the fuel removed from the reactor is stored in water pools at the stations for a minimum of 10 years to allow the fuel to cool to about 0.1 % of the radioactivity levels present at the time of its removal from the reactor. The fuel is then transferred to dry-storage containers for storage until a disposal facility is available.

SOURCE: Record of Decision. April 13, 2017.

Subject: Application to Renew the Waste Facility Operating Licence for the Pickering Waste Management Facility

110. Based on the information considered for this hearing, the Commission is satisfied that the ALARA concept is adequately applied to all PWMF activities.

113. CNSC staff informed the Commission that, in keeping with the ALARA principle, OPG had planned improvements to its radiation protection program during the proposed renewed licence period and CNSC staff would be closely monitoring these initiatives.

115. Based on the information provided for this hearing, the Commission is satisfied that doses to workers at the PWMF are adequately controlled.

121. Based on the information provided on the record for this hearing, the Commission concludes that, given the mitigation measures and safety programs that are in place and will be in place to control radiation hazards, OPG provides, and will continue to provide, adequate protection to the health and safety of persons and the environment throughout the proposed renewed licence period.

122. The Commission is satisfied that OPG's radiation protection program at the PWMF meets the requirements of the Radiation Protection Regulations.

131. The Commission concludes that the health and safety of workers and the public was adequately protected during the operation of the facility for the current licence period and that the health and safety of persons would also be adequately protected during the continued operation of the facility in the proposed renewed licence period.

157. Based on the information submitted by CNSC staff in the EA Report, the Commission is satisfied that the EA adequately shows that OPG made and will continue to make adequate provision for the protection of the environment and persons at the PWMF site.

158. The Commission is satisfied that OPG's and the CNSC's environmental monitoring show that the public and the environment around the PWMF site remain protected.

166. Based on the information presented on the record for this hearing, the Commission is satisfied that the ERAs were carried out satisfactorily and showed that OPG was adequately protecting the environment in the vicinity of the Pickering NGS, and therefore, the PWMF site.

168. Based on the assessment of the application and the information provided on the record at the hearing, the Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards, OPG will provide adequate protection to the health and safety of persons and the environment throughout the proposed licence period.

218. Based on the information presented on the record for this hearing, the Commission is satisfied that OPG is meeting, and will continue to meet, regulatory requirements regarding packaging and transport.

ENCLOSURE 2

OPG letter, K. Aggarwal to M. Bacon-Dussault, "OPG – Addendum to the Application for Amendment to the Pickering Waste Management Facility, Waste Facility Operating Licence WFOL-W4-350.00/2028"

CD# 92896-CORR-00531-01530 P

Modification Design Requirements for Loading, Transferring, Processing and Storing Minimum 6-year-old Fuel at NSSP

92896-MDR-79171-00001

(14 total pages)

Internal Use Only	
Document Number:	92896-MDR-79171-00001
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Title:
**MODIFICATION DESIGN REQUIREMENTS FOR LOADING, TRANSFERRING, PROCESSING,
AND STORING MINIMUM 6-YEAR-OLD FUEL AT NSSP**

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92896

Modification Design Requirements for:

SCI: 79171

System: Dry Storage Container

Associated EC Number(s): 154806

Associated Project Number: N/A

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Revision Summary

Revision Number	Affected Section	Description of Revisions
R001	All	<ul style="list-style-type: none">• Requirement {R-002} from R000 has been removed.• Requirement {R-004} has been added.• Requirement {R-028} has been reworded for clarify.• Reference [R-7] has been added.• Reference [R-8] has been added.• All requirement and reference numbers have been updated throughout the document to reflect above changes.
R000	N/A	Initial Issue.

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1.0 INTRODUCTION

The Dry Storage Container (SCI: 79171) is a nuclear safety related container with a design life of 50 years. Currently, it is defined in supporting licence documents (including Safety Report and PWMF Operating Policies and Procedures) for Pickering Waste Management Facility (PWMF) Operating License, WFOL-W4-350.00/2028 [R-1], that only fuel that have been cooled for 10 years or longer since discharged from the reactor (hereinafter referred to as minimum 10-year-old fuel) are to be loaded into a DSC for its on-site transfer, processing, and storage in a dry storage building for interim storage.

MEC 154806 has been initiated in order to support the OPG Safe Storage Project for Pickering NGS Units 5-8. By the end of December 2025, additional space for discharged used fuel will need to be allocated in the PNGS Irradiated Fuel Bay-B (IFB-B) for two full unit core dumps. The purpose of this modification is to create the additional space in the IFB-B by loading fuel that have been cooled for a period of 6 years or more but less than 10 years (hereinafter referred to as minimum 6-year-old fuel), as required. In November of 2020, OPG has sent a letter [R-2] to CNSC requesting their concurrence to load a minimum of 24 DSCs and a maximum of 100 DSCs with minimum 6-year-old fuel. In the course of the project, further analysis was conducted for IFB-B space projections for end of life defueling and the projected minimum number of DSCs to be loaded with minimum 6-year-old fuel has changed to 34 DSCs [R-3].

Loading of minimum 6-year-old fuel will have the following effects that are different from the current practice of loading DSCs with minimum 10-year-old fuel:

- 1) Higher heat output
- 2) Higher radiation output
- 3) Different composition and activities of releasable radionuclides

Upon implementation, a maximum of 100 DSCs will be loaded by 2025 inside the IFB-B with minimum 6-year-old fuel, transferred to and temporarily stored at Pickering Processing Building for processing, transferred to and temporarily stored at Storage Building 1 (SB1) for International Atomic Energy Agency (IAEA) Safeguard Seal application, and then transferred to and placed in Storage Building 3 (SB3) for dry interim storage for at least until they reach 10 years of age and become eligible for off-site transportation.

This Modification Design Requirement (MDR) lists requirements for the modification, MEC 154806.

2.0 DOCUMENT CONVENTIONS

The requirements and references in this document are each assigned with unique serial numbers. Each serial numbers are prefixed with 'R-'.

The serial numbers for the requirements are enclosed in curly brackets (i.e. {R-000}).

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Rationale and notes may follow a requirement, indicated in italics. They are not binding but provide context and further explanation to assist in understanding and applying the requirement.

The serial numbers for the references are enclosed in square brackets (i.e. [R-0]). The list of references can be found in Section 5.0, References.

3.0 DESIGN REQUIREMENTS

No changes will be made to the existing DSC physical configuration as shown in drawings [R-4] and specification [R-5]. Hence, the requirements from the existing DSC Design Requirements (DR) [R-6] remain effective and are applicable to this modification. For each of the following sections, applicable DSC DR sections are specified. Additional requirements are listed.

3.1 Nuclear Safety Design Requirements

The nuclear safety design requirements are specified in DSC DR [R-6] Section 12.1, 'Nuclear Safety'.

3.2 Functional Requirements

The functional requirements are specified in DSC DR [R-6] Section 2.0, 'Functional Requirements'.

3.3 Performance Requirements

The performance requirements are specified in DSC DR [R-6] Section 3.0, 'Performance Requirements'.

Note that the following requirement {R-001} replaces the requirement (b) from section 3.0 'Performance Requirements' in DSC DR [R-6]:

{R-001} The DSC shall be capable of storing fuel that have been cooled for six (6) years or more in the irradiated fuel bays.

Rationale: Per the existing DSC DR [R-6], the DSCs were originally designed to store fuel that have been cooled for 10 years or more in the irradiated fuel bays. This modification must ensure that the existing DSCs are also capable of storing minimum 6-year-old fuel.

{R-002} *Note: This requirement has been removed in REV001 for being a repetition of requirement (g) from Section 3.0 'Performance Requirements' in DSC DR.*

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Although not specific to this modification, the following requirement is applicable:

- {R-003} The DSC shall be able to maintain the fuel sheath temperature of minimum 6-year-old fuel below 300°C.

Rationale: Previous analysis shows that the fuel integrity can be maintained for 30 years at sheath temperature of 330°C in dry air atmosphere and indefinitely at sheath temperature of 420°C in helium atmosphere [R-8]. The 300°C is a requirement that bounds both atmospheric conditions.

Note: The requirement to maintain the fuel sheath temperature below 300°C is also applicable to the existing DSCs with minimum 10-year-old fuels. However, this requirement has been included for clarity. The effect of higher heat output from minimum 6-year-old fuel on passive cooling capacity of DSC shall be assessed.

3.4 Interfacing Systems

- {R-004} The increased heat output and radiation from minimum 6-year-old fuel shall not compromise the structural integrity, operability, and/or performance of all interfacing systems.

The interfacing systems are specified in DSC DR [R-6] Section 4.0, 'Interfacing Systems'.

Additionally, the following interfacing systems (or structures) may be impacted by this modification:

- A) Nuclear Fuel Location and Storage History (NuFLASH) (SCI: 35030)
- B) Transfer Clamp (SCI: 76199)
 - (i) Lid-to-Base Elastomer Seal
- C) Welding Equipment:
 - (i) Weld Head Camera
- D) Transporters:
 - (i) Transporter Camera
- E) Weld Inspection Equipment:
 - (i) Phased Array Ultrasonic Testing (PAUT) System (SCI: 76556)
- F) Workshop Heating, Ventilation, and Air Conditioning (HVAC) Systems:
 - (i) Heating and Ventilation System (SCIs: 73900, 67390)
 - (ii) Air Conditioning System (SCIs: 73990, 67399)
- G) IFB-B Fuel Bay
 - (i) Fixed Area Gamma Monitors (FAGMs, SCI: 67873)
- H) Processing Building

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- I) Storage Building
 - (i) SB1
 - (ii) SB3
- J) IAEA Surveillance Cameras in IFB-B, Processing Building, and Storage Buildings.

3.4.1 Basic Requirements Imposed on Electrical

{R-005} The increased heat output from the DSCs loaded with minimum 6-year-old fuel shall not cause the temperature of nearby electrical conductors to exceed the conductor temperature rating or conductor termination temperature of the connected systems and/or equipment, whichever is less.

3.4.2 Basic Requirements Imposed on Instrumentation and Control (I&C)

See item C), D), and J) in requirement {R-004}

3.4.3 Basic Requirements Imposed on Process/Mechanical

{R-006} DSCs with minimum 6-year-old fuel shall have weld surface temperature below 50°C at the time of PAUT inspection [R-9].

Note: PAUT is used for inspection of DSC Lid-to-Base Weld.

{R-007} DSCs with minimum 6-year-old fuel shall have weld surface temperature in the range from 5°C to 52°C at the time of liquid penetrant testing [R-10].

Note: Liquid penetrant testing is used for inspection of Drain and Drain Pin Weld.

{R-008} Existing ventilation systems in PB, SB1, and SB3 shall be able to maintain the DSC fuel sheath temperature below 300°C.

3.4.4 Basic Requirements Imposed on Radioactive Waste

Not applicable.

3.4.5 Basic Requirements Imposed on Non-Radioactive Waste Management

Not applicable.

3.4.6 Basic Requirements Imposed on Service Water

Not applicable.

3.4.7 Basic Requirements Imposed on Compressed Air Systems

Not applicable.

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3.4.8 Basic Requirements Imposed on Civil Structure

- {R-009} The increased heat output and radiation from DSCs containing minimum 6-year-old fuel shall not impact the structural integrity of the building floors.

3.4.9 Other Requirements

- {R-010} The higher gamma radiation from DSCs loaded with minimum 6-year-old fuel shall not cause the IFB-B FAGM measurements to exceed the alarm setpoint of 0.3 mSv/h [R-11].
- {R-011} NuFLASH in IFB-B and NSSP shall be capable of tracking and recording the location and status of DSCs loaded with minimum 6-year-old fuel.
- {R-012} The increased heat output and radiation from DSCs containing minimum 6-year-old fuel shall not impact the structural integrity of the In-bay and Transfer Clamps. The Transfer and In-bay clamps were designed to retain the DSC lid onto its body under normal or credible accident conditions thus preventing the loss of used fuel shielding.
- {R-013} The increased heat output and radiation from DSCs containing minimum 6-year-old fuel shall not impact the structural integrity of Lid-to-Base elastomer seal used with Transfer Clamp.

Note: The Lid-to-Base elastomer seal is used with the Transfer Clamp and considered as a part of the Transfer Clamp design.

3.5 Design Limits and Strength Requirements

The design limits and strength requirements are specified in DSC DR [R-6] Section 5.0, 'Design Limits and Strength Requirements'.

Additionally,

- {R-014} Under normal operating conditions, the increased thermal gradient and higher radiation due to loading of minimum 6-year-old fuel shall not compromise the structural integrity of the DSC.
- {R-015} Under credible accident scenarios, the DSCs shall maintain containment and shielding of the fuel, but its structural competency for continued use may be compromised [R-6]. The effect of increased thermal loading and higher radiation from minimum 6-year-old fuel on DSC material shall be evaluated against all credible accident scenarios [R-7].

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3.6 Seismic Requirements

The seismic requirements are specified in DSC DR [R-6] Section 6.0, 'Seismic Requirements'.

3.7 Design Constraints

{R-016} No changes shall be made to the existing DSC physical configuration as shown in drawings [R-4] and specification [R-5].

{R-017} The DSCs loaded with minimum 6-year-old fuel shall not be processed with 5/8" modification as per EC#120931.

Note: The scope of this modification does not include changes from future ECs (i.e. V groove modification) and 5/8" weld modification as per EC#120931. The effect of loading minimum 6-year-old fuel has only been analyzed for the current configuration of the DSC with 1-1/4" Lid to Base closure weld.

{R-018} The DSCs loaded with minimum 6-year-old fuel shall not be transported off-site until they reach 10 years of age. They shall be treated as on-site storage only until the fuel reaches to 10 years cooling period after discharged from the reactor cores.

{R-019} No more than 100 DSCs shall be loaded with minimum 6-year-old fuel per the letter sent to CNSC [R-2]

{R-020} The DSCs containing minimum 6-year-old fuel shall only be stored in SB3 for the purpose of interim on-site storage.

{R-021} The DSCs containing minimum 6-year-old fuel shall be temporarily stored in Processing Building and SB1 only for the purpose of processing and IAEA seal application, respectively.

Note: Evaluation shall be completed during the detailed design phase to determine the maximum allowed number of DSCs loaded with minimum 6-year-old fuel inside Processing Building and SB1 and ensure all the requirements as specified in this MDR are met.

3.8 Environment Qualification/Aging Considerations

The aging considerations are specified in DSC DR [R-6] Section 8.0, 'Environmental Requirements'. However, the DSC does not need to be environmentally qualified.

Additionally,

{R-022} The increased heat output from the minimum 6-year-old fuel shall not accelerate deterioration of the DSC coating

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3.9 Reliability Requirements

The reliability requirements are specified in DSC DR [R-6] Section 9.0, 'Reliability Requirements'.

3.10 Maintainability/Operability/Human Factor Requirements

The maintainability requirements are specified in DSC DR [R-6] Section 10.0, 'Maintainability Requirements'.

Additionally,

- {R-023} For touch-up coating application, the DSC surface temperature at the time of coating application shall meet the substrate temperature requirement specified in the coating manufacturer's specification for PPG Amerlock 400 (self priming).

Note: The PPG Amerlock 400 (self priming) is used as the touchup coating in NSSP. The coating is used to coat the unpainted areas of DSCs and to cover any abnormal DSC coating defects.

- {R-024} The DSCs loaded with minimum 6-year-old fuel at SB3 shall have markings with clear indication of their ages.

3.11 Periodic Inspection Requirements

The periodic inspection requirements are specified in DSC DR [R-6] Section 11.0, 'Periodic Inspection Requirements'.

Additionally,

- {R-025} The inspection plan shall have a clear instruction on how to identify the DSCs loaded with minimum 6-year-old fuel.

3.12 Safety Requirements

3.12.1 Radiation Safety Requirements

The radiation safety requirement is specified in DSC DR [R-6] Section 5.6, 'Radiation Safety (Shielding) Requirements'.

Although not specific to this modification, for all facility buildings

- {R-026} The radiation safety requirements [R-12] under normal operation due to the storage of DSCs loaded with minimum 6-year-old fuel are:

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1. $\leq 0.5 \mu\text{Sv/h}$ outside the Used Fuel Dry Storage (UFDS) areas, on a quarterly average basis, based on the CNSC dose limit of 1 mSv/year for a member of the public, over a maximum of 2,000 hours per year occupancy for non-NEWs.
2. $\leq 100 \mu\text{Sv/year}$ at the Pickering site boundary. This is an administrative dose target of ten percent of the CNSC dose limit of 1 mSv/year for a member of the public.
3. $\leq 50 \text{ mSv}$ for NEWs in any single year, and 100 mSv over 5 years.

{R-027} The radiation safety requirements [R-12] under abnormal event or credible accident due to the storage of DSCs loaded with minimum 6-year-old fuel are:

1. $\leq 1 \text{ mSv}$ for the public at or beyond the OPG property boundary.
2. $\leq 50 \text{ mSv}$ for the NEWs.

Note: The requirements in this section are also applicable to the existing DSCs with minimum 10-year-old fuels. However, these requirements have been included for clarity. The effects of higher radiation from DSCs with minimum 6-year-old fuel on dose rates measured at the site boundary and the facility fences shall be assessed.

3.12.2 Conventional Health and Safety Requirements

{R-028} Per OPG Hazardous Physical Agents Guide [R-13], heat stress controls should be considered if any of the following criteria is met:

- a) Humidex reaches or exceeds 35°C
- b) Environment Canada issues a humidex advisory
- c) Dry bulb temperature in work area is greater than 30°C

Note: The increased heat output from DSCs containing 6-year-old fuel may increase the risk of worker heat stress.

{R-029} Increased DSC surface temperature may pose conventional safety hazard to personnel carrying out processing and inspection activities. Safe work planning and controls shall be in place to prevent contact hazard injuries, if required (refer to OPG-PROC-0129 [R-14]).

Rationale: According to ASTM C1055 – Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries [R-15], there is no short term (that is, less than 6 hours) hazards if the surface temperature is below 44°C. If the surface temperature is in the range from 44°C to 70°C, short term hazards may exist, and thus, the bare skin contact time shall be limited. If the surface temperature exceeds 70°C, irreversible skin damage will occur.

3.12.3 Environmental Requirements

The environmental requirements are specified in DSC DR [R-6] Section 8.0, 'Environmental Requirements'.

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3.12.4 Hazardous Agents or Substances

Not applicable.

3.13 Constructability Requirements

The constructability requirements are specified in DSC DR [R-6] Section 13.0, 'Constructability'.

3.14 Commissioning Facilitation Requirements

Note: A Detailed Commissioning Specification is required to be completed per Section 7.5 of the Design Scoping Checklist associated with this modification (N-FORM-10959).

- {R-030} Current practice and equipment shall be used to measure the dose rates on contact and at 1m distance (at any accessible point from the sides and the lid top) to ensure the nuclear safety requirements (Section 3.1 of this MDR) are met.
- {R-031} The humidex and dry bulb temperature (ambient air temperature) shall be measured to ensure that the conventional safety requirement, Section 3.12.2 {R-028} of this MDR, is met.
- {R-032} The DSC outer surface temperature shall be measured prior to any personnel coming in contact to ensure the conventional safety requirement, Section 3.12.2 {R-029} of this MDR, is met.
- {R-033} The weld surface temperature shall be measured prior to PAUT inspection and Liquid Dye Penetrant Testing to ensure the interfacing systems requirements (Section 3.4.3, requirements {R-006} and {R-007} of this MDR) are met.
- {R-034} Confirm that all equipment used for the temperature and dose rate measurements are properly calibrated.

3.15 Standards and Codes

The standards and codes are specified in DSC DR [R-6] Section 14.0, 'Regulatory, Standards, and Codes'.

3.16 Cyber Security

Not applicable.

3.17 Other Requirements

None.

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3.18 Comparison with Similar Systems in Other Generating Stations

In May of 1998, loading, processing, and interim storage of a DSC containing four modules of 6-year-old fuel was successfully completed. Authorization at the time was given by Atomic Energy Control Board (AECB) [R-16].

Note: Only one DSC was loaded with 6-year-old fuel in 1998, so the effects of multiple DSCs with 6-year-old fuel have not been determined. Thus, this modification is considered a First-of-a-Kind (FOAK).

4.0 IMPACT ON EXISTING SYSTEM DESIGN REQUIREMENTS

Existing DSC Design Requirement, 00104-DR-79171-10000 [R-6] will be affected by this modification. Updates to the DR document shall be made, as required.

Additionally, Design Requirements of systems/structures interfacing with DSC may be affected by this modification. They may include but are not limited to:

- PAUT Design Requirement [R-17]
- Workshop Heating & Ventilation Design Requirement [R-18]
- Used Fuel Dry Storage Facility Design Requirement [R-19]
- SB3 Design Requirement [R-20]
- Transfer Clamp Design Requirement [R-21]

5.0 REFERENCES

- [R-1] WFOL-W4-350.00 2028, PWMF Operating License
- [R-2] 92896-CORR-00531-01397, Proposal to Store Minimum 6-Year Old Used Fuel at the Pickering Waste Management Facility
- [R-3] P-CORR-00990-1008210, IFB-B Space Projections for End of Life Defueling
- [R-4] 00104-DRAW-79171-10051, Long Module Dry Storage Container – MK II General Arrangement
- [R-5] 00104-TS-79171-00001, Used Fuel Dry Storage Ontario Power Generation Dry Storage Container (DSC)
- [R-6] 00104-DR-79171-10000, Ontario Power Generation Used Fuel Dry Storage Container Design Requirements
- [R-7] 92896-REP-01320-00012, Safety Assessment Storing Lower Aged Fuel in PWMF SB3

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- [R-8] 92896-CORR-03000-70063, Long-term Used Fuel Integrity in the Proposed Pickering NGS Dry Storage Facility
- [R-9] I-IP-76556-50000, Procedure for Phased Array Ultrasonic Inspection of Waste Management's Dry Storage Container Lid Seal Weld
- [R-10] I-IP-04163-50015, Liquid Penetrant Examination – Welding Quality Control
- [R-11] NK30-DM-67873-00001, Fixed Area Gamma Radiation Monitoring
- [R-12] 92896-SR-01320-10002, Pickering Waste Management Facility – Safety Report
- [R-13] OPG-GUID-08963-0002, Hazardous Physical Agents Guide
- [R-14] OPG-PROC-0129, Safe Work Planning
- [R-15] ASTM C1055, Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries
- [R-16] 00104-CORR-79171-0139942, Additional Information Concerning Thermal Gradients Pertaining to Dry Storage Containers (DSCs)
- [R-17] 00104-DR-76556-00001, Ultrasonic Inspection System for Dry Storage Container Lid Closure Weld
- [R-18] 92896-73900, Workshop Heating & Ventilation
- [R-19] 92896-DR-29642-00001, System Design Requirements – Used Fuel Dry Storage Facility (Previously Filed as 907-92896-86000)
- [R-20] 92896-DR-01340-00001, Pickering Waste Management Facility Used Fuel Dry Storage Buildings No. 3 and No.4
- [R-21] 92896-DM-76199-00001, DSC Lid Clamps - Used Fuel Dry Storage Facility Pickering NGS