Hautfenne-Jewer, Celia

From: El-Jaby, Samy on behalf of Bruce C Project / Projet de Bruce C
Sent: November 14, 2024 5:22 PM
To: Sesin, Verena; Longo, Samantha; Wylie, Doug; Rupert, Aimee; Ellaschuk, Bernard; Zhang, Henry; Burtt, Julie; Collins, Patrick; Neal, Mark; Martel, Francis; Thambirasa, Suba; Richardson, Ross; Hassan, Junaid; MacCormack, Michelle; Gowdy, Kirk; Wlodarczyk, Christopher; MacDougall, Scott; Trylinski, Don; Nicolai, Laurent; Allison, Nicole; Petrushko, William; Kent, Michael; Eduful, James; Wei, Xuejun; Laxman, Sankar; Duvivier, Noémie; Chatri, Hayat; Gyepi-Garbrah, Samuel; D'Onofrio, Rebecca; Martin, Marina; Soria-Smith, Julia; Steedman, Gavin; Frenette, Mathieu; Stevenson, Jeff; Cunningham, Kim; Corcoran, Angela; Ramsey, Renee; samy.eljaby@gmail.com; MacLellan, Tiffany; Devitt, Peter; Nicolas, Michael; Young, Michael; Chari, Sandhya; Ringer, Ryan
Cc: Fabian Mendoza, Melissa; Kwamena, Nana-Owusua; Thériault, Bertrand; Dagher, Elias; Johnston, Brandon; Désaulniers, Lucie; Houldsworth, Corie; Vesely, Martin; Obuchi, Ross; Tennant, Richard; Nguyen, Thuy; Bourassa, Pascale; Kanasewich, Elaine; Hornof, Monica; Tavasoli, Vali; Bounagui, Abderrazzaq; Sigetich, Justin; Nitheanandan, Thambiayah; Rulko, Robert; Levine, Adam; Thelen, John; Bulkan, Anupama; Robertson, Karen; Broeders, Mark; Vary, Beth; Salmon, Candace; Saric, Jasmine; Ethier, Adrienne
Subject: Bruce Power 'Bruce C' Integrated Impact Assessment
Attachments: 2024-11-06_Bruce C - Summary of Issues - For review team.pdf; CNSC_Lifecycle_Regulator_Advice_Record_-_Bruce_C_Oct_2024.pdf; #7176464-Bruce_C_IA_Team_Contacts.DOCX.DRF

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Bruce C Team –

We are in the planning phase and currently tailoring the integrated guidelines (Tailored Impact Statement Guidelines) for the Bruce C project.

In preparation for this activity, we ask that the Bruce C primary Points of Contact (or if unavailable the Backups) familiarize themselves with the following documents by mid next week if you have not already done so:

- Bruce C initial project description (IPD) (found here - iaac-aeic.gc.ca/050/documents/p88771/158463E.pdf)
- CNSC's Lifecycle Regulator Advice Record (LRAR) (see attached) which is CNSC's official feedback to the IPD.
- Summary of Issues (see attached) which incorporates CNSC's LRAR and all other feedback. Note - The summary of issues uses reference numbers corresponding to feedback captured on the public registry (see Impact Assessment Agency of Canada). The CNSC identifier is #105.

The intent is to have SMEs understand the scope of the project, what is being proposed, and already identified issues. You are not being asked to provide any formal review/feedback at this time.

A0120125_1-000861

We will follow up next week with another email discussing next steps for your input into tailoring of the integrated guidelines.

Thank you for your cooperation.

**note – please inform me of any changes to the Bruce C IA Team (see attached).*

Samy El-Jaby
Project Officer, Advanced Reactor Licensing Division
Canadian Nuclear Safety Commission
280 Slater Street, Ottawa, ON., K1P1C2
mobile: +1 (343) 571-2653
email: samy.el-jaby@cnsc-ccsn.gc.ca

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Bruce C IA Team – Last updated: Nov. 14, 2024

NOTES:
Core Team Members for the Planning Phase highlighted in Blue
Lead Team Members highlighted in Yellow
ITAS: 900215 BRUCE POWER - BRUCE C SERVICE AGREEMENT LL NN
Bruce C EDOC structure – folder 7086392

Directorate	Division	Point of Contact	Backup	Director
Directorate of Environmental and Radiation Protection and Assessment (Dana Beaton)	Environmental Risk Assessment Division	Verena Sesin	Adrienne Ethier	Melissa Fabian Mendoza
	Environmental Review Division	Doug Wylie	Aimee Rupert	Nana-Owusua Kwamena
	Radiation Protection Division	Bernard Ellaschuk		Bertrand Theriault
	Health Sciences and Environmental Compliance Division	Henry Zhang (EP) Julie Burtt (HS)	Addie Ivanova	Elias Dagher
Directorate of Safety Management (Corinne Françoise)	Management Systems Division	Patrick Collins	Daniel Beaulieu	Brandon Johnston
	Personnel Certification Division	Francis Martel	Sandra Vidakovic Joseph Ross	Lucie Désaulniers
	Human and Organizational Performance Division	Junaid Hassan		Corie Houldsworth
	Training Program Evaluation Division	Martin Theriault	Kirk Gowdy	Martin Vesely
Directorate of Security and Safeguards (David Moroz)	Nuclear Security Division	Chris Wlodarczyk	Scott MacDougall	Ross Obuchi
	Emergency Management Programs Division	Don Trylinski	Laurent Nicolai (not available until April 2025)	Richard Tennant Thuy Nguyen (acting till Jan 2025)
	Non-Proliferation and Export Controls Division	Nicole Allison		Pascale Bourassa
	International Safeguards Division	William Petrushko	Michael Kent	Elaine Kanasewich
Directorate of Assessment and Analysis (Melanie Rickard)	Engineering Design Assessment Division	Maha Abdallah	Zuejun Wei	Monica Hornof
	Operational Engineering Assessment Division	Sankar Laxman		Vali Tavasoli
	Probabilistic Safety Assessment and Reliability Division	Noémie Duvivier	Hayat Chatri	Abderrazzaq Bounagui
	Systems Engineering Division			Justin Sigetich
	Reactor Behavior Division	Samuel Gyepi-Garbrah		Thambiaya Nitheanandan
	Reactor Physics and Thermalhydraulics Division			Robert Rulko
Strategic Planning Directorate (Julia Cropley)	Indigenous Consultation and Engagement Division	Rebecca D'Onofrio	Marina Martin	Adam Levine
	Reconciliation Policy and Public Programs Division	Alisha Wilkinson	Meghan Gerrish	Nhan Tran
Directorate of Nuclear Cycle and Facilities Regulation (Luc Sigouin)	Waste and Decommissioning Division	Julia Soria-Smith	Gavin Steedman	John Thelan
Directorate of Nuclear Substance Regulation (Karen Owen-Whitred)	Transport Licensing and Strategic Support Division	Mathieu Frenette		Richard Tenant
Directorate of Power Reactor Regulation (Alexandre Viktorov)	Bruce Regulatory Program Division	Jeff Stevenson		Anu Bulkan
Strategic Communications Directorate (Rhonda Walker-Sisttie)	Corporate and Regulatory Communications Division	Kim Cunningham	Renee Ramsey	Karen Robertson
Directorate of Advanced Reactor Technologies (Sarah Eaton)	Advanced Reactor Licensing Division	Samy El-Jaby	Tiffany MacLellan	Mark Broeders
	Advanced Reactor Assessment Division	Peter Devitt	Michael Nicolas	Beth Vary
Commission Registrar		Michael Young		Candace Salmon
Legal Services Unit		Sandhya Chari	Ryan Ringer	Christina Maheux

E-doc: 7176464

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Hautfenne-Jewer, Celia

s.19(1)

From: [redacted]@oecd-nea.org
Sent: May 15, 2024 4:25 AM
To: Viktorov, Alexandre; [redacted]

[redacted]

Subject: FW: LW-SMMR Workshop Invitation - 10-11 June 2024 - Ankara, Türkiye
Attachments: MDEP SMMR Workshop 2024 FLYER.pdf

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Dear WGNT, WGPL, and WGRO Members,

Below and attached is information regarding an upcoming workshop that may be of interest to you. Please reach out to [redacted]@oecd-nea.org) if you or someone from your organizations would like to participate.

Best regards,

[redacted]
Nuclear Energy Agency (NEA)
Paris, France

[redacted]
Follow the NEA on:

From: MDEP Secretariat <mdep.secretariat@oecd-nea.org>
Sent: Tuesday, May 14, 2024 6:00 PM
To: MDEP Secretariat <mdep.secretariat@oecd-nea.org>
Subject: LW-SMMR Workshop Invitation - 10-11 June 2024 - Ankara, Türkiye

Dear colleagues,

On behalf of the Multinational Design Evaluation Programme (MDEP) Management Board, we are pleased to invite you to the first MDEP brainstorming workshop dedicated to light-water small medium and modular reactors (LW-SMMR), which will be held on 10-11 June 2024 in Ankara, Türkiye with the possibility of an online connection.

The Multinational Design Evaluation Programme (MDEP) has been and will continue to be a unique multinational initiative leveraging the resources and knowledge of national regulators to review new reactor designs. The programme has successfully operated for 17 years and is recognised as an effective framework for regulatory co-operation and harmonisation. We are considering making MDEP a significant platform for addressing present challenges and regulatory expectations concerning LW-SMMR designs. This would involve actively engaging with designers to gain a deeper understanding of the obstacles they encounter.

The event represents a preliminary step for MDEP members to evaluate the opportunity to establish a dedicated working group focused on LW-SMMR designs. The audience will explore key challenges encountered during the safety assessment of such designs. It will help set priorities for future international cooperation aligned with MDEP objectives.

In case of interest, kindly use the Workshop registration link **by 28 May 2024**: http://www.oecd-nea.org/confdb/confdb/conf?id=895 (Please note that you may be prompted to create an account initially; however, this does not complete your registration for the event.)

The negotiated hotel rates, which offer guests the opportunity to reserve rooms at special rates, are guaranteed until **17 May 2024**. Reserve your room by booking online (https://docs.google.com/forms/d/e/1FAIpQLSeasCLrA2pU16FOkw3_RTKClc95gkBbZ3D2hAl-iGBH_MrrEg/viewform). No payment or credit card details required at the time of booking.

If you have any questions or queries, do not hesitate to contact the MDEP Secretariat. (mdep.secretariat@oecd-nea.org).

Best regards,

MDEP Secretariat



OECD Nuclear Energy Agency (NEA)
+33 (0)1 73 21 29 28
Mailing address:
2, rue André Pascal
75775 Paris Cedex 16
France
MDEP.secretariat@oecd-nea.org
www.oecd-nea.org/rwm

10-11 June 2024 ▪ Ankara, Türkiye

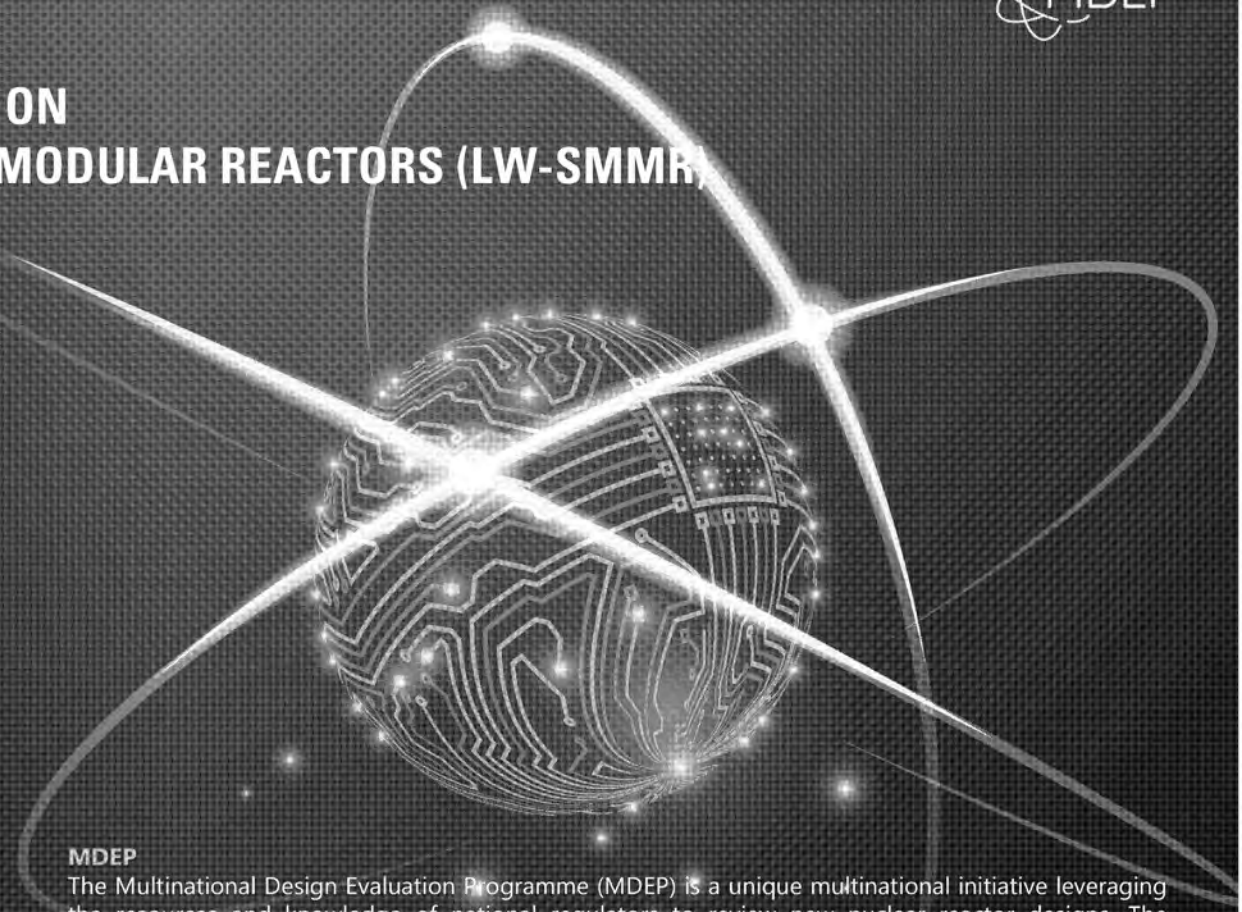
MDEP

MDEP BRAINSTORMING WORKSHOP ON LIGHT-WATER SMALL MEDIUM AND MODULAR REACTORS (LW-SMMR)

About the Workshop

The two-day workshop will include sessions on:

- Prevention vis-a-vis mitigation
- LW-SMMR's mandatory principle for the prevention and mitigation of accidents
- Implementation of probabilistic safety assessment (PSA) for LW-SMMR
- Research needs relevant to LW-SMMR
- Future perspective of recycling of SMMRs
- Verification and validation (V&V) computer benchmarking for LW-SMMRs
- Defense-in-depth (DiD) principles applicability to LW-SMMR
- Justification of the material selection for LW-SMMR reactor and primary and secondary circuits; validate the strength and lifetime of the materials used



MDEP

The Multinational Design Evaluation Programme (MDEP) is a unique multinational initiative leveraging the resources and knowledge of national regulators to review new nuclear reactor designs. The programme is widely recognized as an effective framework for regulatory co-operation and harmonisation.

Contact: mdep.secretariat@oecd-nea.org

REGISTER ONLINE HERE

A0120172_1-002044

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Hautfenne-Jewer, Celia

From: Davis, Heather
Sent: September 26, 2024 7:47 AM
To: Baig, Arslan
Subject: Heather's DNNP questions
Attachments: DNNP Organized Questions.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Arslan.

Please find attached my questions. If you want any support reviewing your Q&A or practicing answering questions, please let me know.

Heather

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Hautfenne-Jewer, Celia

From: Tavasoli, Vali
Sent: April 30, 2024 5:05 PM
To: Bulkan, Anupama
Subject: Large LOCA Background Material
Attachments: Large LOCA Knowledge Management Document.ppt; #6001718-DAA_DPRR_Joint_Recommendation_on_Large_LOCA_Safety_Margin_Issue_in_Existing_CANDU_Reactors.doc.DRF

Follow Up Flag: Follow up
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SEISMIC STUDY INFORMATION AT POINT LEPREAU SITE

April 2024

Questions and Answers

Prepared: June 3, 2024

Énergie NB Power | the power of possibility
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SEISMIC STUDY AT THE POINT LEPREAU SITE

Description of the Seismic Testing Study

The NB Power Advanced Reactor Development (ARD) group is currently conducting various environmental and technical studies to evaluate potential sites for new advanced small modular reactors (SMRs) within the existing Point Lepreau Nuclear Generating Station (PLNGS) property boundaries in Maces Bay, New Brunswick.

The ARD group has retained a contractor to complete a seismic testing study to predict the possible impacts of any potential construction-scale rock blasting if deemed required during future site preparation and construction activities of the proposed SMR.

In this study, small test-scale charges were placed in the bottom of drilled boreholes at predetermined locations on the PLNGS property. These locations were placed near the proposed SMR development areas in the Northwest area of the PLNGS property to provide seismic response measurements. Ground vibrations during this study were very small to minimize risk to nearby structures on the PLNGS site and to residents in the community.

The Way the Seismic Study Was Done

Simulating Construction Energy from Various Areas: Nine test locations (B1 to B9) were chosen near the SMR development area, as shown on the attached planning map, to allow for testing in various directions. The use of the various testing locations helps to determine changing rock conditions and simulate potential construction blasts in the SMR development area.

At each of the nine locations, four boreholes were drilled to varying depths (roughly 10 ft to 20 ft) into bedrock. The varied depths allowed for testing of rock conditions at varied depths as it relates to the size of the charge.

Monitoring Equipment: Portable seismographs were provided by the contractor to monitor all seismic responses created by the seismic test-scale charge and were placed on the ground across the PLNGS property at the following locations:

- Portable seismographs were placed inside the Protected Area outside the Condenser Cooling Water (CCW) Pumphouse, Turbine Hall, Fire Hall, and Reactor Building.

- Additional portable seismographs placed outside of the Protected Area outside the Solid Radioactive Waste Management Facility (SRWMF), Batch Plant Warehouse, ARD Trailer in Batch Plant, Freshwater Pumphouse, Emergency Mitigating Equipment (EME) Building, Transmission Tower Foundation, Supply Chain Warehouse Backlot, Switchyard Exterior. There was also one placed on NB Power-owned property in Welch Cove area, see M1 Location attached.

Description of Steps Taken at The PLNGS Site With Employees As Well As Local Residents

Technical Literature Review: In the planning phase, the ARD group had assessed available technical literature on structural thresholds of sensitive control equipment found in PLNGS, as well as residential or common building structure types (i.e., buildings with concrete masonry block, clay-brick walls and dry-wall).

Limiting Seismic Test Scale Charge and Ground Energy Monitoring: To minimize risks to nearby structures, the existing PLNGS CANDU-6 power plant, and to nearby buried infrastructure in the vicinity of the SMR development area, peak particle velocity (PPV) limits, which is a measure of ground particle velocity, were set to target 5 mm/s during planning. For reference, typical buried infrastructure such as piping is limited to 50 mm/s during seismic test-scale charge activity.

The charge sizes were limited to 6 kg, 12 kg, 18 kg, and 24 kg. Additionally, a 340g booster (or occasionally 680g booster) is also included in the charge size and are used to ensure proper detonation of the test charge in various ground conditions.

Seismic testing occurred from April 9th to April 12th, 2024, inclusively. After each seismic test the two seismographs (M2 and M3) located in the Batch plant area, closest seismographs to the test sites, were visited and the ground energies checked. If the ground energies were sufficiently low (i.e., 3 mm/s or lower) the charge size would increase by 6 kg to the next incremental size in the range described for the particular test location and then start at 6 kg at the next test site.

PLNGS Coordination: System Specialist and Environmental Review: Prior to conducting any drilling work, technical input was obtained from PLNGS system specialists and incorporated into the work plan.

Briefings with Emergency Response Team (ERT) and Nuclear Response Team (NRT): Sessions with representatives from the ERT and NRT groups were conducted to provide opportunities for inputs in the planning of the seismic testing study.

Work Procedure: Coordination and communication with PLNGS ERT, NRT and the Main Control Room was conducted for seismic test -scale charge procedures, post seismic test-scale charge procedures.

Pre-Testing Procedures: Prior to conducting seismic tests, the ERT Field Office, NRT Central Alarm Station and the Main Control Room (MCR) were notified of the upcoming seismic tests, including the seismic test location and planned detonation time.

The Main Control Room were also requested to issue a public address (PA) announcement as per its protocol, before any seismic tests were to occur.

A siren was also used in the field from the vendor's vehicle to inform Station personnel and surrounding areas that seismic testing work will be taking place prior to any seismic testing taking place.

A pre-walk to the seismic testing location was also conducted prior to testing taking place to confirm that nobody was present in the location being tested.

A sentry was also placed at entry areas near the seismic testing to stop people from entering the testing area.

Post-Seismic Test-Scale Charge Procedures: Following each successful seismic tests, calls were made to PLNGS representatives to notify them of the successful test and indicate the location and time of the next seismic test. PLNGS representatives were also requested to indicate any potential seismic or vibration alarm triggers so that this could be recorded. During testing, no vibrations or seismic measurements were triggered by PLNGS detection systems or reported.

Seismic Test Field Data

Seismic Testing Progress Tracker

Date	Test #	Hole	Charge Depth from Surface (ft)	Charge mass (kg)	Time of the testing (00:00)
09/04/2024	1	B1-1	13	6.34	10:37
	2	B1-2	16	12.34	12:27
	3	B1-3	19	18.34	13:12
	4	B1-4	19	24.34	13:59

10/04/2024	1	B2-1	12	6.34	9:06
	2	B2-2	13	12.34	9:30
	3	B2-3	20	18.34	9:59
	4	B2-4	22	24.34	10:12
	5	B7-1	14	6.34	12:39
	6	B7-2	14	12.34	12:55
	7	B7-3	18	12.34	13:19
	8	B7-4	19	12.34	13:41
	9	B6-1	12	6.34	14:20
	10	B6-2	16	12.34	14:41
	11	B6-3	18	12.34	15:26
	12	B6-4	21	12.34	15:45
11/04/2024	1	B4-1	10	6.34	11:01
	2	B4-2	11	12.34	11:30
	3	B4-3	18	12.34	11:48
	4	B4-4	22	12.34	12:12
	5	B5-1	13	6.34	13:46
	6	B5-2	16	12.34	13:55
	7	B5-3	19	18.34	14:15
	8	B5-4	22	24.34	14:33
	9	B3-1	13	6.34	14:57
	10	B3-2	15	12.34	15:10
	11	B3-3	19	18.34	15:24
	12	B3-4	20	24.34	15:45
12/04/2024	1	B9-1	13	6.34	8:54
	2	B9-3	17	6.34	9:13
	3	B9-4	22	6.34	9:31
	4	B8-2	20	6.34	11:05
	5	B8-3	24	12.34	11:20
	6	B8-4	24	18.68	11:41

Discussion of Initial Result:
Results will be included in the final assessment reports.

POL.4. Objective Initiation Form (OIF)

Objective ID: POL.4.

Objective: Fuel reprocessing, recycling, and waste (ex. WATTs) (in partnership with other Federal partners)

Team:

[redacted]

Target Completion Date: [redacted]

Expected Deliverables:

The purpose of this objective is to ensure CNSC readiness to address and regulate fuel reprocessing should it arise. The following shall be considered in scope:

1. Develop a high-level workplan that includes project milestones/timelines.

2. Support policy analysis and/or development on fuel reprocessing in Canada, in collaboration with federal partners.

3. Review CNSC's current requirements and guidance on reprocessing of spent nuclear fuel for use in Small Modular Reactors (SMR). Ensure alignment with #2.

4. Review CNSC staff's current capabilities in conducting reviews of licenses seeking authorization for the production and/or use of reprocessed nuclear fuel; and determine if improvements to regulatory framework, operating experience, training, and guidance on technical assessments is required.

5. Develop and publish an internal report which documents the analysis (based on #3 & #4), identifies all items which require further development and provides recommendations. Leverage existing CNSC processes, as required, to perform the analysis and issue the required information.

6. Ensure CNSC readiness to regulate fuel reprocessing by initiating Implementation of the identified recommendations into existing CNSC managed process. This is considered complete when the recommendations are entered into a managed process.

Reporting Requirements:

- Provide monthly status updates to the appropriate Directorate Lead on the objective's progress.
- Present work plan, implementation plan, and closure to SMRLC.

Project Interfaces:

- Working Group on Reprocessing (NRCAN led)
- POL.3. Policy for Canadian Enrichment (in partnership with others)
- REP.10. Handling fuel waste for SMRs

Ensure the leads of these objectives are kept informed of the outcomes of this objective.

Approval:

Name	Position	Signature and Date
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Note: Refer to Section 10 of the SMR Readiness Project Plan for changes to the OIF form.

Hautfenne-Jewer, Celia

From: Donnelly, Lisa
Sent: October 10, 2024 3:23 PM
To: Greencorn, Nancy; Viktorov, Alexandre; Dodkin, Christina; Rickard, Melanie; Cropley, Julia; Saric, Jasmine; Howlett, Catherine; Thiele, Lisa
Cc: International / International (CNSC/CCSN)
Subject: NEA Steering Committee reports - FYI
Attachments: NEA-Prioritisation of activities.pdf; 2023 NEA Annual Report.pdf

Good afternoon,

NRCan's Nuclear Energy Division senior director, Colin Hoult, will be representing Canada at the 148th session of the NEA Steering Committee on Oct 23-24. Attached for your information are two reports that will be discussed during the meeting:

1. Report on the Prioritisation of Activities of the NEA for 2025-2026
2. 2023 Annual Report on the activities of the NEA.

You may already be familiar with these documents through your committee secretariats, but should there be anything specific on the content that you'd like me to bring to NRCan's attention in advance of the meeting, feel free to let me know.

Many thanks,
Lisa

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LONG TERM STRUCTURE OF THE IAEA SAFETY STANDARDS AND CURRENT STATUS
March 2025

Electronic version available now at:

STATUS OF THE IAEA SAFETY STANDARDS

The whole collection of safety standards in each official IAEA language is available for download at

https://nucleus.iaea.org/sites/committees/Policy%20Documents/Complete%20Collections%20of%20Safety%20Standards

Please note that you may also access the content of the Safety Standards Series and the Nuclear Security Series and navigate within the Series using the Nuclear Safety and Security Online User Interface NSS-OUI available on Nucleus at the following address:

https://nucleus-apps.iaea.org/nss-oui/

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1. Recent Publications

Safety standards published in 2022/2023/2024: GSG-16, SSG-65, SSG-9 (Rev. 1), SSG-77, GSG-15, SSG-66, SSG-26 (Rev. 1), SSG-20 (Rev. 1), SSG-24 (Rev. 1), SSG-27 (Rev. 1), SSG-70, SSG-71, SSG-72, SSG-73, SSG-75, SSG-74, SSG-76, SSG-79, SSG-22 (Rev. 1), SSG-5 (Rev. 1), SSG-6 (Rev. 1), SSG-7 (Rev. 1), SSG-80, SSG-81, SSG-82, SSG-83, SSG-84, SSG-78, SSG-85, SSG-10 (Rev. 1), SSG-37 (Rev. 1), SSG-86, GSG-17, GSG-18, SSG-88, SSG-89, SSG-87, SSG-3 (Rev. 1), SSG-1 (Rev. 1), SSG-90, SSG-91, SSG-13 (Rev. 1)

2. Useful Hyperlinks

General information on the IAEA Safety Standards is available at:
https://www.iaea.org/resources/safety-standards

The IAEA Nuclear Safety and Security Glossary, 2022 (Interim) Edition in English, French and Spanish is available at:

IAEA Nuclear Safety and Security Glossary | IAEA

The 2018 Edition of the IAEA Safety Glossary in English, French, Russian and Spanish, and the 2007 Edition in Arabic, Chinese, English, French, Russian and Spanish are also available there.

An electronic version of the IAEA Nuclear Safety and Security Glossary is also available at:
https://vocabulary.iaea.org/iaea-safety-glossary.html

3. Overall status of the safety standards series

- 133 are established. 133 are published
- 33 drafts are in the development process (23 to revise 23 published Safety Standards and 10 new)
- 2 draft DPPs approved by the Coordination Committee of which 1 to revise 1 published Safety Standards and 1 new

Currently, 92% of the standards are established. 18% of the established standards are under revision.
The expected total number is 144.

4. Application to facilities and activities

For each document in the long term structure of safety standards, a table is provided that indicates to which types of facilities and activities the standard applies. The green boxes indicate the application:

- green NPPs means applicable to nuclear power plants,
- green RRs means applicable to research reactors,
- green FCFs means applicable to fuel cycle facilities and facilities of the predisposal management of radioactive waste,
- green WDF means applicable to waste disposal facilities,
- green MM means applicable to mining/milling activities,
- green RS means applicable to use of radiation sources, and
- green TR means applicable to the transport of radioactive material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

5. Hierarchy

The IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. They are issued in the IAEA Safety Standards Series, which has three categories (see Fig. 1):

Safety Fundamentals

The Safety Fundamentals SF-1 presents the fundamental safety objective and principles of protection and safety and provides the basis for the safety requirements.

Safety Requirements

An integrated and consistent set of Safety Requirements establish the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. If the requirements are not met, measures must be taken to reach or restore the required level of safety. The format and style of the requirements facilitate their use for the establishment, in a harmonized manner, of a national regulatory framework. The General Safety Requirements and the Specific Safety Requirements[1] include overarching requirements and associated requirements, both expressed as "shall" statements. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as 'should' statements.

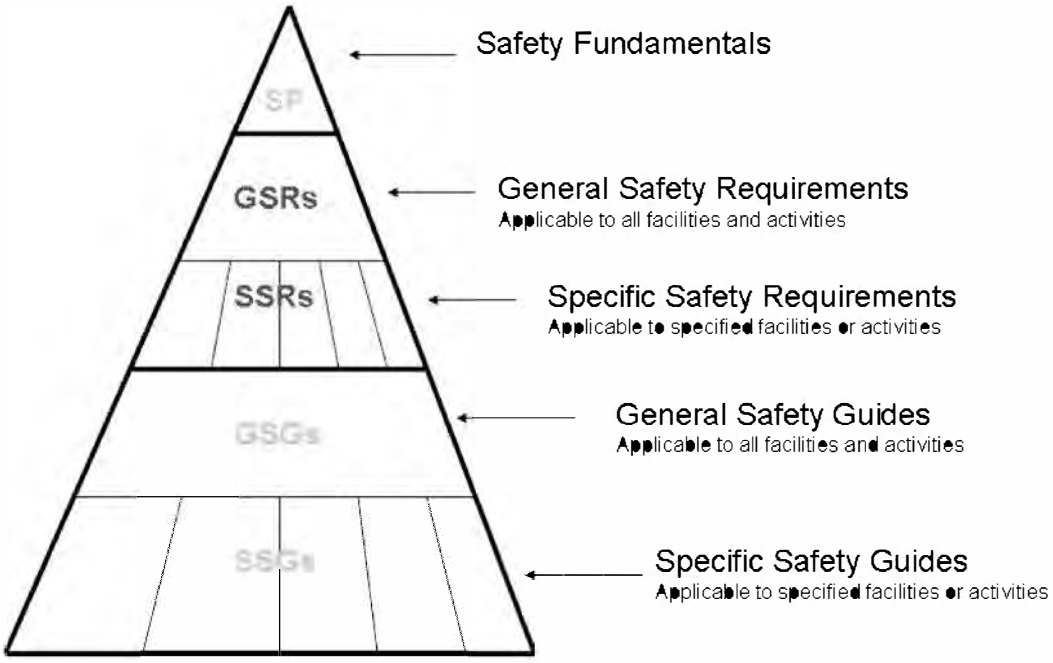
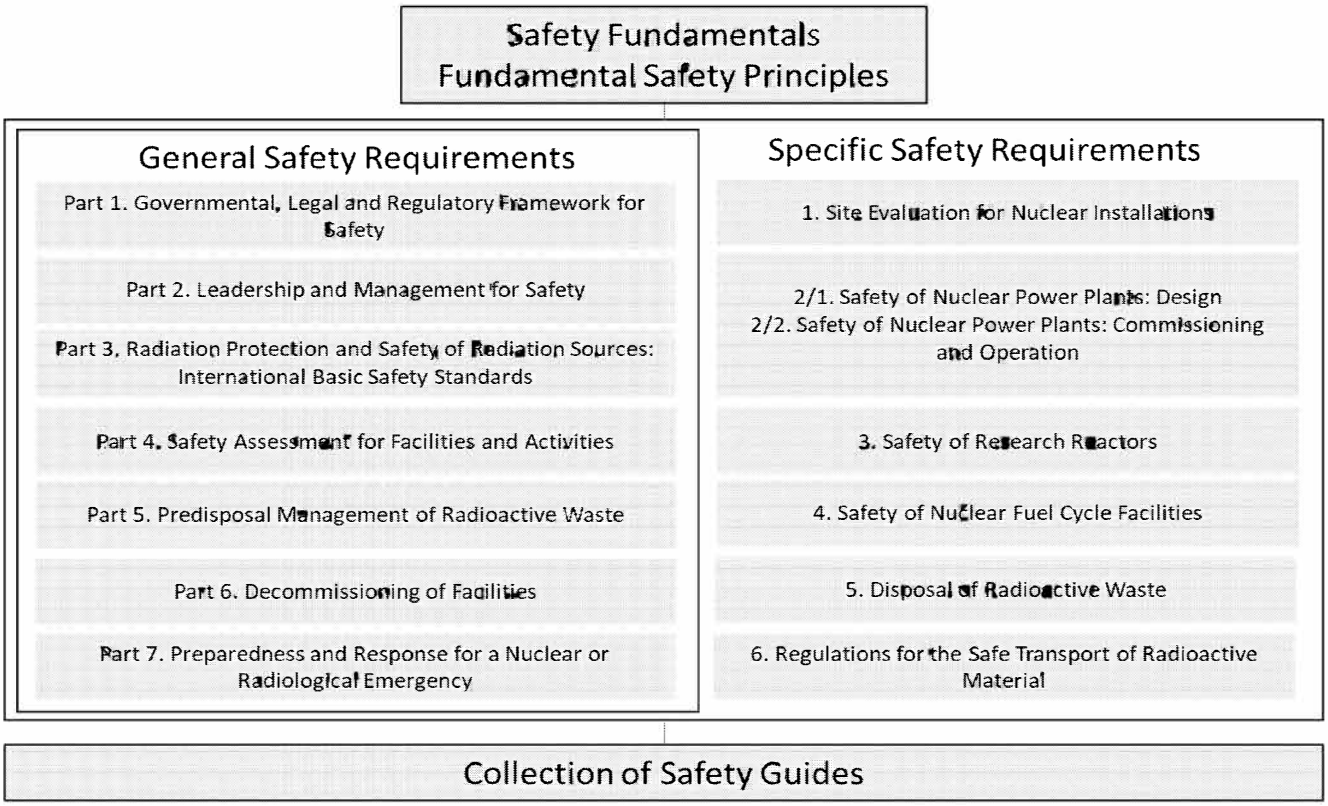


Fig. 1: Safety Standards Categories

[1] This does not currently apply to SSR-6 (Rev. 1) and its predecessors SSR-6 and TS-R-1

6. Structure

The long-term set of Safety Standards includes a unified Safety Fundamentals (SF-1), a General Safety Requirements (GSR) in seven parts applicable to all facilities and activities with a graded approach, complemented by a set of six facilities and activities Specific Safety Requirements (SSRs). The Safety Requirements are implemented through a set of general and specific safety guides.



The following list provides you with the long term set of Safety Standards as well as the status of the current corresponding set of published safety standards and drafts in preparation for the transition to the long term structure.

7. Status of development

Throughout this report the first column provides the list of established IAEA Safety Standards (Safety Fundamentals and Safety Requirements are established when approved by the BoG and Safety Guides are established by the DG when approved by the Publication Committee). The second column gives the working identification number (DS …) of standards being developed or revised and links to the corresponding DPP. **Bold titles** indicate standards issued, or to be issued, under the authority of the Board of Governors, others are issued under the authority of the Director General. The third column provides the development status. The last column provides the list of Committees; the first Committee listed has the lead in the preparation and review of that particular draft.

STEP 1: Preparing a DPP
STEP 2: Internal review of the DPP
STEP 3: Review of the DPP by the RC(s)
STEP 4: Review of the DPP by the CSS
STEP 5: Preparing the draft
STEP 6: First internal review of the draft
STEP 7: First review of the draft by the RC(s)
STEP 8: Soliciting comments by Member States
STEP 9: Addressing comments by Member States
STEP 10: Second internal review of the draft
STEP 11: Second review of the draft by the RC(s)
STEP 12a: Submission to /endorsement by the Publications Committee
STEP 12b1: Submission to /approval by the CSS
STEP 12b2: MTCD Editing provided to the CSS

STEP 13: Establishing as an IAEA safety standard or an IAEA nuclear security guidance (by the DDG and/or Board of Governors (for SF and SR only))
STEP 14: Publication of the safety standard or the nuclear security guidance

8. The Current IAEA Safety Standards

Standards highlighted in Yellow appear several times in the list as they are applicable to different types of facilities and/or activities

Safety Fundamentals

SF-1 EUROPEAN ATOMIC ENERGY COMMUNITY, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1, IAEA, Vienna (2006).

General Safety Standards (applicable to all facilities and activities)

GSR Part 1 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016).

GSR Part 2 INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).

GSR Part 3 EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).

GSR Part 4 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016).

GSR Part 5 INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSR Part 5, IAEA, Vienna (2009).

GSR Part 6 INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).

GSR Part 7 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015).

GSG-12 INTERNATIONAL ATOMIC ENERGY AGENCY, Organization, Management and Staffing of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-12, IAEA, Vienna (2018).

GSG-13 INTERNATIONAL ATOMIC ENERGY AGENCY, Functions and Processes of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-13, IAEA, Vienna (2018).

GS-G-2.1 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION,

Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007).

GSG-2 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011).

GS-G-3.1 INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

GSG-16 INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership, Management and Culture for Safety in Radioactive Waste Management, IAEA Safety Standards Series No. GSG-16, IAEA, Vienna (2022).

GSG-1 INTERNATIONAL ATOMIC ENERGY AGENCY, Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009).

GSG-3 INTERNATIONAL ATOMIC ENERGY AGENCY, The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSG-3, IAEA, Vienna (2013).

GSG-17 INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Concept of Exemption, IAEA Safety Standards Series No. GSG-17, IAEA, Vienna (2023).

GSG-18 INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Concept of Clearance, IAEA Safety Standards Series No. GSG-18, IAEA, Vienna (2023).

RS-G-1.8 INTERNATIONAL ATOMIC ENERGY AGENCY, Environmental and Source Monitoring for Purposes of Radiation Protection, IAEA Safety Standards Series No. RS-G-1.8, IAEA, Vienna (2005).

RS-G-1.9 INTERNATIONAL ATOMIC ENERGY AGENCY, Categorization of Radioactive Sources, IAEA Safety Standards Series No. RS-G-1.9, IAEA, Vienna (2005).

GSG-9 INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Regulatory Control of Radioactive Discharges to the Environment, IAEA Safety Standards Series No. GSG-9, IAEA, Vienna (2018).

GSG-15 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS DEVELOPMENT PROGRAMME, UNITED NATIONS ENVIRONMENT PROGRAMME AND UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, Remediation Strategy and Process for Areas Affected by Past Activities or Events, IAEA Safety Standards Series No. GSG-15, IAEA, Vienna (2022).

WS-G-5.1 INTERNATIONAL ATOMIC ENERGY AGENCY, Release of Sites from Regulatory Control on Termination of Practices, IAEA Safety Standards Series No. WS-G-5.1, IAEA, Vienna (2006).

WS-G-5.2 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for the Decommissioning of Facilities Using Radioactive Material, IAEA Safety Standards Series No. WS-G-5.2, IAEA, Vienna (2008).

WS-G-6.1 INTERNATIONAL ATOMIC ENERGY AGENCY, Storage of Radioactive Waste, IAEA Safety Standards Series No. WS-G-6.1, IAEA, Vienna (2006).

GSG-5 INTERNATIONAL ATOMIC ENERGY AGENCY, Justification of Practices, Including Non-medical Human Imaging, IAEA Safety Standards Series No. GSG-5, IAEA, Vienna (2014).

GSG-6 INTERNATIONAL ATOMIC ENERGY AGENCY, Communication and Consultation with Interested Parties by the Regulatory Body, IAEA Safety Standards Series No. GSG-6, IAEA, Vienna (2017).

GSG-7 INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Occupational Radiation Protection, IAEA Safety Standards Series No. GSG-7, IAEA, Vienna (2018).

GSG-11 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION

ORGANIZATION, INTERNATIONAL LABOUR OFFICE, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Arrangements for the Termination of a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).

GSG-14 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERPOL, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION AND UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, Arrangements for Public Communication in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-14, IAEA, Vienna (2020).

GSG-8 INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Radiation Protection of the Public and the Environment, IAEA Safety Standards Series No. GSG-8, IAEA, Vienna (2018).

GSG-10 INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Prospective Radiological Environmental Impact Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSG-10, IAEA, Vienna (2018).

Specific Safety Standards (applicable to specified facilities and activities)

Nuclear Power Plants

SSR-1 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSR-1, IAEA, Vienna (2019).

SSR-2/1 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev. 1), IAEA, Vienna (2016).

SSR-2/2 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), IAEA, Vienna (2016).

SSG-16 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Safety Infrastructure for a Nuclear Power Programme, IAEA Safety Standards Series No. SSG-16 (Rev. 1), IAEA, Vienna (2020).

GS-G-3.5 INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Nuclear Installations, IAEA Safety Standards Series No. GS-G-3.5, IAEA, Vienna (2009).

SSG-12 INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing Process for Nuclear Installations, IAEA Safety Standards Series No. SSG-12, IAEA, Vienna (2010).

SSG-61 INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61, IAEA, Vienna (2021).

SSG-69 INTERNATIONAL ATOMIC ENERGY AGENCY, Equipment Qualification for Nuclear Installations, IAEA Safety Standards Series No. SSG-69, IAEA, Vienna (2021).

SSG-30 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Classification of Structures, Systems and Components in Nuclear Power Plants, IAEA Safety Standards Series No. SSG-30, IAEA, Vienna (2014).

SSG-39 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Instrumentation and Control Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-39, IAEA, Vienna (2016).

SSG-63 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Fuel Handling and Storage Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-63, IAEA, Vienna (2020).

SSG-68 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Nuclear Installations Against External Events Excluding Earthquakes, IAEA Safety Standards Series No. SSG-68, IAEA, Vienna (2021).

SSG-67 INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Design for Nuclear Installations, IAEA Safety Standards Series No. SSG-67, IAEA, Vienna (2021).

SSG-88 INTERNATIONAL ATOMIC ENERGY AGENCY, Design Extension Conditions and the Concept of Practical Elimination in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-88, IAEA, Vienna (2024), https://doi.org/10.61092/iaea.la1m-dy8m.

SSG-64 INTERNATIONAL ATOMIC ENERGY AGENCY, Protection against Internal Hazards in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-64, IAEA, Vienna (2021).

SSG-34 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Electrical Power Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-34, IAEA, Vienna (2016).

SSG-56 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-56, IAEA, Vienna (2020).

SSG-53 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Containment and Associated Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-53, IAEA, Vienna (2019).

SSG-62 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-62, IAEA, Vienna (2020).

SSG-52 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Core for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-52, IAEA, Vienna (2019).

SSG-90 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection Aspects of Design for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-90, IAEA, Vienna (2024).

SSG-77 INTERNATIONAL ATOMIC ENERGY AGENCY, Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants, Safety Standards Series No. SSG-77, IAEA, Vienna (2022).

SSG-51 INTERNATIONAL ATOMIC ENERGY AGENCY, Human Factors Engineering in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-51, IAEA, Vienna (2019).

SSG-70 INTERNATIONAL ATOMIC ENERGY AGENCY, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-70, IAEA, Vienna (2022).

SSG-71 INTERNATIONAL ATOMIC ENERGY AGENCY, Modifications to Nuclear Power Plants, IAEA Safety Standards Series No. SSG-71, IAEA, Vienna (2022).

SSG-72 INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-72, IAEA, Vienna (2022).

SSG-73 INTERNATIONAL ATOMIC ENERGY AGENCY, Core Management and Fuel Handling for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-73, IAEA, Vienna (2022).

SSG-74 INTERNATIONAL ATOMIC ENERGY AGENCY, Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants, IAEA Safety Standards Series No. SSG-74, IAEA, Vienna (2022).

SSG-40 INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016).

SSG-75 INTERNATIONAL ATOMIC ENERGY AGENCY, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-75, IAEA, Vienna (2022).

SSG-38 INTERNATIONAL ATOMIC ENERGY AGENCY, Construction for Nuclear Installations, IAEA Safety Standards Series No. SSG-38, IAEA, Vienna (2015).

SSG-28 INTERNATIONAL ATOMIC ENERGY AGENCY, Commissioning for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-28, IAEA, Vienna (2014).

SSG-25 INTERNATIONAL ATOMIC ENERGY AGENCY, Periodic Safety Review for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-25, IAEA, Vienna (2013).

SSG-50 INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, IAEA Safety Standards Series No. SSG-50, IAEA, Vienna (2018).

SSG-48 INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-48, IAEA, Vienna (2018).

SSG-89 INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Nuclear Installations, IAEA Safety Standards Series No. SSG-89, IAEA, Vienna (2024).

SSG-76 INTERNATIONAL ATOMIC ENERGY AGENCY, Conduct of Operations at Nuclear Power Plants, IAEA Safety Standards Series No. SSG-76, IAEA, Vienna (2022).

SSG-54 INTERNATIONAL ATOMIC ENERGY AGENCY, Accident Management Programmes for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-54, IAEA, Vienna (2019).

SSG-13 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Chemistry Programme for Water Cooled Nuclear Power Plants, IAEA Safety Standards Series No. SSG-13 (Rev. 1), IAEA, Vienna (2024).

SSG-79 INTERNATIONAL ATOMIC ENERGY AGENCY, Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-79, IAEA, Vienna (2023).

NS-G-3.2 INTERNATIONAL ATOMIC ENERGY AGENCY, Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-3.2, IAEA, Vienna (2002). (under revision)

SSG-9 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-9 (Rev. 1), IAEA, Vienna (2022).

SSG-18 INTERNATIONAL ATOMIC ENERGY AGENCY, WORLD METEOROLOGICAL ORGANIZATION, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-18, IAEA, Vienna (2011).

SSG-21 INTERNATIONAL ATOMIC ENERGY AGENCY, Volcanic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-21, IAEA, Vienna (2012).

SSG-35 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Survey and Site Selection for Nuclear Installations, IAEA Safety Standards Series No. SSG-35, IAEA, Vienna (2015).

NS-G-3.6 INTERNATIONAL ATOMIC ENERGY AGENCY, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-3.6, IAEA, Vienna (2004).

SSG-2 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Deterministic Safety Analysis for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-2 (Rev. 1), IAEA, Vienna (2019).

SSG-3 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-3 (Rev. 1), IAEA, Vienna (2024).

SSG-4 INTERNATIONAL ATOMIC ENERGY AGENCY, Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-4, IAEA, Vienna (2010).

SSG-47 INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018).

SSG-27 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Criticality Safety in the Handling of Fissile Material, IAEA Safety Standards Series No. SSG-27 (Rev. 1), IAEA, Vienna (2022).

Research Reactors

SSR-1 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSR-1, IAEA, Vienna (2019).

SSR-3 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Research Reactors, IAEA Safety Standards Series No. SSR-3, IAEA, Vienna (2016).

SSG-9 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-9 (Rev. 1), IAEA, Vienna (2022).

SSG-18 INTERNATIONAL ATOMIC ENERGY AGENCY, WORLD METEOROLOGICAL ORGANIZATION, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-18, IAEA, Vienna (2011).

SSG-21 INTERNATIONAL ATOMIC ENERGY AGENCY, Volcanic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-21, IAEA, Vienna (2012).

SSG-79 INTERNATIONAL ATOMIC ENERGY AGENCY, Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-79, IAEA, Vienna (2023).

SSG-35 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Survey and Site Selection for Nuclear Installations, IAEA Safety Standards Series No. SSG-35, IAEA, Vienna (2015).

GS-G-3.5 INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Nuclear Installations, IAEA Safety Standards Series No. GS-G-3.5, IAEA, Vienna (2009).

SSG-12 INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing Process for Nuclear Installations, IAEA Safety Standards Series No. SSG-12, IAEA, Vienna (2010).

SSG-50 INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, IAEA Safety Standards Series No. SSG-50, IAEA, Vienna (2018).

SSG-89 INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Nuclear Installations, IAEA Safety Standards Series No. SSG-89, IAEA, Vienna (2024).

SSG-38 INTERNATIONAL ATOMIC ENERGY AGENCY, Construction for Nuclear Installations, IAEA Safety Standards Series No. SSG-38, IAEA, Vienna (2015).

SSG-69 INTERNATIONAL ATOMIC ENERGY AGENCY, Equipment Qualification for Nuclear Installations, IAEA Safety Standards Series No. SSG-69, IAEA, Vienna (2021).

SSG-67 INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Design for Nuclear Installations, IAEA Safety Standards Series No. SSG-67, IAEA, Vienna (2021).

SSG-68 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Nuclear Installations Against External Events Excluding Earthquakes, IAEA Safety Standards Series No. SSG-68, IAEA, Vienna (2021).

SSG-80 INTERNATIONAL ATOMIC ENERGY AGENCY, Commissioning of Research Reactors, IAEA Safety Standards Series No. SSG-80, IAEA, Vienna (2023).

SSG-81 INTERNATIONAL ATOMIC ENERGY AGENCY, Maintenance, Periodic Testing and Inspection of Research Reactors, IAEA Safety Standards Series No. SSG-81, IAEA, Vienna (2023).

SSG-82 INTERNATIONAL ATOMIC ENERGY AGENCY, Core Management and Fuel Handling for Research Reactors, IAEA Safety Standards Series No. SSG-82, IAEA, Vienna (2023).

SSG-83 INTERNATIONAL ATOMIC ENERGY AGENCY, Operational Limits and Conditions and Operating Procedures for Research Reactors, IAEA Safety Standards Series No. SSG-83, IAEA, Vienna (2023).

SSG-84 INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors, IAEA Safety Standards Series No. SSG-84, IAEA, Vienna (2023).

SSG-85 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors, IAEA Safety Standards Series No. SSG-85, IAEA, Vienna (2023).

SSG-40 INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016).

SSG-47 INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018).

SSG-10 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Research Reactors, IAEA Safety Standards Series No. SSG-10 (Rev. 1), IAEA, Vienna (2023).

SSG-22 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors, IAEA Safety Standards Series No. SSG-22 (Rev. 1), IAEA, Vienna (2023).

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SSG-20 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report, IAEA Safety Standards Series No. SSG-20 (Rev. 1), IAEA, Vienna (2022).

SSG-27 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Criticality Safety in the Handling of Fissile Material, IAEA Safety Standards Series No. SSG-27 (Rev. 1), IAEA, Vienna (2022).

SSG-37 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Instrumentation and Control Systems and Software Important to Safety for Research Reactors, IAEA Safety Standards Series No. SSG-37 (Rev. 1), IAEA, Vienna (2023).

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SSR-1 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSR-1, IAEA, Vienna (2019).

SSR-4 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSR-4, IAEA, Vienna (2017).

SSG-9 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-9 (Rev. 1), IAEA, Vienna (2022).

SSG-18 INTERNATIONAL ATOMIC ENERGY AGENCY, WORLD METEOROLOGICAL ORGANIZATION, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-18, IAEA, Vienna (2011).

SSG-21 INTERNATIONAL ATOMIC ENERGY AGENCY, Volcanic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-21, IAEA, Vienna (2012).

SSG-79 INTERNATIONAL ATOMIC ENERGY AGENCY, Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-79, IAEA, Vienna (2023).

SSG-35 INTERNATIONAL ATOMIC ENERGY AGENCY, Site Survey and Site Selection for Nuclear Installations, IAEA Safety Standards Series No. SSG-35, IAEA, Vienna (2015).

GS-G-3.5 INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Nuclear Installations, IAEA Safety Standards Series No. GS-G-3.5, IAEA, Vienna (2009).

SSG-12 INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing Process for Nuclear Installations, IAEA Safety Standards Series No. SSG-12, IAEA, Vienna (2010).

SSG-50 INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, IAEA Safety Standards Series No. SSG-50, IAEA, Vienna (2018).

SSG-89 INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Nuclear Installations, IAEA Safety Standards Series No. SSG-89, IAEA, Vienna (2024).

SSG-67 INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Design for Nuclear Installations, IAEA Safety Standards Series No. SSG-67, IAEA, Vienna (2021).

SSG-68 INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Nuclear Installations Against External Events Excluding Earthquakes, IAEA Safety Standards Series No. SSG-68, IAEA, Vienna (2021).

SSG-5 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Conversion Facilities and Uranium Enrichment Facilities, IAEA Safety Standards Series No. SSG-5, IAEA, Vienna (2023).

SSG-6 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Uranium Fuel Fabrication Facilities, IAEA Safety Standards Series No. SSG-6, IAEA, Vienna (2023).

SSG-7 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities, IAEA Safety Standards Series No. SSG-7, IAEA, Vienna (2023).

SSG-38 INTERNATIONAL ATOMIC ENERGY AGENCY, Construction for Nuclear Installations, IAEA Safety Standards Series No. SSG-38, IAEA, Vienna (2015).

SSG-69 INTERNATIONAL ATOMIC ENERGY AGENCY, Equipment Qualification for Nuclear Installations, IAEA Safety Standards Series No. SSG-69, IAEA, Vienna (2021).

SSG-41 INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-41, IAEA, Vienna (2016).

SSG-42 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Fuel Reprocessing Facilities, IAEA Safety Standards Series No. SSG-42, IAEA, Vienna (2017).

SSG-43 INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Fuel Cycle Research and Development Facilities, IAEA Safety Standards Series No. SSG-43, IAEA, Vienna (2017).

SSG-47 INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018).

SSG-15 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Storage of Spent Nuclear Fuel, IAEA Safety Standards Series No. SSG-15 (Rev. 1), IAEA, Vienna (2020).

SSG-27 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Criticality Safety in the Handling of Fissile Material, IAEA Safety Standards Series No. SSG-27 (Rev. 1), IAEA, Vienna (2022).

Radioactive Waste Disposal Facilities

SSR-5 INTERNATIONAL ATOMIC ENERGY AGENCY, Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).

GSG-16 INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership, Management and Culture for Safety in Radioactive Waste Management, IAEA Safety Standards Series No. GSG-16, IAEA, Vienna (2022).

SSG-1 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Borehole Disposal Facilities for Disused Sealed Radioactive Sources, IAEA Safety Standards Series No. SSG-1 (Rev. 1), IAEA, Vienna (2024).

SSG-23 INTERNATIONAL ATOMIC ENERGY AGENCY, The Safety Case and Safety Assessment for the Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSG-23, IAEA, Vienna (2012).

SSG-29 INTERNATIONAL ATOMIC ENERGY AGENCY, Near Surface Disposal Facilities for Radioactive Waste, IAEA Safety Standards Series No. SSG-29, IAEA, Vienna (2014).

SSG-14 INTERNATIONAL ATOMIC ENERGY AGENCY, Geological Disposal Facilities for Radioactive Waste, IAEA Safety Standards Series No. SSG-14, IAEA, Vienna (2011).

SSG-31 INTERNATIONAL ATOMIC ENERGY AGENCY, Monitoring and Surveillance of Radioactive Waste Disposal Facilities, IAEA Safety Standards Series No. SSG-31, IAEA, Vienna (2014).

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SSG-60 INTERNATIONAL ATOMIC ENERGY AGENCY, Management of Residues Containing Naturally Occurring Radioactive Material from Uranium Production and Other Activities, IAEA Safety Standards Series No. SSG-60, IAEA, Vienna (2021).

Applications of Radiation Sources

GSR Part 3 EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).

SSG-44 INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Infrastructure for Radiation Safety, IAEA Safety Standards Series No. SSG-44, IAEA, Vienna (2018).

SSG-46 INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety in Medical Uses of Ionizing Radiation, IAEA Safety Standards Series No. SSG-46, IAEA, Vienna (2018).

RS-G-1.9 INTERNATIONAL ATOMIC ENERGY AGENCY, Categorization of Radioactive Sources, IAEA Safety Standards Series No. RS-G-1.9, IAEA, Vienna (2005).

SSG-49 INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Medical, Industrial and Research Facilities, IAEA Safety Standards Series No. SSG-49, IAEA, Vienna (2019).

SSG-45 INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education, IAEA Safety Standards Series No. SSG-45, IAEA, Vienna (2019).

SSG-8 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety of Gamma, Electron and X Ray Irradiation Facilities, IAEA Safety Standards Series No. SSG-8, IAEA, Vienna (2010).

SSG-11 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety in Industrial Radiography, IAEA Safety Standards Series No. SSG-11, IAEA, Vienna (2011).

SSG-17 INTERNATIONAL ATOMIC ENERGY AGENCY, Control of Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries, IAEA Safety Standards Series No. SSG-17, IAEA, Vienna (2012).

SSG-19 INTERNATIONAL ATOMIC ENERGY AGENCY, National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources, IAEA Safety Standards Series No. SSG-19, IAEA, Vienna (2011).

SSG-32 INTERNATIONAL ATOMIC ENERGY AGENCY, WORLD HEALTH ORGANIZATION, Protection of the Public against Exposure Indoors due to Radon and Other Natural Sources of Radiation, IAEA Safety Standards Series No. SSG-32, IAEA, Vienna (2015).

SSG-36 INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, Radiation Safety for Consumer Products, IAEA Safety Standards Series No. SSG-36, IAEA, Vienna (2016).

SSG-55 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety of X Ray Generators and Other Radiation Sources Used for Inspection Purposes and for Non-medical Human Imaging, IAEA Safety Standards Series No. SSG-55, IAEA, Vienna (2020).

SSG-57 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety in Well Logging, IAEA Safety Standards Series No. SSG-57, IAEA, Vienna (2020).

SSG-58 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety in the Use of Nuclear Gauges, IAEA Safety Standards Series No. SSG-58, IAEA, Vienna (2020).

SSG-59 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety of Accelerator Based Radioisotope Production Facilities, IAEA Safety Standards Series No. SSG-59, IAEA, Vienna (2020).

SSG-87 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety in the Use of Radiation Sources in Research and Education, IAEA Safety Standards Series No. SSG-87, IAEA, Vienna (2024).

SSG-91 INTERNATIONAL ATOMIC ENERGY AGENCY, Protection of Workers Against Exposure Due to Radon, IAEA Safety Standards Series No. SSG-91, IAEA, Vienna (2024).

Transport of Radioactive Material

SSR-6 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, 2018 Edition, IAEA Safety Standards Series No. SSR-6 (Rev. 1), IAEA, Vienna (2018).

SSG-26 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition), IAEA Safety Standards Series No. SSG-26 (Rev. 1), IAEA, Vienna (2022).

SSG-65 INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency Involving the Transport of Radioactive Material, IAEA Safety Standards Series No. SSG-65, IAEA, Vienna (2022).

SSG-66 INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Package Design Safety Report for the Transport of Radioactive Material, IAEA Safety Standards Series No. SSG-66, IAEA, Vienna (2022).

SSG-86 INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection Programmes for the Transport of Radioactive Material, IAEA Safety Standards Series No. SSG-86, IAEA, Vienna (2023).

TS-G-1.4 INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.4, IAEA, Vienna (2008).

SSG-78 INTERNATIONAL ATOMIC ENERGY AGENCY, Compliance Assurance for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. SSG-78, IAEA, Vienna (2023).

SSG-33 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition), IAEA Safety Standards Series No. SSG-33 (Rev. 1), IAEA, Vienna (2021).

SSG-27 (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, Criticality Safety in the Handling of Fissile Material, IAEA Safety Standards Series No. SSG-27 (Rev. 1), IAEA, Vienna (2022).

9. Safety Fundamentals

Safety Fundamentals

SF-1: Fundamental Safety Principles
Published in Arabic, Chinese, English, French, Russian and Spanish
Cosponsorship: Euratom, FAO, ILO, IMO, OECD/NEA, PAHO, UNEP, WHO
Ex. DS298, Supersedes Safety series Nos 110, 111-F and 120
NPPs | RRs | FCFs | WDFs | MM | RS | TR

10. General Safety Requirements

GSR Part 1: Governmental, Legal and Regulatory Framework for Safety
NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 1 (Rev. 1) Governmental, Legal and Regulatory Framework for Safety (2016) Ex DS463 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **GSR Part 1: Governmental, Legal and Regulatory Framework for Safety (2010)** Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS415 Supersedes GS-R-1 Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (2000) Ex DS180 Published in Arabic, Chinese, English, French, Russian, Spanish which Superseded Safety Series Nos. 50-C-G (Rev. 1) and 111-S-1			

GSR Part 2: Leadership and Management for Safety
NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 2: Leadership and Management for Safety (2016) Ex **DS456** Published in Arabic, Chinese, English, French, Russian, Spanish supersedes **GS-R-3 The Management System for Facilities and Activities (2006)** Ex **DS338** Published in Arabic, Chinese, English, French, Russian, Spanish (Supersedes Safety Series 50-C-Q)			

GSR Part 3: Radiation Protection and Safety of Radiation Sources

NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 3 Radiation Protection and Safety of Radiation Sources, International BSS (2014) Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: EC, FAO, ILO, OECD/NEA, PAHO, UNEP, WHO Ex DS379 supersedes **SS115 International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (1996)** Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: FAO, ILO, OECD/NEA, PAHO, WHO Which superseded Safety Series No. 9, 1982 Edition GSR Part 3 also supersedes **WS-R-3 Remediation of Areas Contaminated by Past Activities and Accidents (2003)** Ex DS162 Published in English			

GSR Part 4: Safety Assessment for Facilities and Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 4 (Rev. 1) Safety Assessment for Facilities and Activities (2016) Ex DS466 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **GSR Part 4: Safety Assessment for Facilities and Activities (2009)** Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS348 Supersedes NS-G-1.2			

GSR Part 5: Predisposal Management of Radioactive Waste (2009)

NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 5: Predisposal Management of Radioactive Waste (2009) Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS353 Supersedes WS-R-2 Published in Arabic, Chinese, English, French, Russian, Spanish	DS548: Predisposal Management of Radioactive Waste dpp	Step 5: preparing the draft G. Bruno	WASSC, RASSC, TRANSSC, NUSSC, EPReSC, NSGC

GSR Part 6: Decommissioning and Termination of Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 6 Decommissioning of Facilities (2014) Ex DS450 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes WS-R-5 **Decommissioning of Facilities Using Radioactive Material (2006)** Ex DS333 Published in Arabic Chinese, English, French, Russian, Spanish Supersedes the decommissioning part of WS-R-2 on Predisposal Management of Radioactive Waste, including Decommissioning (2000) Published in Arabic, Chinese, English, French, Russian, Spanish			

GSR Part 7: Emergency Preparedness and Response

NPPs | RRs | FCFs | WDFs | MM | RS | TR

GSR Part 7: Preparedness and Response for a Nuclear or Radiological Emergency (2015) Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS457 Cosponsorship: FAO, ICAO, ILO, IMO, INTERPOL, OECD/NEA, PAHO, CTBTO, UNEP, OCHA, WHO, WMO Supersedes GS-R-2 **Preparedness and Response for a Nuclear or Radiological Emergency (2002)** Ex DS43 Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: FAO, OCHA, OECD/NEA, ILO, PAHO, WHO			

11. Specific Safety Requirements

SSR-1: Site Evaluation for Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSR-1 Site Evaluation for Nuclear Installations (2019) Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS484 Supersedes **NS-R-3 (Rev. 1) Site Evaluation for Nuclear Installations (2016)** Ex DS464 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **NS-R-3 Site Evaluation for Nuclear Installations (2003)** Ex DS305 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes Safety Series Nos. 50-C-S (Rev. 1) & S9			

SSR-2/1: Safety of Nuclear Power Plants: Design

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSR-2/1 (Rev. 1) Safety of Nuclear Power Plants: Design (2016) Ex DS465 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **SSR-2/1: Safety of Nuclear Power Plants: Design (2012)** Ex DS414 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **NS-R-1 Safety of Nuclear Power Plants: Design (2000)** Ex DS181 Published in Chinese, English, French, Russian, Spanish Which superseded Safety Series Nos. 50-C-D (Rev. 1) and D1			

SSR-2/2 Safety of Nuclear Power Plants: Commissioning and Operation

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSR-2/2 (Rev. 1) Safety of Nuclear Power Plants: Commissioning and Operation (2016) Ex DS467 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **SSR-2/2 Safety of Nuclear Power Plants: Commissioning and Operation (2011)** Ex DS413 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes NS-R-2 **Safety of Nuclear Power Plants: Operation (2000)** Ex DS179 Published in Chinese, English, French, Russian, Spanish Which superseded Safety Series No. 50-C-O (Rev. 1)	DS532: Safety of Nuclear Power Plants: Commissioning and Operation, revision of SSR-2/2 (Rev. 1) dpp	Step 5: Preparing the draft S. Morgan	NUSSC, EPReSC, NSGC, RASSC, WASSC

SSR-3: Safety of Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSR-3: Safety of Research Reactors (2016) Published in Arabic, Chinese, English, French, Russian, Spanish Ex DS476 supersedes **NS-R-4 Safety of Research Reactors (2005)** Ex DS272 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes Safety Series Nos. 35-S1 and 35-S2			

SSR-4: Safety of Nuclear Fuel Cycle Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSR-4: Safety of Nuclear Fuel Cycle Facilities (2017) Ex: DS478 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **NS-R-5 (Rev. 1) Safety of Nuclear Fuel Cycle Facilities (2014)** Ex DS439 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **NS-R-5 Safety of Nuclear Fuel Cycle Facilities (2008)** Ex DS316 Published in English			

SSR-5: Disposal of Radioactive Waste (2011)
Published in Arabic, Chinese, English, French, Russian, Spanish
Ex DS354
Supersedes
WS-R-1 Near Surface Disposal of Radioactive Waste (1999) Published in Arabic, Chinese, English, French, Russian, Spanish and **WS-R-4 Geological Disposal of Radioactive Waste (2006)**
Ex DS154
Published in English
Cosponsorship: OECD/NEA.

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSR-6: Regulations for the Safety Transport of Radioactive Material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSR-6 (Rev. 1) Regulations for the Safe Transport of Radioactive Material, 2018 Edition (2018) Ex DS495 Published in Arabic, Chinese, English, French, Russian, Spanish supersedes **SSR-6 Regulations for the Safe Transport of Radioactive Material, 2012 Edition** Ex DS437 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes **TS-R-1 Regulations for the Safe Transport of Radioactive Material (2009 Edition)** Ex DS345 Published in Arabic, Chinese, English, French, Russian, Spanish	**DS543**: Regulations for the Safe Transport of Radioactive Material, 20xx Edition, revision of SSR-6 (Rev. 1) dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS E. Reber	TRANSSC, RASSC, WASSC, NUSSC, EPReSC, NSGC

12. General Safety Guides

1. Establishing a National Safety Infrastructure

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-16 (Rev. 1) Establishing the Safety Infrastructure for a Nuclear Power Programme (2020) Published in Chinese, English, French Ex DS486 supersedes SSG-16 Establishing the Safety Infrastructure for a Nuclear Power Programme (2012) Ex DS424 Published in English, Russian			
SSG-44 Establishing the Infrastructure for Radiation Safety (2018) Published in Chinese, English, French, Spanish Ex DS455 supersedes RS-G-1.4 Building Competence in Radiation Protection and the Safe Use of Radiation Sources (2001) Ex DS73 Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: Int. Labour Office, PAHO, WHO			

2. Regulatory Control of Facilities and Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Modular revision of

- GS-G-1.1 Organization and staffing of the regulatory body for nuclear facility (2002) that will include ‘Management systems for regulatory bodies’ (DS113) as well as guidance on ‘self assessment’. This should address nuclear facilities and activities as well as the control of radiation facilities and radiation sources.

- GS-G-1.2 Review and assessment of nuclear facilities by the regulatory body (2002),

- GS-G-1.3 Regulatory inspection of nuclear facilities and enforcement by the regulatory body (2002)

- GS-G-1.4 Documentation for use in regulating nuclear facilities (2002)

- GS-G-1.5 Regulatory control of radiation sources (2004) incorporating the TECDOCs on ‘Authorization’ and ‘Inspection’. This will also cover the licensing, authorization, notification process for radiation sources and activities

- and WS-G-5.1 Release of sites from regulatory control upon termination of practices (2006)

- reference will also be made to the revision of WS-G-2.3 Regulatory control of radioactive discharges to the environment (DS442)

The revised safety guide will also cover the licensing process for nuclear installations SSG-12.

The guide will also address the content of DS429 on external expert support on safety issues.

GSG-12: Organisation, Management and Staffing of a Regulatory Body for Safety (2018) Ex DS472 Published in Chinese, English, French, Russian, Spanish Supersedes GS-G-1.1 Organization and Staffing of the Regulatory Body for Nuclear Facilities (2002) Ex DS247 Published in Chinese, English, French, Russian, Spanish Supersedes Safety Series No. 50-SG-G1 and GSG-4 Use of External Experts by the Regulatory Body (2013) Ex DS429 Published in English			
GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes GS-G-1.2 Review and Assessment of Nuclear Facilities by the Regulatory Body (2002) Ex DS248 Published in Chinese, English, French, Russian, Spanish Supersedes Safety Series No. 50-SG-G3			
GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes GS-G-1.3 Regulatory Inspection of Nuclear Facilities and Enforcement by the Regulatory Body (2002) Ex DS289 Published in English, Chinese, French, Russian, Spanish Supersedes Safety Series No. 50-SG-G4 (Rev. 1)			
GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes GS-G-1.4 Documentation for Use in Regulating Nuclear Facilities (2002) Ex DS290 Published in English, Chinese, French, Russian, Spanish Supersedes Safety Series Nos. 50-SG-G8 and 50-SG-G9			

GSG-12: Organisation, Management and Staffing of a Regulatory Body for Safety (2018) Ex DS472 Published in Chinese, English, French, Russian, Spanish and GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersede GS-G-1.5 Regulatory Control of Radiation Sources (2004) Ex DS67 Published in Arabic, English, French, Spanish Cosponsorship: FAO, ILO, PAHO, WHO			
GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes partly WS-G-5.1 Release of Sites from Regulatory Control upon the Termination of Practices (2006) Ex DS332 Published in Chinese, English, Russian, Spanish	DS542: Release of Sites from Regulatory Control on Termination of Activities in Planned Exposure Situation, revision of WS-G-5.1 dpp	Step 5: preparing the draft V. Ljubenov	WASSC, RASSC
GSG-12: Organisation, Management and Staffing of a Regulatory Body for Safety (2018) Ex DS472 Published in Chinese, English, French, Russian, Spanish Supersedes GSG-4 Use of External Experts by the Regulatory Body (2013) Ex DS429 Published in English			
GSG-6: Communication and Consultation with Interested Parties by the Regulatory Body (2017) Ex DS460 Published in Chinese, English, French, Russian, Spanish			

New: Regulatory Experience Feedback Management

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS547: Regulatory Experience Feedback Management dpp	STEP 8: Soliciting comments by Member States K. Alm Lytz	NUSSC RASSC, WASSC, TRANSSC, EPReSC NSGC

3. Categorization of Radioactive Sources

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision; if necessary, of RS-G-1.9 Categorization of Radioactive Sources (2005)

RS-G-1.9 Categorization of Radioactive Sources (2005) Ex DS343 Published in Arabic, Chinese, English, French, Russian, Spanish			

4. Application of the Concepts of Exclusion, Exemption and Clearance

NPPs | RRs | FCFs | WDFs | MM | RS | TR

General philosophy and table in RS-G-1.7 (2004) should be incorporated into the BSS. RS-G-1.7. remains

GSG-17 Application of the Concept of Exemption (2023). Ex DS499 Published in English, Spanish And GSG-18 Application of the Concept of Clearance (2023). Ex DS500 Published in English Supersede RS-G-1.7 Application of the Concepts of Exclusion, Exemption and Clearance (2004) Ex DS161 Published in Chinese English, Russian, Spanish			

5. Protection of the Public and the Environment

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Should cover general guidance on optimization and on the use of dose constraints

Should include WS-G-2.3 -Regulatory control of radioactive discharges to the environment (2000)

It should also include DS421 and DS432.

GSG-9 Regulatory Control of Radioactive Discharges to the Environment (2018) Ex DS442 Published in Chinese, English, French, Russian, Spanish Cosponsorship: UN Environment supersedes WS-G-2.3 Regulatory Control of Radioactive Discharges to the Environment (2000) Ex DS25 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes Safety Series No. 77			
SSG-32 Protection of the Public against Exposure Indoors due to Radon and Other Natural Sources of Radiation (2015) Ex DS421 Published in Chinese, English, French, Spanish Cosponsorship: WHO			

GSG-8 Radiation Protection of the Public and the Environment (2018) Ex DS432 Published in Chinese, English, French, Russian, Spanish Cosponsorship: UNEP			
SSG-60 Management of Residues Containing Naturally Occurring Radioactive Material from Uranium Production and other Activities (2021) Ex DS459 Published in Chinese, English Supersedes WS-G-1.2 Management of Radioactive Waste from the Mining and Milling of Ores (2002) Ex DS277 Published in English, Russian, Spanish Supersedes Safety Series No. 85			

6. Application of the Management System for Facilities and Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision of GS-G-3.1, as necessary and incorporation at a later stage of GS-G-3.2 on Management System for Technical Services (2008), GS-G-3.3 on Management System for the Processing, Handling and Storage of Radioactive Waste (2008), GS-G-3.4 on Management System for the Disposal of Radioactive Waste (2008) and of TS-G-1.4 on The Management System for the Safe Transport of Radioactive Material (2008), all recently published.

GS-G-3.1 Application of the Management System for Facilities and Activities. (2006) Ex DS339 Published in English, Russian, Spanish (Supersedes Safety Series 50-SG-Q1 to Q7)	DS513: Leadership, Management and Culture for Safety dpp	STEP 9: Addressing comments by Member States I. Kubanova	NUSSC RASSC WASSC TRANSSC EPReSC NSGC
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in Chinese, English, French, Russian Cosponsorship: ILO Supersedes GS-G-3.2 The Management System for Technical Services in Radiation Safety (2008) Ex DS315 Published in English, French, Russian			

GSG-16 Leadership, Management and Culture for Safety in Radioactive Waste Management (2022) Ex DS477 Published in Chinese, English, Spanish Supersedes GS-G-3.3 The Management System for the Processing, Handling and Storage of Radioactive Waste (2008) Ex DS336 Published in English, Russian and GS-G-3.4 The Management System for the Disposal of Radioactive Waste (2008) Ex DS337 Published in English, Russian			
TS-G-1.4 The Management System for the Safe Transport of Radioactive Material (2008) Ex DS326 Supersedes Safety Series No.113 Published in English, Russian, Spanish	DS530: The Management System for the Safe Transport of Radioactive Material, revision of TS-G-1.4 dpp	Step 5: preparing the draft E. Reber	TRANSSC NSGC

7. Occupational Radiation Protection in Facilities and Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

DS453 to combine and supersede Safety Guides – RS-G-1.1 Occupational Radiation Protection (1999), RS-G-1.2 Assessment of Occupational Exposure Due to Intakes of Radionuclides (1999), RS-G-1.3 Assessment of Occupational Exposure Due to External Sources of Radiation (1999), RS-G-1.6 Occupational Radiation Protection in the Mining and Processing of Raw Materials (2004) and GS-G-3.2 The Management System for Technical Services in Radiation Safety (2008)

GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian, Spanish Cosponsorship: ILO Supersedes RS-G-1.1 Occupational Radiation Protection (1999) Ex DS69 Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: Int. Labour Office			
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO Supersedes RS-G-1.2 Assessment of Occupational Exposure due to Intakes of Radionuclides (1999) Ex DS85 Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: Int. Labour Office			

GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO Supersedes RS-G-1.3 Assessment of Occupational Exposure due to External Sources of Radiation (1999) Ex DS12 Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: Int. Labour Office			
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO Supersedes RS-G-1.6 Occupational Radiation Protection in the Mining and Processing of Raw Materials (2004) Ex DS17 Published in English, Spanish Cosponsorship: ILO Supersedes Safety Series No. 26			
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO Supersedes GS-G-3.2 The Management System for Technical Services in Radiation Safety (2008) Ex DS315 Published in English, French, Russian			
SSG-91 Protection of Workers Against Exposure due to Radon Ex DS519 Published in English Cosponsorship: ILO			

8. Integrated Safety Assessment and Decision Making

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New document. It will include several proposals on safety assessment as well as WS-G-5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material (2008) and the amended content of "old" DS365, according to the agreement of 25 NUSSC.

WS-G-5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material (2008) Ex DS376 Published in Chinese, English, Russian,, Spanish	See project DS555		

9. Environmental and Source Monitoring for Purposes of Radiation Protection

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To revise RS-G-1.8 Environmental and Source Monitoring for Purposes of Radiation Protection (2005)

RS-G-1.8 Environmental and Source Monitoring for Purposes of Radiation Protection (2005) Ex DS62 Published in English, Russian, Spanish	DS505: Radiological Monitoring for Protection of the Public and the Environment, revision of RS-G-1.8 dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS J. Calabria	WASSC, RASSC, NUSSC, EPReSC

10. Criticality Safety for Nuclear Facilities and Activities Handling Fissionable Material

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-27 (Rev. 1) Criticality Safety in the Handling of Fissile Material (2022) Ex DS516 Published in Chinese, English Supersedes SSG-27 Criticality Safety in the Handling of Fissile Material (2014) Ex DS407 Published in English			

11. GSG-1: Classification of Radioactive Waste (2009)

Ex DS390
Published in Chinese, English, French, Russian, Spanish
Supersedes 111-G-1.1 Classification of Radioactive Waste

NPPs | RRs | FCFs | WDFs | MM | RS | TR

11b New Safety Guide National Policies and Strategies for the Safety of Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS526: National Policies and Strategies for the Safety of Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation dpp	STEP 5: Preparing the draft D Bennett	WASSC, EPReSC, RASSC, NUSSC, NSGC

12. Predisposal Management of Radioactive Waste and Safety of Associated Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To combine and supersede Safety Guides WS-G-2.5 Predisposal management of low and intermediate level radioactive waste (2003) WS-G-2.6 Predisposal management of high level radioactive waste (2003) and GS-G-3.3 The Management System for the Processing, Handling and Storage of Radioactive Waste (2008).

In addition, external events for nuclear waste facilities should be considered.

It will also include WS-G-6.1 Storage of Radioactive Waste (2006) and GSG-3 on Safety Case and Safety Assessment for Predisposal Management of Radioactive Waste.

SSG-40: Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors (2016) Ex DS448 Published in Chinese, English, Russian Supersedes WS-G-2.5 Predisposal Management of Low and Intermediate Level Radioactive Waste (2003) Ex DS159 Published in English ,Russian, Spanish			
SSG-41: Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities (2016) Ex DS447 Published in Chinese, English Supersedes WS-G-2.6.Predisposal Management of High Level Radioactive Waste (2003) Ex DS163 Published in English, Russian, Spanish			
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO Supersedes GS-G-3.2 The Management System for Technical Services in Radiation Safety (2008) Ex DS315 Published in English, French, Russian			
WS-G-6.1 Storage of Radioactive Waste (2006) Ex DS292 Published in Chinese, English, Russian, Spanish	DS550: Storage of Radioactive Waste dpp	Step 5: preparing the draft A. Guskov	WASSC, RASSC, EPReSC, NUSSC, NSGC
GSG-3 The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste (2013) Ex DS284 Published in Chinese, English, French, Spanish	DS553: The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, revision of GSG-3 dpp	Step 5: preparing the draft A. Guskov	WASSC, RASSC, EPReSC, NSGC

13. Arrangements for Preparedness for Nuclear or Radiological Emergencies

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision, as necessary of GS-G-2.1 Arrangements for Preparedness for Nuclear or Radiological Emergencies (2006)

It will also include GSG-2 Criteria for Use in Preparedness and Response to a Nuclear or Radiological Emergency

GS-G-2.1 Arrangements for Preparedness for a Nuclear or Radiological Emergency (2007) Ex DS105 Published in English, Russian, Spanish Cosponsorship: FAO, ILO, PAHO, OCHA, WHO (Supersedes Safety Series Nos. 50-SG-G6, 50 SG-O6 and 98)	DS504: Arrangements for Preparedness and Response for a Nuclear or Radiological Emergency, revision of GS-G-2.1 dpp	STEP 9: Addressing comments by Member States M. Assi	EPReSC RASSC, WASSC, TRANSSC, NUSSC, NSGC

GSG-2 Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency (2011) Ex DS44 Published in Arabic, English, French, Russian, Spanish Cosponsorship: FAO, ILO, PAHO, WHO Supersedes SS109 Intervention Criteria in a Nuclear or Radiation Emergency (1994)	DS527: Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency dpp	STEP 8: Soliciting comments by Member States F. Stephani	EPReSC, RASSC, TRANSSC, WASSC, NSGC
	DS534: Protection Strategy for a Nuclear or Radiological Emergency dpp	Step 5: Preparing the draft A. Baciu	All RCs

14. Arrangements for Response to Radiation Emergencies

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Two new safety guides:

GSG-11: Arrangements for the Termination of a Nuclear of Radiological Emergency (2018) Ex DS474 Published in Chinese, English, Russian, Spanish Cosponsorship: FAO, ICAO, ILO, IMO, INTERPOL, OECD/NEA, OCHA, WHO, WMO			
GSG-14: Arrangements for Public Communications in Preparedness and Response for a Nuclear or Radiological Emergency (2020) Ex DS475 Published in Chinese, French, English, Russian, Spanish Cosponsorship: FAO, ICAO, INTERPOL, CTBTO, UNOOSA			

15. Remediation Process for Areas Affected by Past Activities and Accidents

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision, as necessary of WS-G-3.1 Remediation Process for Areas Affected by Past Activities and Accidents (2007)

GSG-15 Remediation Strategy and Process for Areas Affected by Past Activities or Events (2022) Ex DS468 Published in Chinese, English Cosponsorship: FAO, UNDP, UNEP, OCHA Supersedes WS-G-3.1 Remediation Process for Areas affected by Past Activities and Accidents (2007) Ex DS172 Published in English, Spanish			

15a Long Term Post-Remediation Management of Areas Affected by Past Activities or Events

New Safety Guide

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS538: Long Term Post-Remediation Management of Areas Affected by Past Activities or Events dpp	STEP 5: Preparing the draft C. Mommaert	WASSC, RASSC, EPReSC

15b Radiation Protection and Safety in Existing Exposures Situations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS544: Radiation Protection and Safety in Existing Exposure Situations dpp	STEP 5: Preparing the draft O. Guzmán López-Ocón	RASSC, WASSC, EPReSC

15c Management of the interfaces between nuclear and radiation safety and nuclear security

New Safety Guide

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS533/NST067: Management of the interfaces between nuclear and radiation safety and nuclear security dpp	STEP 5: Preparing the draft K. Horvath	NSGC EPReSC NUSSC RASSC, WASSC, TRANSSC

13. Specific Safety Guides

16. Site Survey and Site Selection for Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision of Safety Series 50-SG-S9 (1984).

SSG-35: Site Survey and Site Selection for Nuclear Installations (2015) Ex DS433 Published in Chinese, English, Russian			

17. SSG-21 Volcanic Hazard in Site Evaluation for Nuclear Installations (2012)

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Ex DS405

Published in Chinese, English, Russian

18. SSG-9 (Rev. 1) Seismic Hazards in Site Evaluation for Nuclear Installations (2021)

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-9 (Rev. 1) Seismic Hazards in Site Evaluation for Nuclear Installations (2022) Ex DS507 Published in Chinese, English Supersedes SSG-9 Seismic Hazards in Site Evaluation for Nuclear Installations (2010) Ex DS422 Published in English Supersedes NS-G-3.3 Evaluation of Seismic Hazard for Nuclear Power Plants (2002) Ex DS302 Published in English, Russian which Superseded Safety Series No. 50-SG-S1 (Rev. 1)			

19. SSG-18 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011)

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-18 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011) Ex DS417 Published in Chinese, English, Russian Supersedes NS-G-3.4 Meteorological Events in Site Evaluation for Nuclear Power Plants (2003) Ex DS184 Published in English, Russian Supersedes Safety Series Nos. 50-SG-S11A &-S11B and NS-G-3.5 Flood Hazard for Nuclear Power Plants on Coastal and River Sites (2003) Ex DS280 Published in English, Russian Supersedes Safety Series Nos. 50-SG-S10A & S10B	DS541: Assessment of Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, revision of SSG-18 dpp	STEP 6: First internal review of the draft K. Nagasawa	NUSSC, WASSC

20. Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To supersede NS-G-3.6 Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants (2004)

NS-G-3.6 Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants (2004) Ex DS300 Published in Chinese, English, Russian Supersedes Safety Series No. 50-SG-S8	DS531: Geotechnical Aspects in siting and Design of Nuclear Installations, revision of NS-G-3.6 dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS N. Stoeva	NUSSC WASSC

21. External Human Induced Events in Site Evaluation for Nuclear Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To supersede NS-G-3.1 External Human Induced Events in Site Evaluation for Nuclear Power Plants (2002)

SSG-79 Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations (2023) Ex DS520 Published in Chinese, English Supersedes NS-G-3.1 External Human Induced Events in Site Evaluation for Nuclear Power Plants (2002) Ex DS258 Published in Chinese, English, French, Russian Supersedes Safety Series No. 50-SG-S5			

22. Construction of Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New safety guide

SSG-38: Construction for Nuclear Installations (2015) Ex DS441 Published in Chinese, English, Russian			

23. Design of the Reactor Coolant System and Associated Systems in Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To keep the current safety guide NS-G-1.9, Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants (2004) and to update it as and when it is necessary

SSG-56: Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants (2020) Ex DS481 Published in Chinese, English, Russian Supersedes NS-G-1.9 Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants (2004) Ex DS282 Published in English, Russian, Spanish Supersedes Safety Series Nos. 50-SG-D6 and 50-SG-D13			

24. Design of Reactor Containment Systems and other Buildings for NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-53: Design of the Reactor Containment and Associated Systems for Nuclear Power Plants (2019) Ex DS482 Published in Chinese, English, Russian Supersedes NS-G-1.10 Design of Reactor Containment Systems for Nuclear Power Plants (2004) Ex DS296 Published in English, Russian Supersedes Safety Series No. 50-SG-D12			

25. Design of Auxiliary and Supporting Systems in Nuclear Power Plants

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New safety guide

SSG-62: Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants (2020) Ex DS440 Published in Chinese, English, Russian			

26. Design of Electric Power Systems for Nuclear Power Plants

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New Safety Guide that will replace current Safety Guide NS-G-1.8 Design of emergency power systems for NPPs", (2004), it will expand the scope to include cables, cables trays, etc.

SSG-34: Design of Electrical Power Systems for Nuclear Power Plants (2016) Published in Chinese, English, Russian Ex DS430 Supersedes NS-G-1.8 Design of Emergency Power Systems for Nuclear Power Plants (2004) Ex DS303 Published in English, Russian Supersedes Safety Series No 50-SG-D7 (Rev. 1)			

27. Design of I&C Systems for Nuclear Power Plants

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New safety guide. It will combine and supersede the current 2 safety guides:

- NS-G-1.1 – Software for computer based systems important to safety in NPPs (2000),

- NS-G-1.3 – "Instrumentation and control systems important to safety in NPPs", (2002).

SSG-39: Design of Instrumentation and Control Systems for Nuclear Power Plants (2016) Published in Chinese, English, Russian Ex DS431 Supersedes NS-G-1.1 Software for Computer Based Systems Important to Safety in Nuclear Power Plants (2000) Ex DS264 Published in Chinese, English, French NS-G-1.3 Instrumentation and Control Systems Important to Safety in Nuclear Power Plants (2002) Ex DS252 Published in Chinese, English, French, Russian Supersedes Safety Series Nos. 50-SG-D3 and D8			

27b. Human Factors Engineering in Nuclear Power Plants

New safety guide

SSG-51 Human Factors Engineering in the Design of Nuclear Power Plants (2019) Ex DS492 Published in Chinese, English, Russian			

27c. Equipment Qualification for Nuclear Installations

New Safety Guide

SSG-69 Equipment Qualification for Nuclear Installations (2021) Ex DS514 Published in Chinese, English			

28. Protection against Internal and External Hazards in the Design of Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

The initial idea was to have a new safety guide that would combine and supersede the current 4 safety guides:

- NS-G-1.5 External events excluding earthquakes in the design of NPPs (2003);

- NS-G-1.6 Seismic design and qualification for NPPs (2003);

- NS-G-1.7 Protection against Internal Fires and Explosions in the Design of NPPs;

- NS-G-1.11 Protection against Internal Hazards other than fires and Explosions in the Design of NPPs ; and

But the detailed analysis led to the following proposal in terms of DPPs

SSG-68 Design of Nuclear Installations Against External Events Excluding Earthquakes (2021) Ex DS498 Published in Chinese, English Supersedes NS-G-1.5 External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003) Ex DS301 Published in English, Russian Supersedes Safety Series No. 50-SG-D5 (Rev. 1)			
SSG-67: Seismic Design for Nuclear Installations (2021) Ex DS490 Published in Chinese, English Supersedes NS-G-1.6 Seismic Design and Qualification for Nuclear Power Plants (2003) Ex DS304 Published in English, Russian Supersedes Safety Series No. 50-SG-D15			
SSG-64: Protection against Internal Hazards in the Design of Nuclear Power Plants (2021) Ex DS494 Published in Chinese, English, Russian Supersedes NS-G-1.7 Protection Against Internal Fires and Explosions in the Design of Nuclear Power Plants (2004) Ex DS306 Published in English, Russian Supersedes Safety Series No.50-SG-D2 (Rev. 1) And NS-G-1.11 Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants (2004) Ex DS299 Published in English Supersedes Safety Series No. 50-SG-D4			

29. Design of fuel storage systems in NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-63: Design of Fuel Handling and Storage Systems for Nuclear Power Plants (2020) Ex DS487 Published in Chinese, English, Russian Supersedes NS-G-1.4 Design of Fuel Handling and Storage Systems for Nuclear Power Plants (2003) Ex DS276 Published in English, Russian, Spanish Supersedes Safety Series No. 50-SG-D10			

30. Radiation Protection Aspects for the Design of NPPs

NPPs	RRs	FCFs	WDFs	MM	RS	TR

It will combine and supersede the current documents:

- Safety Guide NS-G-1.13 – "Radiation Protection Aspects, (2005);

- The radiation protection aspect covered in NS-G-2.7 Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002), and include guidance occupational exposure

SSG-90 Radiation Protection Aspects of Design for Nuclear Power Plants (2024) Ex DS524 Published in English Supersedes NS-G-1.13 Radiation Protection Aspects of Design for Nuclear Power Plants (2005) Ex DS313 Published in English, Russian Supersedes Safety Series No. 50-SG-D9 and No. 79			
GSG-7 Occupational Radiation Protection (2018) Ex DS453 Published in English, Russian Cosponsorship: ILO and SSG-40: Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors (2016) Ex DS448 Published in Chinese, English, Russian Supersede NS-G-2.7 Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002) Ex DS187 Published in English, Russian, Spanish Supersedes Safety Series Nos 50-SG-O5 and O11			

31. Radioactive Waste Management Aspects for the Design of NPPs, Research Reactors and Waste Management Systems

NPPs	RRs	FCFs	WDFs	MM	RS	TR

It will combine and supersede the current documents:

- Safety Series No.79 – "Design of radioactive waste management systems at NPPs", (1986) incorporated into NS-G-1.13.

- Waste management related aspects covered by the Safety Guide NS-G-4.6 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2008)

- appropriate parts of WS-G-2.1 Decommissioning of Nuclear Power Plants and Research Reactors

SSG-90 Radiation Protection Aspects of Design for Nuclear Power Plants (2024) Ex DS524 Published in English Supersedes NS-G-1.13 Radiation Protection Aspects of Design for Nuclear Power Plants (2005) Ex DS313 Published in English, Russian Supersedes Safety Series No. 50-SG-D9 and No. 79			
SSG-85 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2023) Ex DS509f Published in Chinese, English Supersedes NS-G-4.6 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2008) Ex DS340 Published in English			
SSG-47 Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities (2018) Ex DS452 Published in Chinese, English, Russian Supersedes both WS-G-2.1 and WS-G-2.4 WS-G-2.1 Decommissioning of Nuclear Power Plants and Research Reactors (1999) Ex DS257 Published in Arabic, Chinese, English, French, Russian Supersedes Safety Series Nos. 74 and 105			

32. Removed. See item 29

33. Design of Reactor Core for NPPs and Core Management

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-52: Design of the Reactor Core for Nuclear Power Plants (2019) Ex DS488 Published in Chinese, English Supersedes NS-G-1.12 Design of the Reactor Core for Nuclear Power Plants (2005) Ex DS283 Published in Chinese, English, Russian Supersedes Safety Series No. 50-SG-D14			

34. Storage of Spent Fuel

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-15 (Rev. 1) Storage of Spent Nuclear Fuel (2020) Published in Chinese, English Ex DS489 Supersedes SSG-15 Storage of Spent Nuclear Fuel (2012) Ex DS371 Published in English, Spanish Superseded 116 Design of Spent Fuel Storage Facilities (1994) 117 Operation of Spent Fuel Storage Facilities (1994) 118 Safety Assessment for Spent Fuel Storage Facilities: A Safety Practice (1995)			

35. Safety Classification of Structures, Systems and Components in Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

DS367: Finalize the guide for NPP and extend to installations in future.

SSG-30 Safety Classification of Structures, Systems and Components in Nuclear Power Plants (2014) Published in Chinese, English, Russian, Spanish Ex DS367			

36. Content of the Safety Analysis Report for Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision of the current GS-G-4.1 Format and Content of the Safety Analysis Report for Nuclear Power Plants (2004) to reflect new developments and a more precise scope.

It will also include the technical part of SSG-12, the process part being in 2

SSG-61: Format and Content of the Safety Analysis Report for Nuclear Power Plants (2021) Ex DS449 Published in Chinese, English, Russian Supersedes GS-G-4.1 Format and Content of the Safety Analysis Report for Nuclear Power Plants (2004) Ex DS309 Published in Chinese, English Supersedes Safety Series No. 50-SG-G2			
GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes GS-G-1.4 Documentation for Use in Regulating Nuclear Facilities (2002) Ex DS290 Published in Chinese, English, French, Russian, Spanish Supersedes Safety Series Nos. 50-SG-G8 and 50-SG-G9			

GSG-13: Functions and Processes of the Regulatory Body for Safety (2018) Ex DS473 Published in Chinese, English, French, Russian, Spanish Supersedes partly SSG-12 Licensing Process for Nuclear Installations (2010) Ex DS416 Published in Chinese, English, Russian, Spanish	DS539: Licensing Process for Nuclear Installations dpp	STEP 8: Soliciting comments by Member States B. Rini	NUSSC, RASSC, TRANSSC, WASSC, EPReSC, NSGC

37. SSG-2 Deterministic Safety Analysis for Nuclear Power Plants (2009)

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-2 (Rev. 1): Deterministic Safety Analysis for Nuclear Power Plants (2019) Ex DS491 Published in Chinese, English, Russian Supersedes SSG-2 Deterministic Safety Analysis for Nuclear Power Plants (2009) Ex DS395 Published in English, Russian, Spanish Supersedes NS-G-1.2 Safety Assessment and Verification for Nuclear Power Plants (2001) Ex DS253 Published in Chinese, English, French, Russian, Spanish Which superseded the Safety Series No. 50-SG-D11			

38. Probabilistic Safety Assessment for NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Combine SSG-3 and SSG-4 and add level 3 PSA.

SSG-3 (Rev. 1) Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (2024) Ex DS523 Published in English Supersedes SSG-3 Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (2010) Ex DS394 Published in Chinese, English, Russian			

SSG-4 Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants (2010) Ex DS393 Published in Chinese, English, Russian	DS528: Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS J. Luis Hernandez	NUSSC

38a. Assessment of the Safety Approach for Design Extension Conditions and Application of the Practical Elimination Concept in the Design of Nuclear Power Plants

New Safety guide

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-88 Design Extension Conditions and the Concept of Practical Elimination in the Design of Nuclear Power Plants (2024) Ex DS508 Published in English			

38b Safety Demonstration of Innovative Technology in Power Reactor Designs

New Safety Guide

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS537: Safety Demonstration of Innovative Technology in Power Reactor Designs dpp	STEP 7: First review of the draft by the RC(s) S. Poghosyan	NUSSC, TRANSSC, WASSC, NSGC

39. Radiological Environmental Impact Analysis for Facilities and Activities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To supersede partly Safety Guide NS-G-3.2 Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for NPPs (2002)

GSG-10 Prospective Radiological Environmental Impact Assessment for Facilities and Activities (2018) Ex DS427 Published in Chinese, English, French, Russian, Spanish Cosponsorship: UNEP			
NS-G-3.2 Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants (2002) Ex DS182 Published in English, Russian Supersedes Safety Series Nos. 50-SG-S3, S4, S6 & S7	DS529: Investigation of Site Characteristics and Evaluation of Radiation Risks to the Public and the Environment in Site Evaluation for Nuclear Installations dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS S. McDuffie	NUSSC, RASSC, WASSC, EPReSC

40. Periodic Safety Review of NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Revision of NS-G-2.10 Periodic Safety Review of Nuclear Power Plants (2003) (SSG-25) would includes LTO

related issues

SSG-25 Periodic Safety Review for Nuclear Power Plants (2013) Ex DS426 Published in Chinese, English, Russian, Spanish Supersedes NS-G-2.10 Periodic Safety Review of Nuclear Power Plants (2003) Ex DS307 Published in English, Russian Supersedes Safety Series No. 50-SG-O12	DS535: Periodic Safety Review for Nuclear Power Plants, revision of SSG-25 dpp	Step 5: preparing the draft M. Gajdos	NUSSC, RASSC, WASSC, EPReSC, NSGC

41. Seismic Evaluation of Existing Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-89 Evaluation of Seismic Safety for Nuclear Installations (2024) Ex DS522 Published in English Supersedes NS-G-2.13 Evaluation of Seismic Safety for Existing Nuclear Installations (2009) Ex DS383 Published in English, Russian			

New 41.a Safety Evaluation of Nuclear Installations for External Events Excluding Earthquakes

NPPs | RRs | FCFs | WDFs | MM | RS | TR

	DS552: Safety Evaluation of Nuclear Installations for External Events Excluding Earthquakes dpp	Step 5: preparing the draft. M. Salmon	NUSSC, WASSC

42. The Management System for Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Finalize document DS349. Draft being published.

Then include the revision of the Safety Guides NS-G-2.4 The operating organization for NPPs (2001), with guidance on operational decision making, management of change and self-assessment.

Also include the revision of the Safety Guide NS-G-2.8 Recruitment, qualification and training of personnel for NPPs (2002), with guidance on knowledge management in the revised guide.

And include the revision of the Safety Guide NS-G-4.5 The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors.

GS-G-3.5 The Management System for Nuclear Installations (2009). Ex DS 349 Published in English, Russian, Spanish Supersedes 50-SG-Q, **Safety Guides Q8-Q14 (1996),** [Q8 Research and Development, Q9 Siting, Q10 Design, Q11 Construction, Q12 Commissioning, Q13 Operation, and Q14 Decommissioning]			
SSG-72 The Operating Organization for Nuclear Power Plants (2022) Ex DS497c Published in Chinese, English Supersedes NS-G-2.4 The Operating Organization for Nuclear Power Plants (2001) Ex DS250 Published in Chinese, English, French, Russian Supersedes Safety Series No. 50-SG-O9			
SSG-75 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2022) Ex DS497f Published in Chinese, English Supersedes NS-G-2.8 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002) Ex DS287 Published in English, Russian Supersedes Safety Series No. 50-SG-O1 (Rev. 1)			
SSG-84 The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors Published in Chinese, English Ex DS509e Supersedes NS-G-4.5 The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors (2008) Ex DS325 Published in English			

43. Commissioning for NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To supersede Safety Guide NS-G-2.9 Commissioning of NPPs (2003)

SSG-28 Commissioning for Nuclear Power Plants (2014) Published in Chinese, English, Russian Ex DS446 Supersedes NS-G-2.9 Commissioning for Nuclear Power Plants (2003) Ex DS291 Published in English Supersedes Safety Series No. 50-SG-O4			

44. Operation of NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Combine and supersede Safety Guides NS-G-2.2 Operational limits and conditions and operating procedures for NPPs (2000), NS-G-2.14 Conduct of Operations at Nuclear Power Plants (2008), NS-G-2.1 Fire safety in operation of NPPs (2000) and SSG-13 Chemistry Programme for Water Cooled Nuclear Power Plants and include guidance on configuration management and on transition from operation to decommissioning.

SSG-76 Conduct of Operations at Nuclear Power Plants (2022) Ex DS497g Published in Chinese, English Supersedes NS-G-2.14 Conduct of Operations at Nuclear Power Plants (2008) Ex DS347 Published in English, Russian, Spanish			
SSG-70 Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2022) Ex DS497a Published in Chinese, English Supersedes NS-G-2.2 Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000) Ex DS185 Published in Chinese, English, French, Russian, Spanish Supersedes Safety Series No. 50-SG-O3			
SSG-13 (Rev. 1): Chemistry Programme for Water Cooled Nuclear Power Plants (2024) Ex DS525 Published in English Supersedes SSG-13 Chemistry Programme for Water Cooled Nuclear Power Plants (2011) Ex DS388 Published in Chinese, English, Russian			
SSG-77 Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants (2022) Ex DS503 Published in Chinese, English, Russian Supersedes NS-G-2.1 Fire Safety in Operation of Nuclear Power Plants (2000) Ex DS263 Published in Chinese, English, French, Russian			
SSG-73 Core Management and Fuel Handling for Nuclear Power Plants (2022) Ex DS497d Published in Chinese, English Supersedes NS-G-2.5 Core Management and Fuel Handling for Nuclear Power Plants (2002) Ex DS297 Published in English, Russian Supersedes Safety Series No. 50-SG-O10			

45. Modification and Maintenance of NPPs

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To supersede Safety Guides NS-G-2.6 Maintenance, surveillance and in-service inspection in NPPs (2002) and NS-G-2.3 Modifications to NPP (2000) and includes NS-G-2.12 Ageing Management for Nuclear Power Plants (2009)

It will also address the issues related to long term operation initially intended to be covered by DS426.

SSG-74 Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants (2022) Ex DS497c Published in Chinese, English Supersedes NS-G-2.6 Maintenance, Surveillance and In-Service Inspection in Nuclear Power Plants (2002) Ex DS273 Published in English, Russian, Spanish Supersedes Safety Series Nos. 50-SG-O2, 50-SG-O7 (Rev. 1) and 50-SG-O8 (Rev. 1)			
SSG-71 Modifications to Nuclear Power Plants (2022) Ex DS497b Published in Chinese, English Supersedes NS-G-2.3 Modifications to Nuclear Power Plants (2001) Ex DS251 Published in Chinese, English, French, Russian Spanish			
SSG-48: Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants (2018) Ex DS485 Published in Chinese, English, Russian Supersedes NS-G-2.12 Ageing Management for Nuclear Power Plants (2009) Ex DS382 Published in English, Russian			

46. Feedback of Operating Experience for Nuclear Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To revise and update Safety Guide NS-G-2.11 A system for feedback of experience from events in nuclear installations (2006), and to include guidance on effective corrective action programme, low level events and near misses, and the analysis of precursors and antecedents of events in the revised safety guide.

SSG-50 Operating Experience Feedback for Nuclear Installations (2018) Ex DS479 Published in Chinese, English, Russian Supersedes NS-G-2.11 A System for the Feedback of Experience from Events in Nuclear Installations (2006) Ex DS288 Published in English, Russian, Spanish Supersedes Safety Series No. 93			

47. On-Site Emergencies for Nuclear Installations

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To cover all aspects of on-site emergencies arising from incidents, accidents and severe accidents. This will revise

NS-G-2.15.

SSG-54 Accident Management Programmes for Nuclear Power Plants (2019) Ex DS483 Published in Chinese, English, Russian Supersedes NS-G-2.15 Severe Accident Management Programmes for Nuclear Power Plants (2009) Ex DS385 Published in English, Russian, Spanish			

48. Commissioning of Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

To revise NS- G-4.1 Commissioning of Research Reactors (2006)

SSG-80 Commissioning of Research Reactors (2023) Ex DS509a Published in Chinese, English Supersedes NS-G-4.1 Commissioning of Research Reactors (2006) Ex DS259 Published in English			

Seismic Design for Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

The revision of NS-G-1.6 applies now to all nuclear installations

SSG-67: Seismic Design for Nuclear Installations (2021) Ex DS490 Published in Chinese, English Supersedes NS-G-1.6 Seismic Design and Qualification for Nuclear Power Plants (2003) Ex DS304 Published in English, Russian Supersedes Safety Series No. 50-SG-D15			

Design for Research Reactors Against External Events Excluding Earthquakes

NPPs | RRs | FCFs | WDFs | MM | RS | TR

The revision of NS-G-1.5 applies now to all nuclear installations

SSG-68 Design of Nuclear Installations Against External Events Excluding Earthquakes (2021) Ex DS498 Published in Chinese, English Supersedes NS-G-1.5 External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003) Ex DS301 Published in English, Russian Supersedes Safety Series No. 50-SG-D5 (Rev. 1)			

Equipment Qualification for Research Reactors

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-69 applies to all nuclear Installations

SSG-69 Equipment Qualification for Nuclear Installations (2021) Ex DS514 Published in Chinese, English			

49. Radiation Protection Aspects for the Design of Research Reactors

NPPs	RRs	FCFs	WDFs	MM	RS	TR

It will combine and supersede the current documents:

- Safety Guide NS-G-1.13 Radiation Protection Aspects of Design for Nuclear Power Plants (2005)

- Radiation protection aspects of NS-G-4.6 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2008)

- and appropriate parts of WS-G-2.1 Decommissioning of Research Reactors.

SSG-90 Radiation Protection Aspects of Design for Nuclear Power Plants (2024) Ex DS524 Published in English Supersedes NS-G-1.13 Radiation Protection Aspects of Design for Nuclear Power Plants (2005) Ex DS313 Published in English, Russian Supersedes Safety Series No. 50-SG-D9 and No. 79			
SSG-85 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2023) Ex DS509f Published in Chinese, English Supersedes NS-G-4.6 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2008) Ex DS340 Published in English			

SSG-47: Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities (2018) Ex DS452 Published in Chinese, English, Russian Supersedes both WS-G-2.1 and WS-G-2.4 WS-G-2.1 Decommissioning of Nuclear Power Plants and Research Reactors (1999) Ex DS257 Published in Arabic, Chinese, English, French, Russian Supersedes Safety Series Nos. 74 and 105			

50. Safety in the Utilization (Experiments) and Modification of Research Reactors

NPPs | **RRs** | FCFs | WDFs | MM | RS | TR

SSG-24 (Rev. 1) Safety in the Utilization and Modification of Research Reactors (2012) Ex DS510B Published in Chinese, English supersedes SSG-24 Safety in the Utilization and Modification of Research Reactors (2012) Ex DS397 Published in English supersedes 35-G2 Safety in the Utilization and Modification of Research Reactors (1994)			

51. Maintenance of Research Reactors

NPPs | **RRs** | FCFs | WDFs | MM | RS | TR

Combine and supersede Safety Guides SSG-10 Ageing Management for Research Reactors (2010) and NS-G-4.2 Maintenance, Periodic Testing and Inspections of Research. (2006)

It will also reflect ageing management and maintenance

SSG-10 (Rev. 1) Ageing Management for Research Reactors (2023) Ex DS509g Published in Chinese, English Supersedes SSG-10 Ageing Management for Research Reactors (2010) Ex DS412 Published in English			
SSG-81 Maintenance, Periodic Testing and Inspections of Research Reactors (2023) Ex DS509b Published in Chinese, English Supersedes NS-G-4.2 Maintenance, Periodic Testing and Inspections of Research Reactors (2006) Ex DS260 Published in English			

52. The Use of a Graded Approach for Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Finalize document DS351.

Either a guide with large scope or to be included in each individual guide (policy decision needed)

SSG-22 (Rev .1) Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors (2023) Ex DS511 Published in Chinese, English Supersedes SSG-22 Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors (2012) Ex DS351 Published in English			

53. Licensing Documentation for Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

Combine and supersede Safety Guides NS-G-4.4 Operational Limits and Conditions and Operating Procedures for Research Reactors (2008), DS396 Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report.

SSG-20 (Rev .1) Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report (2012) Ex DS510A Published in Chinese, English Supersedes SSG-20 Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report (2012) Ex DS396 Published in English Supersedes 35-G1 Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report (1994)			
SSG-83 Operational Limits and Conditions and Operating Procedures for Research Reactors (2023) Ex DS509d Published in Chinese, English Supersedes NS-G-4.4 Operational Limits and Conditions and Operating Procedures for Research Reactors (2008) Ex DS261 Published in English			

54. Instrumentation and Control and Software Important to Safety for Research Reactors

NPPs | RRs | FCFs | WDFs | MM | RS | TR

New safety guide

SSG-37 (Rev. 1) Instrumentation and Control Systems and Software Important to Safety for Research Reactors (2023) Ex DS509h Published in Chinese, English Supersedes SSG-37: Instrumentation and Control Systems and Software Important to Safety for Research Reactors (2015) Ex DS436 Published in English			

55. Core Management and Fuel Handling for Research Reactors

NPPs | **RRs** | FCFs | WDFs | MM | RS | TR

To revise Safety Guide NS-G-4.3 Core management and fuel handling for research reactors. (2008)

SSG-82 Core Management and Fuel Handling for Research Reactors (2023) Ex DS509c Published in Chinese, English Supersedes NS-G-4.3 Core Management and Fuel Handling for Research Reactors (2008) Ex DS350 Published in English			

56. Safety of Uranium and MOX Fuel Fabrication Facilities

NPPs | RRs | **FCFs** | WDFs | MM | RS | TR

Combine SSG-6 and SSG-7, including decommissioning aspects.

SSG-6 (Rev. 1) Safety of Uranium Fuel Fabrication Facilities (2023) Ex DS3517b Published in Chinese, English, Spanish Supersedes SSG-6 Safety of Uranium Fuel Fabrication Facilities (2010) Ex DS317 Published in English			
SSG-7 (Rev. 1) Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities (2023) Ex DS517c Published in Chinese, English Supersedes SSG-7 Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities Ex DS318 Published in English			

57. SSG-5 Safety of Conversion Facilities and Uranium Enrichment Facilities

NPPs | RRs | **FCFs** | WDFs | MM | RS | TR

SSG-5 (Rev. 1) Safety of Conversion Facilities and Uranium Enrichment Facilities (2023) Ex DS517a Published in Chinese, English Supersedes SSG-5 Safety of Conversion Facilities and Uranium Enrichment Facilities (2010) Ex DS344 Published in English			

58. Safety of Reprocessing Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-42 Safety of Nuclear Fuel Reprocessing Facilities (2017) Ex DS360 Published in Chinese, English	DS518a: Revision of SSG-42 on Safety of Nuclear Fuel Reprocessing Facilities and SSG-43 on Safety of Nuclear Fuel Cycle Research and Development Facilities dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS L. Valiveti	NUSSC, RASSC, WASSC, EPReSC and NSGC

59. Safety of Fuel Cycle Research and Development Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

SSG-43 Safety of Nuclear Fuel Cycle Research and Development Facilities (2017) Ex DS381 Published in Chinese, English	DS518b: Revision of SSG-42 on Safety of Nuclear Fuel Reprocessing Facilities and SSG-43 on Safety of Nuclear Fuel Cycle Research and Development Facilities dpp	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS L. Valiveti	NUSSC, RASSC, WASSC, EPReSC and NSGC

Seismic Design for Fuel Cycle Facilities

NPPs | RRs | FCFs | WDFs | MM | RS | TR

The revision of NS-G-1.6 applies now to all nuclear installations

SSG-67: Seismic Design for Nuclear Installations (2021) Ex DS490 Published in Chinese, English Supersedes NS-G-1.6 Seismic Design and Qualification for Nuclear Power Plants (2003) Ex DS304 Published in English, Russian Supersedes Safety Series No. 50-SG-D15			

Design for Fuel Cycle Facilities Against External Events Excluding Earthquakes

NPPs | RRs | FCFs | WDFs | MM | RS | TR

The revision of NS-G-1.5 applies now to all nuclear installations

SSG-68 Design of Nuclear Installations Against External Events Excluding Earthquakes (2021) Ex DS498 Published in Chinese, English Supersedes NS-G-1.5 External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003) Ex DS301 Published in English, Russian Supersedes Safety Series No. 50-SG-D5 (Rev. 1)			

Equipment Qualification for Fuel Cycle Facilities

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-69 applies to all nuclear Installations

SSG-69 Equipment Qualification for Nuclear Installations (2021) Ex DS514 Published in Chinese, English			

60. Decommissioning of Nuclear Installations

NPPs	RRs	FCFs	WDFs	MM	RS	TR

To combine and supersede Safety Guides DS402 on Decommissioning of Nuclear Power Plants and Research Reactors (to supersede WS-G-2.1 (1999)) and DS404 on Decommissioning of Nuclear Fuel Cycle Facilities (to supersede WS-G-2.4 (1999))

SSG-47 Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities (2018) Ex DS452 Published in Chinese, English, Russian Supersedes both WS-G-2.1 and WS-G-2.4 WS-G-2.1 Decommissioning of Nuclear Power Plants and Research Reactors (1999) Ex DS257 Published in Arabic, Chinese, English, French, Russian Supersedes Safety Series Nos. 74 and 105 WS-G-2.4 Decommissioning of Nuclear Fuel Cycle Facilities (2001) Ex DS171 Published in Chinese, English, French, Russian, Spanish			

61. Decommissioning of Facilities Using NORM

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Initially proposed as a new safety guide. RASSC30&WASSC31 meetings decided not to develop this safety guide but to add a related chapter to a relevant document under development (Rev of WS-G.1.2). See DS459.

61.b Decommissioning of Uranium Production Facilities

NPPs | RRs | **FCFs** | WDFs | MM | RS | TR

	DS551: Decommissioning of Uranium Production Facilities dpp	Step 5: preparing the draft Z. Fan	WASSC, RASSC, EPReSC, NUSSC

62. Near Surface Disposal of Radioactive Waste

NPPs | RRs | FCFs | **WDFs** | MM | RS | TR

Finalize the draft DS356. Later, it will incorporate DS357 and DS355

SSG-29 Near Surface Disposal Facilities for Radioactive Waste (2014) Published in Chinese, English, Russian Ex DS356 Supersedes 111-G-3.1 Siting of Near Surface Disposal Facilities (1994)			
SSG-31 Monitoring and Surveillance of Radioactive Waste Disposal Facilities (2014) Published in Chinese, English, Russian Ex DS357			
SSG-23 The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (2012) Published in Chinese, English, Russian Ex DS355 supersedes WS-G-1.1 Safety Assessment for Near Surface Disposal of Radioactive Waste (1999) Published in Arabic, Chinese, English, French, Russian, Spanish			

63. Geological Disposal of Radioactive Waste

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG14 will later incorporate DS357 and DS355

SSG-14 Geological Disposal Facilities for Radioactive Waste (2011) Published in Chinese, English, Russian Ex DS334 Supersedes 111-G-4.1 Siting of Geological Disposal Facilities (1994)			
SSG-31 Monitoring and Surveillance of Radioactive Waste Disposal Facilities (2014) Published in Chinese, English, Russian Ex DS357			
SSG-23 The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (2012) Published in Chinese, English, Russian Ex DS355 supersedes WS-G-1.1 Safety Assessment for Near Surface Disposal of Radioactive Waste (1999) Published in Arabic, Chinese, English, French, Russian, Spanish			

64. Boreholes Disposal of Radioactive Waste

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-1 (Rev. 1) Borehole Disposal Facilities for Disused Sealed Radioactive Sources (2024) Published in English Ex DS512 supersedes SSG-1 Borehole Disposal Facilities for Radioactive Waste (2009) Published in Chinese, English Ex DS335			
SSG-31 Monitoring and Surveillance of Radioactive Waste Disposal Facilities (2014) Published in Chinese, English, Russian Ex DS357			
SSG-23 The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (2012) Published in Chinese, English, Russian Ex DS355 supersedes WS-G-1.1 Safety Assessment for Near Surface Disposal of Radioactive Waste (1999) Published in Arabic, Chinese, English, French, Russian, Spanish			

65. Disposal of Radioactive Ores

NPPs	RRs	FCFs	WDFs	MM	RS	TR

New guide to deal with long-term exposure issues. Long-term exposure not addressed in 5 on protection of the

Public. . It will also incorporate DS357 and DS355

SSG-31 Monitoring and Surveillance of Radioactive Waste Disposal Facilities (2014) Published in Chinese, English, Russian Ex DS357			
SSG-23 The Safety Case and Safety Assessment for the Disposal of Radioactive Waste (2012) Published in Chinese, English, Russian Ex DS355 supersedes WS-G-1.1 Safety Assessment for Near Surface Disposal of Radioactive Waste (1999) Published in Arabic, Chinese, English, French, Russian, Spanish			

66. Management of Waste from the Use of Radioactive Material in Medicine, Industry, Research, Agriculture and Education

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Revision of WS-G-2.7 Management of Waste from the Use of Radioactive Materials in Medicine, Industry, Agriculture, Research and Education (2005)

SSG-45: Predisposal Management of Waste from the Use of Radioactive Materials in Medicine, Industry, Research, Agriculture and Education (2019) Ex DS454 Published in Chinese, English supersedes WS-G-2.7 Management of Waste from the Use of Radioactive Materials in Medicine, Industry, Agriculture, Research and Education (2005) Ex DS160 Published in Chinese English, Russian, Spanish			

67. Justification of Practices (scope to be precised in the title)

NPPs	RRs	FCFs	WDFs	MM	RS	TR

GSG-5 Justification of Practices, Including Non-Medical Human Imaging (2014) Ex DS401 Published in Chinese, English, French, Spanish			

68. Medical Uses of Ionizing Radiation

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Finalize DS399 to supersede RS-G-1.5.Radiological protection for medical exposure to Ionizing radiation (2002). The issues related to the public exposures resulting from medical application could be addressed here or in a new specific safety guide.

SSG-46 Radiation Protection and Safety in Medical Uses of Ionizing Radiation (2018) Ex DS399 Published in Chinese, English, French, Russian, Spanish Cosponsorship: ILO, PAHO, WHO supersedes RS-G-1.5 Radiological Protection for Medical Exposure to Ionizing Radiation (2002) Ex DS22 Published in Chinese, English, French, Russian, Spanish Cosponsorship: ILO, PAHO & WHO			

69. SSG-8 Radiation Safety of Gamma, Electron and X ray Irradiation Facilities (2010)

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-8 Radiation Safety of Gamma, Electron and X ray Irradiation Facilities (2010) Ex DS409 Published in Chinese, English, Spanish Supersedes SS 107 Radiation Safety of Gamma and Electron Irradiation Facilities (1992)	DS545: Radiation Safety of Gamma, X Ray and Electron Beam Irradiation Facilities, revision of SSG-8 dpp	Step 5 Preparing the draft H. Pappinisseri	RASSC, WASSC, TRANSSC, EPReSC, NSGC

70. Radiation Generators and Sealed Radioactive Sources

NPPs	RRs	FCFs	WDFs	MM	RS	TR

RS-G-1.10 Safety of Radiation Generators and Sealed Radioactive Sources (2006) Ex DS114 Published in English, French, Spanish Declared as superseded at CSS 55 in May 2024. See here			

71. SSG-11 Radiation Safety in Industrial Radiography (2011)

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-11 Radiation Safety in Industrial Radiography (2011) Ex DS408 Published in Arabic, Chinese, English, French, Spanish	DS540: Radiation Safety for Industrial Radiography dpp	Step 5 Preparing the draft M. Cervera	RASSC, WASSC, TRANSSC, EPReSC, NSGC

72. Radioisotope Production Facilities

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-59: Radiation Safety of Accelerator Based Radioisotope Production Facilities (2020) Ex DS434 Published in Chinese, English, Russian			

73. Well Logging

NPPs | RRs | FCFs | WDFs | MM | **RS** | TR

SSG-57: Radiation Safety in Well Logging (2020) Ex DS419 Published in Chinese, English, French, Spanish			

74. Nuclear Gauges

NPPs | RRs | FCFs | WDFs | MM | **RS** | TR

SSG-58 Radiation Safety in the use of Nuclear Gauges (2020) Ex DS420 Published in Chinese, English			

75. X-ray Generators and Sources Used for Inspection Purposes

NPPs | RRs | FCFs | WDFs | MM | **RS** | TR

New Safety Guide

SSG-55: Radiation Safety of X-ray Generators and other Radiation Sources Used for Inspection Purposes and for Non-Medical Human Imaging (2020) Ex: DS471 Published in Chinese, English, Russian			

75b- (Not initially planned) Radiation Safety and Regulatory Control for Consumer Products

NPPs | RRs | FCFs | WDFs | MM | **RS** | TR

New Safety Guide

SSG-36: Radiation Safety for Consumer Products (2016) Ex: DS458 Published in Chinese, English Cosponsorship: OECD/NEA			

76. Radiation Sources in Research and Education

NPPs | RRs | FCFs | WDFs | MM | **RS** | TR

New Safety Guide

SSG-87 Radiation Safety in the Use of Radiation Sources in Research and Education Ex DS470 Published in English			

77. Decommissioning of Medical, Industrial, Research, Agriculture and Education Facilities

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Finalize DS403 to revise WS-G-2.2 Decommissioning of Medical, Industrial and Research Facilities (1999)

SSG-49 Decommissioning of Medical, Industrial and Research Facilities (2019) Ex DS403 Published in Chinese, English Supersedes WS-G-2.2 Decommissioning of Medical, Industrial and Research Facilities (1999) Ex DS173 Published in Arabic, Chinese, English, French, Russian, Spanish			

78. Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Next revision of TS-G-1.1 (rev.1), DS425

SSG-26 (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition), IAEA Safety Standards Series No. SSG-26 (Rev. 1), IAEA, Vienna (2022) Ex DS496 Published in English, Spanish Supersedes SSG-26 Advisory Material for the IAEA Regulations for the Safety Transport of Radioactive Material, 2012 Edition (2014) Ex DS425 Published in English, Spanish Supersedes TS-G-1.1 (Rev.1) Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2008) Ex DS346 Published in English, Spanish Supersedes TS-G-1.1 (2002) and previous Safety Series Nos. 7 and 37	DS554: Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (20XX Edition) SSG-26 (Rev. 2), revision of SSG-26 (Rev. 1) dpp	Step 5: preparing the draft. E. Reber	TRANSSC, RASSC, WASSC, NUSSC, EPReSC, NSGC

79. Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

SSG-33 (Rev. 1) Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition) (2021) Ex DS506 Published in Chinese, English SSG-33 Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition) (2015) Ex DS461 Published in English TS-G-1.6 (Rev.1): Schedule of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2009 Edition) (addendum and revision of TS-G-1.6) 2014 EX DS451 Published in English TS-G-1.6 Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2005 Edition) Ex DS387 Published in English, Spanish			

80. Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Revision of TS-G-1.2 Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material (2002) may be carried out on a modular basis

SSG-65 Preparedness and Response for a Nuclear or Radiological Emergency Involving the Transport of Radioactive Material (2022) Ex DS469 Published in Chinese, English, Russian Cosponsorship: ICAO, IMO Supersedes TS-G-1.2 Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material (2002) Ex DS246 Published in English, Russian, Spanish Supersedes Safety Series No. 87			

81. Radiation Protection Programme for the Safe Transport of Radioactive Material

NPPs	RRs	FCFs	WDFs	MM	RS	TR

Revision of TS-G-1.3 Radiation Protection Programmes for Transport Radioactive Material (2007)

SSG-86 Radiation Protection Programmes for Transport Radioactive Material (2023) Ex DS521 Published in English Supersedes TS-G-1.3 Radiation Protection Programmes for Transport Radioactive Material (2007) Ex DS377 Published in English, Spanish			

82. Compliance Assurance for the Safe Transport of Radioactive Material

SSG-78: Compliance Assurance for the Safe Transport of Radioactive Material (2023) Ex DS515 Published in Chinese, English Supersedes TS-G-1.5 Compliance Assurance for the Safe Transport of Radioactive Material (2009) Ex DS327 Published in English, Spanish Supersedes Safety Series No.112			
SSG-66: INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Package Design Safety Report for the Transport of Radioactive Material, IAEA Safety Standards Series No. SSG-66, IAEA, Vienna (2022) Ex DS493 Published in Chinese, English			
	DS546: Ageing Management and Maintenance of Radioactive Material Transport Packages dpp	STEP 9: Addressing comments by Member States A. Bujnova	TRANSSC, WASSC, RASSC, NUSSC

Other standards, not maintained for the reference list for the long term:

Established IAEA Safety Standards	Safety Standards in Preparation Working ID - Title	Remarks / Status / Technical Officer/ Expected date of publication	Committee
SSG-19 National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources (2011) Ex DS410 Published in Arabic, Chinese, English, French, Spanish			
SSG-17 Control of Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries (2012) Ex DS411 Published in Arabic, Chinese, English, French, Spanish	DS549: Control of Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries dpp	Step 5: preparing the draft T. Hailu	RASSC, WASSC, EPReSC, NSGC

14. Projects

DS555: Safety Guide on Safety Assessment for the Decommissioning of Facilities, Revision of WS-G-5.2, Step 4, Duriem Calderin, WASSC, NUSSC, RASSC
DS556: Safety Guide on the Safe Use of Unsealed Sources, Step 4, Jovica Bosnjak, RASSC, TRANSSC, WASSC, EPReSC, NSGC
DS557: Safety Requirements on Site Evaluation for Nuclear Installations, Step 3, Paolo Contri, NUSSC, EPReSC, RASSC, TRANSSC, WASSC, NSGC

INFORMATION ON THE STATUS OF THE NUCLEAR SECURITY SERIES

General information on the IAEA Nuclear Security Series is available at:
https://www.iaea.org/resources/nuclear-security-series

Nuclear Security Fundamentals

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Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 20: INTERNATIONAL ATOMIC ENERGY AGENCY, Objective and Essential Elements of a State's Nuclear Security Regime, IAEA Nuclear Security Series No. 20, IAEA, Vienna (2013). Published in Arabic, Chinese, English, French, Russian, Spanish	NST072 (NSS No. 20, Revision 1), Step 4, Katerina Kouts, all RCs		All RCs

Nuclear Security Recommendations

Nuclear Material and Nuclear Facilities

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 13: INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2011). Published in Arabic, Chinese, English, French, Russian, Spanish	NST073 (INFCIRC/225/Revision 6) (NSS No. 13, Revision 1), Step 4, Nilgun Gerceker		All RCs

Radioactive Material and Associated Facilities

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 14: INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Radioactive Material and Associated Facilities, IAEA Nuclear Security Series No. 14, IAEA, Vienna (2011). Published in Arabic, Chinese, English, French, Russian, Spanish	NST074 (NSS No. 14, Revision 1), Step 4, Muhammad Waseem		All RCs

Nuclear and Other Radioactive Material out of Regulatory Control

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 15: EUROPEAN POLICE OFFICE, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL CRIMINAL POLICE ORGANIZATION–INTERPOL, UNITED NATIONS INTERREGIONAL CRIME AND JUSTICE RESEARCH INSTITUTE, UNITED NATIONS OFFICE ON DRUGS AND CRIME, WORLD CUSTOMS ORGANIZATION, Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 15, IAEA, Vienna (2011). Published in Arabic, Chinese, English, French, Russian, Spanish Cosponsorship: EUROPOL, ICAO, INTERPOL, UNICRI, UNODC, WCO	NST075 (NSS No. 15, Revision 1), Step 4, Elena Paladi		All RCs

National Infrastructure for Nuclear Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 19: INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Nuclear Security Infrastructure for a Nuclear Power Programme, IAEA Nuclear Security Series No. 19, IAEA, Vienna (2013). Ex NST010 Published in Arabic, Chinese, English, French, Russian, Spanish			

National Regulatory Framework for Nuclear Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 29-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Developing Regulations and Associated Administrative Measures for Nuclear Security, IAEA Nuclear Security Series No. 29-G, IAEA, Vienna (2018). Ex NST002 Published in Arabic, Chinese, English, French, Russian, Spanish			

Nuclear Security Culture

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 7: INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Culture, IAEA Nuclear Security Series No. 7, IAEA, Vienna (2008). Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 28-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Self-assessment of Nuclear Security Culture in Facilities and Activities, IAEA Nuclear Security Series No. 28-T, IAEA, Vienna (2017). Ex NST026 Published in Arabic, English, French, Russian, Spanish			
NSS No. 38-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Enhancing Nuclear Security Culture in Organizations Associated with Nuclear and Other Radioactive Material, IAEA Nuclear Security Series No. 38-T, IAEA, Vienna (2021). Ex NST027 Published in English, French, Spanish			

Safety-Security Interface

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
	DS533/NST067: Management of the interfaces between nuclear and radiation safety and nuclear security	STEP 5: Preparing the draft K. Horvath	

Trustworthiness

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
	NST065: Establishment and Implementation of a Trustworthiness Programme in Nuclear Security	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS N Gerceker	

Threat Assessment

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 10-G (Rev. 1) INTERNATIONAL ATOMIC ENERGY AGENCY, National Nuclear Security Threat Assessment, Design Basis Threats and Representative Threat Statements, IAEA Nuclear Security Series No. 10-G (Rev. 1), IAEA, Vienna (2021). Ex NST058 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes NSS No. 10: INTERNATIONAL ATOMIC ENERGY AGENCY, Development, Use and Maintenance of the Design Basis Threat, IAEA Nuclear Security Series No. 10, IAEA, Vienna (2009). Published in Arabic, Chinese, English, French			
NSS No. 24-G: INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CRIMINAL POLICE ORGANIZATION–INTERPOL, Risk Informed Approach for Nuclear Security Measures for Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 24-G, IAEA, Vienna (2015).			

Ex NST007 Published in Arabic, Chinese, English, French, Russian Spanish Cosponsorship: INTERPOL			

Physical Protection of Nuclear Material and Nuclear Facilities

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 27-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Physical Protection of Nuclear Material and Nuclear Facilities (Implementation of INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 27-G, IAEA, Vienna (2018). Ex NST023 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 40-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Handbook on the Design of Physical Protection Systems for Nuclear Material and Nuclear Facilities, IAEA Nuclear Security Series No. 40-T, IAEA, Vienna (2021). Ex NST055 Published in Arabic, French, English, Spanish			
	NST071 Concepts and Application of Security by Design	Step 5	
	NST029: Evaluation of Physical Protection Systems at Nuclear Facilities	STEP 14: Publication of the nuclear security guidance G. Bultz	NSGC
	NST068 Regulatory Inspection and Enforcement During the Lifetime of a Nuclear Facility	Step 5	NSGC
NSS No. 48-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Identification and Categorization of Sabotage Targets, and Identification of Vital Areas at Nuclear Facilities, IAEA Nuclear Security Series No. 48-T, IAEA, Vienna (2024) Ex NST063 Published in English supersedes NSS No. 4: INTERNATIONAL ATOMIC ENERGY AGENCY, Engineering Safety Aspects of the Protection of Nuclear Power Plants against Sabotage, IAEA Nuclear Security Series No. 4, IAEA, Vienna (2007). Published in Chinese, English			
And supersedes NSS No. 16: INTERNATIONAL ATOMIC ENERGY AGENCY, Identification of Vital Areas at Nuclear Facilities, IAEA Nuclear Security Series No. 16, IAEA, Vienna (2012).			

Published in English, French, Russian			
NSS No. 35-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Security during the Lifetime of a Nuclear Facility, IAEA Nuclear Security Series No. 35-G, IAEA, Vienna (2019). Ex NST051 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 45-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Regulatory Authorization and Related Inspection for Nuclear Security During the Lifetime of a Nuclear Facility, IAEA Nuclear Security Series No. 45-T, IAEA, Vienna (2024) Ex NST060 Published in English			

Nuclear Material Accounting and Control for Nuclear Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 25-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Use of Nuclear Material Accounting and Control for Nuclear Security Purposes at Facilities, IAEA Nuclear Security Series No. 25-G, IAEA, Vienna (2015). Ex NST021 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 32-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing a System for Control of Nuclear Material for Nuclear Security Purposes at a Facility during Use, Storage and Movement, IAEA Nuclear Security Series No. 32-T, IAEA, Vienna (2019). Ex NST033 Published in English, French, Russian, Spanish			

Security of Radioactive Material and Associated Facilities

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 11-G (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Security of Radioactive Material in Use and Storage and of Associated Facilities, IAEA Nuclear Security Series No. 11-G (Rev. 1), IAEA, Vienna (2019). Ex NST048 Published in Arabic, Chinese, English, French, Russian, Spanish Supersedes NSS No. 11: Security of Radioactive Sources (2009)			

Published in Arabic, Chinese, English, French, Spanish			
NSS No. 43-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Security Management of Radioactive Material in Use and Storage and of Associated Facilities, Nuclear Security Series, IAEA, Vienna (2022). Ex NST024 Published in English, French, Spanish			

Information and Computer Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 23-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Security of Nuclear Information, IAEA Nuclear Security Series No. 23-G, IAEA, Vienna (2015). Ex NST022 Published in Arabic, Chinese, English, French, Russian, Spanish	NST070 Information Security for Nuclear Security	STEP 10: Second internal review of the draft M. Hewes	
NSS No. 42-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Computer Security for Nuclear Security, IAEA Nuclear Security Series No. 42-G, IAEA, Vienna (2021). Ex NST045 Published in Arabic, Chinese, English, French, Spanish			
NSS No. 17-T (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Computer Security Techniques for Nuclear Facilities, IAEA Nuclear Security Series No. 17-T (Rev. 1), IAEA, Vienna (2021). Ex NST047 Published in Arabic, English, French, Spanish			
NSS No. 33-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Computer Security of Instrumentation and Control Systems at Nuclear Facilities, IAEA Nuclear Security Series No. 33-T, IAEA, Vienna (2018). Ex NST036 Published in English, French, Russian, Spanish The three documents NSS No. 42-G, NSS N). 17-T (Rev. 1) and NSS No. 33-T supersede NSS No. 17: INTERNATIONAL ATOMIC ENERGY AGENCY, Computer Security at Nuclear Facilities, IAEA Nuclear Security Series No. 17, IAEA, Vienna (2011). Published in Arabic, Chinese, English, French, Russian, Spanish			

Insider Threats

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 8-G (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Preventive and Protective Measures Against Insider Threats, IAEA Nuclear Security Series No. 8-G (Rev. 1), IAEA, Vienna (2020). Ex: NST041 Published in Arabic, English, French, Russian, Spanish Supersedes NSS No. 8: **Preventive and Protective Measures against Insider Threats (2008)** Published in Chinese, English, French, Russian			

Nuclear and Other Radioactive Material out of Regulatory Control

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 36-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Preventive Measures for Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 36-G, IAEA, Vienna (2019). Ex: NST011 Published in Arabic, Chinese, English, French, Russian Spanish			
NSS No. 18: INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Systems and Measures for Major Public Events, IAEA Nuclear Security Series No. 18, IAEA, Vienna (2012). Published in Arabic, Chinese, English, French, Russian, Spanish	NST069: Nuclear Security Systems and Measures for Major Public Events	STEP 5: Preparing the draft	
NSS No. 6: EUROPEAN POLICE OFFICE, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL POLICE ORGANIZATION, WORLD CUSTOMS ORGANIZATION, Combating Illicit Trafficking in Nuclear and Other Radioactive Material, IAEA Nuclear Security Series No. 6, IAEA, Vienna (2007). Published in Chinese, English Cosponsorship: EUROPOL, INTERPOL, WCO			
NSS No. 34-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Planning and Organizing Nuclear Security Systems and Measures for Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 34-T, IAEA, Vienna (2019). Ex NST042 Published in English, Russian			
NSS No. 41-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Preparation, Conduct and Evaluation of Exercises for			

Detection of and Response to Acts Involving Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 41-T, IAEA, Vienna (2020). Ex NST050 Published in Arabic, English, French, Spanish			

Detection of Material out of Regulatory Control

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 21: INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Systems and Measures for the Detection of Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 21, IAEA, Vienna (2013). Ex NST012 Published in Arabic, Chinese, English, French, Russian Spanish			
NSS No. 44-T: Detection at State Borders of Nuclear and Other Radioactive Material out of Regulatory Control (2023) Ex NST016 Published in Arabic, English, French Cosponsorship: ICPO-INTERPOL, UNICRI, UNOCT, UNODC, WCO And NSS No. 47-T: Detection in a State's Interior of Nuclear and Other Radioactive Material out of Regulatory Control (2024) Ex NST061 Published in Arabic, English Cosponsorship: EUROPOL, ICPO-INTERPOL, UNICRI, UNOCT, UNODC Supersede NSS No. 3: INTERNATIONAL ATOMIC ENERGY AGENCY, UNIVERSAL POSTAL UNION, WORLD CUSTOMS ORGANIZATION, Monitoring for Radioactive Material in International Mail Transported by Public Postal Operators, IAEA Nuclear Security Series No. 3, IAEA, Vienna (2006). Published in Chinese, English, Russian Cosponsorship: UPU, WCO			

NSS No. 1: INTERNATIONAL ATOMIC ENERGY AGENCY, Technical and Functional Specifications for Border Monitoring Equipment, IAEA Nuclear Security Series No. 1, IAEA, Vienna (2006). Published in English – available on request	NST059: Functional Specifications for Border Monitoring Equipment	STEP 5: Preparing the draft C. Massey	NSGC
NSS No. 5: INTERNATIONAL ATOMIC ENERGY AGENCY, Identification of Radioactive Sources and Devices, IAEA Nuclear Security Series No. 5, IAEA, Vienna (2007). Published in Chinese, English, French, Russian, Spanish			
	NST062: Expert Support for the Assessment of Alarms and Alerts for Nuclear and Other Radioactive Material out of Regulatory Control	STEP 12a: Submission to /endorsement by the Publications Committee STEP 12b1: Submission to /approval by the CSS M. Mohamed	NSGC

Response to Nuclear Security Events

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 37-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Developing a National Framework for Managing the Response to Nuclear Security Events, IAEA Nuclear Security Series No. 37-G, IAEA, Vienna (2019). Ex NST004 Published in Arabic, Chinese, English, French, Russian, Spanish			
	NST005: Nuclear Security Aspects of Regaining Control Over Nuclear and Other Radioactive Material Out of Regulatory Control	STEP 6: First internal review of the draft C. Massey	NSGC, EPReSC, RASSC, TRANSSC, WASSC
NSS No. 39-T: INTERNATIONAL ATOMIC ENERGY AGENCY, Developing a Nuclear Security Contingency Plan for Nuclear Facilities, IAEA Nuclear Security Series No. 39-T, IAEA, Vienna (2019). Ex NST056 Published in English, French, Russian, Spanish			
	NST066 Preparing Nuclear Security Response Plans for Other Radioactive Material in Use and Storage, and Associated Facilities	STEP 9: Addressing comments by Member States M. Waseem	NSGC EPReSC
NSS No. 22-G: INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CRIMINAL POLICE ORGANIZATION–INTERPOL, UNITED NATIONS INTERREGIONAL CRIME AND JUSTICE RESEARCH INSTITUTE, Radiological Crime Scene Management,	NST064: Radiological Crime Scene Management	STEP 8: Soliciting comments by Member States Zhong YUAN	NSGC EPReSC

IAEA Nuclear Security Series No. 22-G, IAEA, Vienna (2014). Ex NST013 Published in Arabic, English Russian, Spanish Cosponsorship: INTERPOL, UNICRI			
NSS No. 2-G (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Forensics in Support of Investigations, IAEA Nuclear Security Series No. 2-G (Rev. 1), IAEA, Vienna (2015). Ex NST014 Published in Arabic, Chinese, English, French, Spanish Supersedes NSS No. 2: Nuclear Forensics Support (2006) Published in Chinese, English			
	NST052 Developing Nuclear Security Procedures for Responding to Criminal and Intentional Unauthorized Acts Involving Nuclear or Other Radioactive Material	STEP 5: Preparing the draft Fei LIU	NSGC EPReSC

Sustainability of Nuclear Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 30-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Sustaining a Nuclear Security Regime, IAEA Nuclear Security Series No. 30-G, IAEA, Vienna (2018). Ex NST020 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 31-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Building Capacity for Nuclear Security, IAEA Nuclear Security Series No. 31-G, IAEA, Vienna (2018). Ex NST009 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 12-T (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Model Academic Curriculum in Nuclear Security, IAEA Nuclear Security Series No. 12-T (Rev. 1), IAEA, Vienna (2021). Ex NST054 Published in Arabic, English, French, Russian, Spanish			

Transport Security

NM&NF | RM&AF | MORC

Published IAEA guidance	Guidance in Preparation Working ID – Title	Remarks / Status / Technical Officer	Committee(s)
NSS No. 9-G (Rev. 1): INTERNATIONAL ATOMIC ENERGY AGENCY, Security of Radioactive Material in Transport, IAEA			

Nuclear Security Series No. 9 (Rev. 1), IAEA, Vienna (2020). Ex NST044 Published in Arabic, English, French, Russian, Spanish supersedes NSS No. 9: **Security in the Transport of Radioactive Material (2008)** Published in Chinese, English, French, Spanish			
NSS No. 26-G: INTERNATIONAL ATOMIC ENERGY AGENCY, Security of Nuclear Material in Transport, IAEA Nuclear Security Series No. 26-G, IAEA, Vienna (2015). Ex NST017 Published in Arabic, Chinese, English, French, Russian, Spanish			
NSS No. 46-T: Security of Nuclear and Other Radioactive Material in Transport, IAEA Nuclear Security Series No. 46-T, IAEA, Vienna (2024) Ex NST053 Published in English			

Pages 2577 to / à 2580

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13(1)(b)

of the Access to Information Act

de la Loi sur l’accès à l’information

Hautfenne-Jewer, Celia

From: Carlos Lorencez <Carlos.Lorencez@CANDU.ORG>
Sent: October 7, 2024 3:07 PM
To: Carrière, Danielle
Cc: Viktorov, Alexandre; [redacted]
Subject: RE: IAEA NUSSC Surveys
Attachments: NUSSC Medium Term Plan Survey - COG.docx; e WG 03072024_questionnaire final - COG.docx

Follow Up Flag: Follow up
Flag Status: Completed

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Good afternoon, Danielle.

I am attaching the two filled out surveys about the NUSSC medium-term plan and the CSS long-term plan. Thanks for including us.

Best regards,
Carlos Lorencez, Ph.D., P.Eng.
Director | Nuclear Safety and Environmental Affairs

CANDU Owners Group Inc.
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655 Bay Street, 17th Floor, Toronto, ON M5G 2K4
"Excellence Through Collaboration"

From: Carrière, Danielle <Danielle.Carriere@cnsc-ccsn.gc.ca>
Sent: September 19, 2024 9:59 AM
To: [redacted]@CANDU.ORG>; Carlos Lorencez <Carlos.Lorencez@CANDU.ORG>
Cc: Viktorov, Alexandre <Alexandre.Viktorov@cnsc-ccsn.gc.ca>
Subject: IAEA NUSSC Surveys

Good morning,

The Nuclear Safety Standards Committee Secretary has submitted the attached two surveys for Member States relating to the NUSSC medium-term plan and the CSS long-term plan. Recognizing that industry may have valuable feedback to provide, we are sharing them with you. We kindly request that you provide any feedback industry may have for NUSSC Member consideration by responding to this email by October 7, 2024.

Thank you,

Danielle Carrière, M.Eng., P.Eng.

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NUCLEAR SAFETY STANDARDS COMMITTEE
Medium-Term Plan for IAEA Safety Standards

Introduction to Survey

In addition to developing the new Long-Term Structure and Plan for the IAEA Safety Standards, NUSSC -57 decided work on the NUSSC living the Medium-Term Plan. It was decided that inputs for the Medium-Term Plan would be collected through consultation within respective country,
reviewing the IAEA safety standards published more than 5 years ago and identifying top 5 topics needing revision, topics identified during 9th Term of NUSSC.

For this purpose, NUSSC has developed a questionnaire for collecting inputs from its members in cooperation with the representatives of the State in the Safety Standards Review Committees.

This questionnaire is intended to scan NUSSC members' views on current IAEA Safety Standards, new possible issues to be considered.

NUSSC members are the recipients of this are expected to answer the questionnaire by **15th October 2024**, in line with the submission of the NUSSC questionnaire on Long-Term Structure and Plan for IAEA Safety Standards.

1. Do IAEA safety standards require updating to reflect technological advancements and new safety concerns/challenges (other than those already being revised)?

Yes	**No**
☒	☐

2. If the answer to question 1 is yes, in the list below, identify which IAEA Safety Standards you recommend: (a) for revision in the next 5 years of (b) for revision after the next five years.

	(a) Needs revision within the next 5 years	(b) Needs revision after the next 5 years
GSR Part 1 (Rev. 1), 2016 - Governmental, Legal and Regulatory Framework for Safety	☒	☐
GSR Part 2, 2016 - Leadership and Management for Safety -	☒	☐
GSR Part 4 (Rev. 1), 2016 - Safety Assessment for Facilities and Activities	☒	☐
SSR-1, 2019 - Site Evaluation for Nuclear Installations	☐	☒
SSR-2/1 (Rev. 1), 2016 - Safety of Nuclear Power Plants: Design	☒	☐
SSR-3, 2016 - Safety of Research Reactors	☒	☐
SSR-4, 2017 - Safety of Nuclear Fuel Cycle Facilities	☐	☒
GSG- 6, 2017 - Communication and Consultation with Interested Parties by the Regulatory Body	☒	☐
GSG- 12, 2018 - Organization, Management and Staffing of the Regulatory Body for Safety	☒	☐
GSG- 13, 2018 - Functions and Processes of the Regulatory Body for Safety	☒	☐
GS-G-3.5, 2009 - The Management System for Nuclear Installations	☒	☐
SSG-2 (Rev. 1), 2019 - Deterministic Safety Analysis for Nuclear Power Plants	☐	☒

SSG-3, 2024 - Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, Rev .1	☐	☒
SSG-5 (Rev. 1), 2023 - Safety of Conversion Facilities and Uranium Enrichment Facilities	☐	☒
SSG- 6 (Rev. 1), 2018 - Safety of Uranium Fuel Fabrication Facilities	☐	☒
SSG-7 (Rev. 1), 2023 - Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities	☐	☒
SSG-9 (Rev. 1), 2022 - Seismic Hazards in Site Evaluation for Nuclear Installations	☐	☒
SSG-10 (Rev. 1), 2023 - Ageing Management for Research Reactors	☐	☒
SSG-16 (Rev. 1), 2020 - Establishing the Safety Infrastructure for a Nuclear Power Programme	☒	☐
SSG-20 (Rev. 1), 2022 - Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report	☐	☒
SSG-21, 2012 - Volcanic Hazards in Site Evaluation for Nuclear Installations	☒	☐
SSG- 22 (Rev. 1), 2023 - Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors	☐	☒
SSG- 24 (Rev. 1), 2022 - Safety in the Utilization and Modification of Research Reactors	☐	☒
SSG-27 (Rev. 1), 2022 - Criticality Safety in the Handling of Fissile Material	☐	☒
SSG-28, 2014 - Commissioning for Nuclear Power Plants	☒	☐
SSG-30, 2014 - Safety Classification of Structures, Systems and Components in Nuclear Power Plants	☒	☐
SSG-34, 2016 - Design of Electrical Power Systems for Nuclear Power Plants	☒	☐
SSG-35, 2015 - Site Survey and Site Selection for Nuclear Installations	☒	☐

SSG-37 (Rev. 1), 2023 - Instrumentation and Control Systems and Software Important to Safety for Research Reactors	☐	☒
SSG-38, 2015 - Construction for Nuclear Installations	☒	☐
SSG-39, 2016 - Design of Instrumentation and Control Systems for Nuclear Power Plants	☒	☐
SSG-48, 2018 - Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants	☒	☐
SSG-50, 2018 - Operating Experience Feedback for Nuclear Installations	☒	☐
SSG-51, 2019 - Human Factors Engineering in the Design of Nuclear Power Plants	☒	☐
SSG-52, 2019 - Design of the Reactor Core for Nuclear Power Plants	☒	☐
SSG-53, 2019 - Design of the Reactor Containment and Associated Systems for Nuclear Power Plants	☒	☐
SSG-54, 2019 - Accident Management Programmes for Nuclear Power Plants	☒	☐
SSG-56, 2020 - Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants	☒	☐
SSG-61, 2021 - Format and Content of the Safety Analysis Report for Nuclear Power Plants	☐	☒
SSG-62, 2020 - Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants	☒	☐
SSG-63, 2020 - Design of Fuel Handling and Storage Systems for Nuclear Power Plants	☒	☐
SSG 64, 2021 - Protection against Internal Hazards in the Design of Nuclear Power Plants	☐	☒
SSG-67, 2021 - Seismic Design of Nuclear Installations	☐	☒

SSG-68, 2021 - Design of Nuclear Installations Against External Events Excluding Earthquakes	☐	☒
SSG -69, 2021 - Equipment Qualification for Nuclear Installations	☐	☒
SSG- 70, 2022 - Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants	☐	☒
SSG- 71, 2022 - Modifications to Nuclear Power Plants	☐	☒
SSG- 72, 2022 - The Operating Organization for Nuclear Power Plants	☐	☒
SSG- 73, 2022 - Core Management and Fuel Handling for Nuclear Power Plants	☐	☒
SSG- 74, 2022 - Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants	☐	☒
SSG- 75, 2022 - Recruitment, Qualification and Training of Personnel for Nuclear Power Plants	☐	☒
SSG- 76, 2022 - Conduct of Operations at Nuclear Power Plants	☐	☒
SSG- 77, 2022 - Protection against Internal and External Hazards in the Operation of Nuclear Power Plants	☐	☒
SSG- 79, 2023 - Hazards Associated with External Human Induced Events in Site Evaluation for Nuclear Installations	☐	☒
SSG-80, 2023 - Commissioning of Research Reactors	☐	☒
SSG-81, 2023 - Maintenance, Periodic Testing and Inspection of Research Reactors	☐	☒
SSG-82, 2023 - Core Management and Fuel Handling for Research Reactors	☐	☒
SSG-83, 2023 - Operational Limits and Conditions and Operating Procedures for Research Reactors	☐	☒
SSG-84, 2023 - The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors	☐	☒

SSG-85, 2023 - Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors	☐	☒
SSG-89, 2024 - Evaluation of Seismic Safety for Existing Nuclear Installations	☐	☒

3. If you have chosen option "(a)" for question number two for one or more IAEA Safety Standards, please list the key topics in need of revision for each of those Safety Standards.

Safety Standards updated before 2020:

All of them need revision within the next five years, otherwise they will be completely outdated since the pace of advancement is rather fast.

4. Given current IAEA safety standards and those under development, should NUSSC consider the following new topics to integrate guidance on emerging nuclear technologies?

☒ Advanced Fuel Cycles
☒ Artificial Intelligence
☒ Robotics
☒ New Transport Vehicles
☐ Virtual Reality
☒ Advanced Manufacturing Technologies and 3D Printing
☒ Application of Drones for Safety and Security
☒ Advanced Sensors and Instrumentation
☐ Blockchain
☒ Wireless Technology
☐ No new topics need to be included as of now

Other (Please Specify)

5. How should this topic be considered for an IAEA safety standard?

The established process is appropriate: start with CMs, TMs, and preparation of TECDOCs, and then use them as input to DPPs.

6. Given current IAEA safety standards and those under development, should NUSSC consider the following new topics to integrate guidance on various safety concerns related to the operating environment?

   ☒ Climate impact
   ☒ External events (e.g., armed conflicts)
   ☒ Various stakeholders (e.g. public, industry, etc.)
   ☒ Evolving cyber threats

   Other (Please Specify)

7. How should this topic be considered for an IAEA safety standard?

The established process is appropriate: start with CMs, TMs, and preparation of TECDOCs, and then use them as input to DPPs.

NUCLEAR SAFETY STANDARDS COMMITTEE(NUSSC)

Long Term Structure and Plan for IAEA Safety Standards

Introduction

The previous long term structure and plan for the IAEA safety standards established by the Commission on Safety Standards (CSS) in 2008 is now coming to completion. The CSS is in the process of developing the structure and long-term plan for the IAEA Safety Standards. This is being done in consultation with Member States, in particular through the representatives of the members States at the CSS and the **Safety Standards Committees.** The new long term structure and plan is expected to be finalized in 2026 and will guide the work on the development of safety standards for the next 10–15 years. For this purpose, CSS has developed a questionnaire for collecting inputs from its members in cooperation with the representatives of the State in the Safety Standards Review Committees.

In order to support the CSS in this activity and to collect specific inputs from NUSSC members regarding the Long Term Structure and Plan for the NUSSC led safety standards in particular; NUSSC members agreed to create an eWG to develop a NUSSC specific questionnaire. The results of this questionnaire will provide CSS with bottom-up information for the development of the IAEA Safety Standards structure and long-term plan.

This questionnaire is intended to scan NUSSC members' views on structure of the IAEA Safety Standards, new possible issues to be considered in long term planning, topics identified common to all review committees in the chairs meeting 27th May 2024, IAEA Safety Standards development process and IAEA software tools related to Safety Standards.

This questionnaire has two main parts. The first part is the CSS questionnaire, and the second part is the NUSSC specific Questionnaire. NUSSC members are the recipients of this are expected to answer both parts the questionnaire by October 15th2024, in line with the submission of the CSS questionnaire for CSS members.

I. CSS Questionnaire (10-15 years)

(1) Have you conducted evaluations, either at the national level or within regulatory organizations, of the anticipated future operating environment, and of how potential changes might impact radiation and nuclear safety and nuclear security? The Canadian Nuclear Industry has not conducted evaluations but discussions in meetings, workshops and conferences include potential new models of business cases for the deployment of microreactors at mining sites and small modular reactors in remote locations. The SSS are always present in those conversations.

(2) Utilizing for example the PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) factors, what changes do you anticipate occurring within your country that might result in new needs to be addressed in the future collection of safety standards, and what is the anticipated timeframe for these changes? The deployment of Gen IV reactors (waste burners, energy for industrial parks, district heating, etc.) will likely trigger changes in several PESTLE factors. The Gen IV reactors will not be deployed before the mid-2030s.

(3) Based on your assessments, what are the main aspects you've identified to be addressed as top priorities? Radioactive waste management and reprocessing/recycling of used fuel. Changes to extremely strict environmental regulations. More green bonds to finance new reactors.

(4) What topical areas should be further addressed in relation to safety and security interfaces? The design of new reactors must inherently include the SSS such that the new reactors are resilient to safety, security, and safeguards threats.

(5) Are there any gaps or other issues you would like to raise?

II. NUSSC Specific Questionnaire

1. NUSSC led IAEA Safety Standards (10-15 years)

i) The present structure of the IAEA Safety Standards is fit for Generation I to III plus land-based NPPs.

Strongly Agree	Agree	No Opinion/No experience	Disagree	Strongly disagree
X				

What are the strengths, weaknesses and opportunities for improvement in the current structure for Generation I to III plus land-based NPPs?

S: the structure is fit for every commercial reactor technology

O: the structure needs to include areas for digital and manufacturing advancements not considered previously

ii) The present structure of the IAEA Safety Standards is fit for Generation IV land-based NPPs.

Strongly Agree	Agree	No Opinion/No experience	Disagree	Strongly disagree
	X			

What are the strengths, weaknesses and opportunities for improvement in the current structure for Generation IV land-based NPPs?

S: In principle, the structure is fit for every commercial technology including Gen IV reactors

O: the structure may need to include additional branches for specific aspects of Gen IV reactors

iii) The present structure of the IAEA Safety Standards is fit for land-based NPPs with transportable reactors (i.e. transportation of fueled reactors).

Strongly Agree	Agree	No opinion/no experience	Disagree	Strongly disagree
	X			

What are the strengths, weaknesses and opportunities for improvement in the current structure for land-based NPPs with transportable reactors (i.e. transportation of fueled reactors)?

S: In principle, the structure is fit for transportable reactors since the transportation of the reactors is only a small fraction of their life cycle

O: the structure may need to include additional SS for specific aspects of transportable reactors

iv) The present structure of the IAEA Safety Standards is fit for marine-based nuclear facilities with reactors, including floating NPPs.

Strongly Agree	Agree	No opinion/no experience	Disagree	Strongly disagree
			X	

What are the strengths, weaknesses and opportunities for improvement in the current structure for marine-based nuclear facilities with reactors, including floating NPPs?

S: the current structure is fit for land-based reactors

O: the structure may need additional branches to include SS with as much naval experience as possible about the design, construction, operation, decommissioning, etc., of marine reactors

v) The present structure of the IAEA Safety Standards is fit for fusion facilities, including fusion research devices, fusion sources of ionizing radiation and fusion power plants.

Strongly Agree	Agree	No opinion/no experience	Disagree	Strongly disagree
			X	

What are the strengths, weaknesses and opportunities for improvement in the current structure for fusion facilities, incl. fusion research devices, fusion sources of ionizing radiation and fusion power plants?

S: In principle, the structure is fit for fusion reactors O: the structure was developed for fission reactors and needs to be revised to include fusion reactors

vi) The present structure of the IAEA Safety and Ssecurity standards addresses remote control of nuclear facilities, advanced manufacturing technologies (e.g. 3D printing), etc.

Strongly Agree	Agree	No opinion/no experience	Disagree	Strongly disagree
			X	

What are the strengths, weaknesses and opportunities for improvement in the current structure for remote control of nuclear facilities, advanced manufacturing technologies (e.g. 3D printing), etc.?

O: the structure needs to include areas for digital and manufacturing advancements not considered previously

vii) Should the IAEA apply all hazards (e.g. pandemics or any other type of crisis situation) approach to consider different types of disruptive events in the operating environment of the nuclear power plants and the regulatory bodies?

Yes	No
X	

Text box to clarify the position.

We hae realized that some hazards never considered before also have a not insignificant probability of occurrence.

viii) Any other topics having an impact on the safety of nuclear reactors that should be considered in long-term planning?

2. IAEA process for the development of IAEA Safety Standards

i) Is the SPESS* B (Step-by-step preparation and review process) process fit for developing IAEA Safety Standards?

Yes	No
X	

* Strategies and Processes for the Establishment of IAEA Safety Standards (SPESS)

open text to clarify the position and possible needs

When developing or updating SS, it is indispensable to consider the input of all the MS interested in a given subject; SPESS B is a proven process to accomplish it but we need to improve its efficiency.

ii) Are there any opportunities to enhance the process or add some flexibility?

Yes	No
X	

open text to clarify the position and possible needs

A working group focused on SPESS B improvements may be needed to enhance it and make it more efficient.

3. NUSSC members experience on IAEA SW-tools to aid the development of the IAEA Safety Standards

i) Have you used the IAEA the new IT web tools to facilitate your work at NUSSC?

Yes	No
X	

ii) Would you please give feedback on the IAEA new IT tools?

Navigating the site and managing documents is much easier.

iii) Should IAEA improve user friendliness of Nuclear Safety and Security Online User Interface (NSS-OUI) by emerging technologies such as AI, machine learning, etc. What could be areas of suggested improvements?

4. Any other issues NUSSC members would like to take to long-term planning of the IAEA Safety Standards?

NUSSC may need to get together more than twice per year to accomplish the medium- and long-term plans. Virtual meetings can be as effective as in-person meetings.

a) What topics or areas would NUSSC members like to see prioritized in the future development of IAEA Safety Standards?

I would suggest Gen IV, marine-based and fusion reactors.

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Pages 2603 to / à 2611

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19(1), 20(1)(b), 20(1)(c)

of the Access to Information Act

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Pages 2612 to / à 2623

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21(1)(a), 21(1)(b)

of the Access to Information Act

de la Loi sur l'accès à l'information

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20(1)(b), 21(1)(b)

of the Access to Information Act
de la Loi sur l'accès à l'information

Pages 2631 to / à 2632

are withheld pursuant to section

sont retenues en vertu de l'article

13(1)(b)

of the Access to Information Act

de la Loi sur l’accès à l’information

Hautfenne-Jewer, Celia

From: Davis, Heather
Sent: June 5, 2024 2:41 PM
To: Bulkan, Anupama; Williams, Thomas
Subject: RE: SME review Media Lines - PLNGS
Attachments: RE: NWMO question

Thanks Anu.

These align with my understanding and the information that we do and continue to share when asked.

I am also aware of the PRGI request and I had forwarded that to Alex yesterday.

We (myself working with ISRD) have also provided an e-mail response to PRGI (see attached) in early May with regards to any 'partnerships'.

Thanks
Heather

From: Bulkan, Anupama <Anupama.Bulkan@cnsc-ccsn.gc.ca>
Sent: Wednesday, June 5, 2024 3:28 PM
To: Davis, Heather <Heather.Davis@cnsc-ccsn.gc.ca>; Williams, Thomas <thomas.williams@cnsc-ccsn.gc.ca>
Subject: FW: SME review Media Lines - PLNGS

Hi Heather,

Can you review the media lines below and let me know if you have any concerns? I have scanned it and the attachment and I don't have any particular concerns. I apologize for the short turnaround but could you get it back to me asap?

Thanks.

Anu

From: Cunningham, Kim <kim.cunningham@cnsc-ccsn.gc.ca>
Sent: Wednesday, June 5, 2024 1:29 PM
To: Bulkan, Anupama <Anupama.Bulkan@cnsc-ccsn.gc.ca>
Subject: SME review Media Lines - PLNGS

Hi Anu,

CNSC has received the attached letter re: potential OPG/NB Power partnership. These media lines were previously approved by Ramzi.
If you could review and share back at your soonest convenience, that would be super.
Then I will share with Registry SME.

Media Lines:

- The Canadian Nuclear Safety Commission (CNSC) is Canada's nuclear regulator. We regulate nuclear energy, facilities and materials to protect the health, safety and security of the public and the environment. We will never compromise on safety.
- The CNSC has not received regulatory notification, nor application for a proposed change to a licence.
    - If and when the CNSC receives an application, the appropriate regulatory process will be determined.
- Any regulatory impact or potential effect on licensing would depend on the nature of that partnership.
    - Arrangements that the two operators might undertake in relation to the operation of PLNGS would be evaluated against the requirements of the Nuclear Safety and Control Act, its regulations and the applicable licences.
- As the regulator, the CNSC would verify that any changes the operators sought to make to the operation of the PLNGS, would ensure nuclear safety and security, protection of the environment and upholds Canada's international obligations.
- Both NB Power and OPG are experienced nuclear power plant operators and qualified licensees.
    - Their management structures and operating processes are well understood and regulated by the CNSC.
- Operators sharing their operating experience and industry best practices is not only a good idea for the operators themselves, it is a regulatory expectation.
- For specific information about this potential partnership, please contact:
    - New Brunswick Power
    - OPG

Kim Cunningham
Senior Communications Advisor
Strategic Communications Directorate
Canadian Nuclear Safety Commission / Government of Canada
kim.cunningham@cnsc-ccsn.gc.ca / Tel: 343-540-6296

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19(1), 20(1)(b), 20(1)(c)

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13(1)(b)

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Hautfenne-Jewer, Celia

From: Rzentkowski, Bartek
Sent: April 4, 2025 11:48 AM
To: Simon, Nicole; Miller, Douglass; Fice, Kevin; Leblanc, Julie; Naraine, Matthew; Tanase, Aurelian; Reodikar, Sameer
Cc: Broeders, Mark; Vary, Beth; Campbell, Kimberley
Subject: DART DNNP Team - see attached licence and RoD
Attachments: Signed - DNNP Power Reactor Construction Licence -PRCL 32 00 2035.pdf; Signed - Record of Decision Licence for OPG DNNP BWRX-300.pdf

Hello DNNP DARTers:

Please see attached licence and Record of Decision. We should all read the attached decision and then we can discuss next steps at our staff level DNNP weekly meeting on Wednesday.

Commission authorizes Ontario Power Generation Inc. to construct 1 BWRX-300 reactor at the Darlington New Nuclear Project site - Canada.ca

Regards,
Bartek

Bartek Rzentkowski
Senior Project Officer / Advanced Reactor Licensing Division
Canadian Nuclear Safety Commission / Government of Canada
Bartek.Rzentkowski@cnsc-ccsn.gc.ca / Tel: 613-295-4628

A0120221_1-002674

I) LICENCE NUMBER: PRCL 32.00/2035

II) LICENSEE:

Pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*, this licence is issued to:

Ontario Power Generation (OPG), Incorporated
700 University Avenue
Toronto, Ontario M5G 1X6

III) LICENCE PERIOD:

This licence is valid from: **April 4, 2025** to **March 31, 2035** unless otherwise suspended, amended, revoked, or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

i) Prepare the site for Class IA nuclear facilities at the Darlington New Nuclear site, comprising the following activities:

   a. Construction of site access control measures.
   b. Clearing and grubbing of vegetation.
   c. Excavation and grading of the site to the finished design elevation.
   d. Installation of services and utilities (domestic water, fire water, sewage, electrical, communications, natural gas) to service the future nuclear facility.
   e. Construction of administrative and support buildings inside the future protected area.
   f. Construction of environmental monitoring and mitigation systems; and
   g. Construction of flood protection and erosion control measures.

ii) Construct a Class IA nuclear facility and supporting infrastructure at the Darlington New Nuclear site, comprising the following activities:

   a. Construction of a single BWRX-300 Powerblock, consisting of the Reactor Building, the Turbine Building, the Control Building, the Radwaste Building, and associated structures.
   b. Construction of supporting infrastructure, including condenser cooling water system structures.

c. Conduct of commissioning testing of systems and structures prior to the loading of nuclear fuel.

iii) Possess and use prescribed information that is required for, associated with, or arises from the activities described in (i) or (ii) above.

V) EXPLANATORY NOTES:

i) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.

ii) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations.

iii) The "OPG DARLINGTON NEW NUCLEAR PROJECT (DNNP) POWER REACTOR CONSTRUCTION LICENCE (PRCL) Licence Conditions Handbook (LCH)" provides compliance verification criteria including the Canadian standards and regulatory documents used to verify compliance with the conditions in the licence. The LCH also provides information regarding delegation of authority, applicable versions of documents, and non-mandatory recommendations and guidance on how to achieve compliance.

VI) CONDITIONS:

G. GENERAL

G.1 The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis, defined as:

i) The regulatory requirements set out in the applicable laws and regulations;

ii) The conditions and safety and control measures described in the facility's or activity's licence and the documents directly referenced in that licence; and

iii) The safety and control measures described in the licence application and the documents needed to support that licence application.

Unless otherwise approved in writing by the Canadian Nuclear Safety Commission (CNSC, hereinafter "the Commission").

G.2 The licensee shall give written notification of changes to the facility or its operation, including the deviation from design, operating conditions, policies, programs, and methods referred to in the licensing basis.

G.3 The licensee shall control the use and occupation of any land within the exclusion zone.

G.4 The licensee shall provide, at the nuclear facility and at no expense to the Commission, suitable office space for employees of the Commission who customarily carry out their functions on the premises of that nuclear facility (onsite Commission staff).

G.5 The licensee shall maintain a financial guarantee for decommissioning that is acceptable to the Commission.

G.6 The licensee shall implement and maintain a public information and disclosure program.

1. Management System

1.1. The licensee shall implement and maintain a management system.

2. Human Performance Management

2.1. The licensee shall implement and maintain a human performance program.

2.2. The licensee shall implement and maintain a training program.

3. Operating Performance

3.1. The licensee shall implement and maintain an operations program.

3.2. The licensee shall notify and report in accordance with the periods and requirements of CNSC Regulatory Document REGDOC-3.1.1 – REPORTING REQUIREMENTS FOR NUCLEAR POWER PLANTS.

3.3. The licensee shall implement a construction and commissioning program.

4. Safety Analysis

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

5. Physical Design

5.1. The licensee shall implement and maintain a design program.

5.2. The licensee shall implement and maintain a pressure boundary program and have in place a formal agreement with an Authorized Inspection Agency.

5.3. The licensee shall implement and maintain an equipment and structure qualification program.

6. Fitness for Service

6.1. Not applicable.

7. Radiation Protection

7.1. The licensee shall implement and maintain a radiation protection program.

8. Conventional Health and Safety

8.1. The licensee shall implement and maintain a conventional health and safety program.

9. Environmental Protection

9.1. The licensee shall implement and maintain an environmental protection program.

10. Emergency Management and Fire Protection

10.1. The licensee shall implement and maintain an emergency preparedness program.

10.2. The licensee shall implement and maintain a fire protection program.

11. Waste Management

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

11.2. The licensee shall implement and maintain a decommissioning plan.

12. Security

12.1. The licensee shall implement and maintain a security program.

13. Safeguards and Non-Proliferation

13.1. The licensee shall implement and maintain a safeguards program.

14. Packaging and Transport

14.1. Not applicable.

15. Site Specific

15.1. The licensee shall implement the mitigation measures proposed and commitments made during the Darlington Joint Review Panel process, including the applicable recommendations of the Darlington Joint Review Panel Report, in accordance with the Government of Canada response.

15.2. The licensee shall implement and maintain an environmental assessment follow-up program.

15.3. The licensee shall obtain the approval of the Commission, or consent of a person authorized by the Commission, prior to the removal of established regulatory hold points.

15.4. The licensee shall conduct Indigenous engagement activities, specific to the DNNP, throughout the period of this licence.

Nuclear Power Reactor Construction Licence | Permis de construire de réacteur nucléaire | **PRCL 32.00/2035**

SIGNED at Ottawa on **April 4, 2025**

X

President, Canadian Nuclear Safety Commiss...

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

Record of Decision

DEC 24-H3

In the Matter of

Applicant	Ontario Power Generation Inc.
Subject	Application for a Licence to Construct one BWRX-300 Reactor at the Darlington New Nuclear Project Site
Date of Decision	April 4, 2025

Document ID (Word): DAMZHJW66V33-166150894-411
Document ID (PDF): DAMZHJW66V33-166150894-455

RECORD OF DECISION – DEC 24-H3

Applicant:	Ontario Power Generation Inc.
Address/Location:	700 University Avenue 19th Floor, Toronto, Ontario M5G 1X6
Purpose:	Application for a Licence to Construct one BWRX-300 Reactor at the Darlington New Nuclear Project Site
Application received:	October 31, 2022
Dates of public hearing:	October 2, 2024 January 8-10, 13-14, 2025
Location:	Ajax Convention Centre, 550 Beck Crescent, Ajax, ON, L1Z 1C9 and virtually via Zoom
Date of decision:	April 4, 2025
Members present:	P. Tremblay, President T. Berube A. Hardie J. Hopwood M. Lacroix V. Remenda
Registrar:	C. Salmon
Recording Secretary:	M. McMillan
Senior General Counsel:	L. Thiele

Applicant Represented By		Document Number
B. Jackowski	Vice-President, Small Modular Reactors	24-H3.1 24-H3.1A 24-H3.1B 24-H3.1C 24-H3.1D 24-H3.1E 24-H3.1F
C. Cheng	Director, Nuclear Environment Projects Support	
D. Tyndall	Vice-President, New Nuclear Engineering	
D. Hinds	Principal Engineer, Plant Integration Engineering, General Electric Vernova Hitachi Nuclear Energy	
D. Popovic	Senior Vice-President, SMR Execution	
G. Irwin	Director, Management Reporting	

G. Watford	Senior Vice-President, Engineering, General Electric Vernova Hitachi Nuclear Energy	24-H3.1G
G. Jhin	Senior Technical Engineer/Officer, Fire Protection Programs	
H. Rambukkana	Director, Eastern Waste Operations and Maintenance	
J. Holla	Senior Manager, Corporate Relations & Projects	
J. Duhig	Radiation Safety Scientist	
K. Haddlesey	Director, Indigenous Partnerships	
K. Fairservice	Senior Manager, Fuelling and Reactor Physics	
K. Ross	Senior Manager, Indigenous Relations	
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Natural Resources Canada: M. Kolaj		
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Licence to Construct: Issued

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1 INTRODUCTION

1. Ontario Power Generation Inc. (OPG) has applied to the Canadian Nuclear Safety Commission[1] (CNSC), under subsection 24(2) of the *Nuclear Safety and Control Act*[2] (NSCA), for a licence to construct (LTC) one General Electric Hitachi (GEH) Boiling Water Reactor X-300 (BWRX-300) for its Darlington New Nuclear Project (DNNP or Project)[3] on the site of the Darlington Nuclear Generating Station (Darlington Nuclear site). The Darlington Nuclear site is located in the Municipality of Clarington, Ontario, within the traditional lands and waters of the Michi Saagiig Anishinaabeg, the Gunshot Treaty (1877–88), the Williams Treaties (1923), and the Williams Treaties First Nations Settlement Agreement (2018).

2. The DNNP is a proposal by OPG for the site preparation, construction, operation, decommissioning and abandonment of up to four new nuclear reactors at its existing Darlington Nuclear site. OPG currently holds a power reactor site preparation licence for the DNNP, which the Commission renewed in 2021.[4]

3. The DNNP was subject to an Environmental Assessment[5] (EA) conducted by a Joint Review Panel (JRP) under the *Canadian Environmental Assessment Act*[6] (CEAA 1992). In April 2024,[7] the Commission determined that the BWRX-300 reactor technology was not fundamentally different from the technologies considered in the EA, and that a new EA was not required. With this determination, the Commission could proceed with the consideration of OPG's application for a licence to construct one BWRX-300 reactor unit at the DNNP site.

Issues

4. Pursuant to paragraphs 24(4)(a) and (b) of the NSCA, in considering whether to issue the licence to construct, the Commission must be satisfied that:

   a) OPG is qualified to carry on the activities that the licence would authorize; and

   b) in carrying on those activities, OPG will 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.

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[1] The *Canadian Nuclear Safety Commission* is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal.
[2] S.C. 1997, c. 9.
[3] The DNNP is a proposal by OPG for the site preparation, construction, operation, decommissioning and abandonment of up to four new nuclear reactors on the existing Darlington Nuclear site.
[4] *Record of Decision in the matter of Ontario Power Generation Inc.'s Application to Renew the Power Reactor Site Preparation Licence for the Darlington New Nuclear Project*, DEC 21-H4, CNSC, October 12, 2021.
[5] Joint Review Panel, *Environmental Assessment Report – Darlington New Nuclear Power Plant Project*, August 2011.
[6] Statutes of Canada (S.C.) 1992, c. 37.
[7] *Record of Decision in the matter of the Determination of Applicability of Darlington New Nuclear Project Environmental Assessment to OPG's Chosen Reactor Technology*, CNSC, April 19, 2024.

5. As an agent of the Crown, the Commission recognizes its role in fulfilling the Crown's constitutional obligations, along with advancing reconciliation with Indigenous Peoples of Canada. The Commission's responsibilities include the duty to consult and, where appropriate, accommodate where the Crown contemplates conduct which may adversely impact potential or established Aboriginal[8] or treaty rights.[9] As such, the Commission must determine what engagement and consultation steps and accommodation measures are called for respecting Indigenous interests and whether what has been done satisfies the obligation of consultation and, where appropriate, accommodation of implicated Aboriginal or treaty rights. That determination, of what the duty to consult and accommodate requires, is informed by the principles and the provisions of the *United Nations Declaration on the Rights of Indigenous Peoples*[10] (UNDRIP), as a result of its adoption into Canadian law via the *United Nations Declaration on the Rights of Indigenous Peoples Act*[11] (UNDA).[12] The Commission must be satisfied that the duty to consult has been met prior to making its licensing decision.

Public Hearing

6. On June 27, 2024, the Commission published a *Notice of Public Hearing*[13] for this matter, which invited applications to intervene by November 4, 2024. The Commission subsequently published a *Revised Notice of Public Hearing*[14] on December 2, 2024, confirming the dates for Part 2 of the hearing.

7. The Commission considered information presented for a two-part public hearing. Part 1 of the hearing was held virtually on October 2, 2024, and Part 2 was held in Ajax, Ontario on January 8-10 and 13-14, 2025. The public hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*[15] (the Rules). During the public hearing, the Commission considered written submissions and heard oral presentations from OPG (CMD 24-H3.1, CMD 24-H3.1A, CMD 24-H3.1B, CMD 24-H3.1C, CMD 24-H3.1D, CMD 24-H3.1E, CMD 24-H3.1F, CMD 24-H3.1G) and CNSC staff (CMD 24-H3, CMD 24-H3.A, CMD 24-H3.B, CMD 24-H3.C and CMD 24-H3.D,[16] CMD 24-H3.E, CMD 24-H3.F, CMD 24-H3.G, CMD 24-H3.H). The Commission also considered oral and written submissions from 85 intervenors (see Appendix A for a list of interventions). The hearing was webcast live via the CNSC website, and video archives are available on the CNSC website.

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[8] "Aboriginal" is the term used in this document when referring to the Crown's duty to consult as that is the term used in s. 35 of the Constitution Act, 1982. In all other cases, "Indigenous" is the preferred terminology and used accordingly.
[9] *Haida Nation v. British Columbia (Minister of Forests),* 2004 SCC 73; *Taku River Tlingit First Nation v. British Columbia (Project Assessment Director)*, 2004 SCC 74.
[10] *United Nations Declaration on the Rights of Indigenous Peoples*, United Nations, September 2007.
[11] S.C. 2021, c. 14.
[12] *Kebaowek First Nation v. Canadian Nuclear Laboratories*, 2025 FC 319.
[13] *Notice of Public Hearing 2024-H-03*, CNSC, June 27, 2024.
[14] *Revised Notice of Public Hearing 2024-H-03*, CNSC, December 2, 2024.
[15] Statutory Orders and Regulations (SOR)/2000-211.
[16] CMD 24-H3.C and CMD 24-H3.D contain prescribed information and are not available to the public.

8. The follow-up issues the Commission requested be addressed by CNSC staff and OPG during Part 1 of the hearing were captured in CMD 24-H3-Q. The Commission was satisfied with the answers to these questions provided by CNSC staff (CMD 24-H3.F) and OPG (CMD 24-H3.1C).

Confidentiality Requests

9. Alongside its application and supporting submissions, OPG submitted 5 requests for confidentiality[17,18,19,20,21] in accordance with rule 12 of the Rules. The Commission considered OPG's requests and issued three separate decisions setting out the measures it would and would not take to protect information, pursuant to subrule 12(3):

- a *Partial Record of Decision*[22] on October 29, 2024
- a *Record of Decision*[23] on November 28, 2024
- a *Record of Decision*[24] on December 3, 2024

Participant Funding Program

10. Pursuant to paragraph 21(1)(b.1) of the NSCA, the Commission has established a Participant Funding Program (PFP) to facilitate the participation of Indigenous Nations and communities, members of the public and stakeholders in Commission proceedings. In October 2023, up to $150,000 in funding was made available through the PFP to review the application and associated documentation, and to provide the Commission with value-added information through topic-specific interventions. A Funding Review Committee, independent of the CNSC, reviewed the funding applications received and made recommendations on the allocation of funds. Based on the recommendations from the Committee, the CNSC awarded up to $191,863.98 to the following 11 applicants:

- Canadian Coalition for Nuclear Responsibility
- Canadian Environmental Law Association
- Chippewas of Georgina Island First Nation[25]
- Curve Lake First Nation
- Hiawatha First Nation
- Métis Nation of Ontario

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[17] *Request for Confidentiality of Material Submitted in Relation to NK054-CORR-00531-10740*, OPG, July 26, 2024.
[18] *Request for Confidentiality of Material Submitted in Relation to CMD #24-H3.1*, OPG, July 26, 2024.
[19] *Request to Protect Confidential Information in the Matter of OPG Confidential DNNP Submission Package #6(b) Construction and Commissioning Program Confidential Deliverables in Support of the Licence to Construct Application for the CNSC Review*, OPG, March 28, 2023.
[20] *Request for Confidentiality of Material Submitted in Relation to CMD #24-H3*, OPG, July 26, 2024.
[21] *Request for Confidentiality of Material Submitted in Relation to CNSC Staff CMD 24-H3*, OPG, November 28, 2024.
[22] *Partial Record of Decision on OPG's Request to Protect Confidential Information*, CNSC, October 29, 2024.
[23] *Record of Decision on OPG's Request to Protect Confidential Information*, CNSC, November 28, 2024.
[24] *Record of Decision on OPG's Request to Protect Confidential Information*, CNSC, December 3, 2024.
[25] The Chippewas of Georgina Island First Nation did not submit an intervention for this matter.

- Mississaugas of Scugog Island First Nation
- Northwatch
- Nuclear Transparency Project
- Paul Sedran (RESD Inc.)
- Saugeen Ojibway Nation

11. The CNSC also awarded up to a total of $106,490.25 of additional participant funding to Alderville First Nation, Curve Lake First Nation, and Mississaugas of Scugog Island First Nation to facilitate additional meetings with CNSC staff to discuss the licence application and to assess the Project's potential impacts to rights. The CNSC awarded this additional funding based on the Funding Review Committee's recommendations on the allocation of funds.

Mandate of the Commission

12. Several interventions addressed the economic impact of the DNNP. The Commission notes that, as the regulatory authority over nuclear matters in Canada, it has no economic mandate and does not base its decisions on the economic impact of a facility. The Commission's mandate is found in section 9 of the NSCA and includes the Commission's object to regulate the production and use of nuclear energy to prevent unreasonable risk to national security, the environment, and the health and safety of people, and to implement the international obligations to which Canada has agreed.

13. Several intervenors expressed their views about the DNNP in relation to energy policy. The Commission notes that it is the Ontario government that determines Ontario's energy policy. Determination of energy policy is not a part of the mandate of the CNSC.

Scope of OPG's Licence to Construct Application and the Public Hearing

14. OPG has applied for a licence to construct one BWRX-300 reactor for the DNNP at its Darlington Nuclear site. The proposed LTC would authorize OPG to complete site preparation activities, to construct a single BWRX-300 powerblock,[26] to construct supporting infrastructure for up to four BWRX-300 units, and to complete commissioning activities with no fuel in the reactor core (fuel-out commissioning) for the single constructed BWRX-300 unit. The proposed licence would not authorize fuel loading, fuel-in commissioning, or operation of the BWRX-300 reactor. No nuclear fuel would be onsite during the LTC licence period and no radioactive wastes would be generated. Authorization to operate the DNNP facility would be considered by the Commission under a future hearing process, should OPG submit an application for a licence to operate.

[26] The BWRX-300 powerblock would include the structures, systems, and components associated with the reactor building, the control building, the turbine building, the radioactive waste building, and their associated auxiliary structures.

2 DECISION

15. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Decision*, the Commission concludes the following:

- the *Impact Assessment Act*[27] (IAA) does not impose any obligation upon the Commission in respect of this matter
- the Commission's responsibility to uphold the honour of the Crown and its legal obligation to consult and, where appropriate, accommodate Indigenous interests, pursuant to section 35 of the *Constitution Act, 1982*,[28] has been satisfied
- OPG is qualified to carry on the activities that the licence will authorize
- OPG, in carrying on these activities, will 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

Therefore,

> the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues Nuclear Power Reactor Construction Licence PRCL 32.00/2035 to Ontario Power Generation Inc. for its Darlington New Nuclear Project located in the Municipality of Clarington, Ontario. The licence is valid from April 4, 2025, to March 31, 2035, unless suspended, amended, revoked, or replaced.

16. The Commission includes in the licence the conditions as recommended by CNSC staff in CMD 24-H3.B, including the following four site-specific licence conditions:

> 15.1. The licensee shall implement the mitigation measures proposed and commitments made during the Darlington Joint Review Panel process, including the applicable recommendations of the Darlington Joint Review Panel Report, in accordance with the Government of Canada response.
>
> 15.2. The licensee shall implement and maintain an environmental assessment follow-up program.
>
> 15.3. The licensee shall obtain the approval of the Commission, or consent of a person authorized by the Commission, prior to the removal of established regulatory hold points.
>
> 15.4. The licensee shall conduct Indigenous engagement activities, specific to the DNNP, throughout the period of this licence.

[27] S.C. 2019, c. 28, s. 1.
[28] *Constitution Act, 1982, Schedule B to the Canada Act 1982 (UK), 1982, c 11.*

Licence condition 15.4 is included in response to a request from the Michi Saagiig Nations to have a regulatory mechanism that would require OPG to fulfill its engagement commitments. The Commission is of the view that licence condition 15.4 provides such a regulatory mechanism.

17. The Commission is satisfied with the following three regulatory hold points (RHP) proposed by CNSC staff in section 1.6 of CMD 24-H3 and in the proposed LCH:

- RHP-1: Installation of the Reactor Building Foundation
  - The removal of this RHP would authorize OPG to place the foundation for the reactor building and commence civil construction of the reactor building structure, internal civil structures, and internal reactor building systems and components.
- RHP-2: Installation of the Reactor Pressure Vessel
  - The removal of this RHP would authorize OPG to install the reactor pressure vessel and associated structures and components, as well as complete the appropriate installations of critical components, and conduct limited component testing.
- RHP-3: Fuel-Out Commissioning
  - The removal of this RHP would authorize OPG to conduct full-scale testing and commissioning of installed structures, systems, and components.

18. The Commission delegates its authority for the purposes of licence condition 15.3 to the following CNSC staff:

- Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch

Licence conditions and the delegation of authority are further discussed in section 3.8 of this *Record of Decision*.

19. The Commission expects CNSC staff to continue engagement with the Michi Saagiig Nations and Saugeen Ojibway Nation regarding the compliance verification criteria under licence conditions 11.1 and 15.4 in the Licence Conditions Handbook (LCH), as appropriate. The Commission directs CNSC staff to provide the updated LCH to the Commission for its information once the compliance verification criteria for these two conditions are finalized. The Commission directs CNSC staff to notify it of any future changes made to the LCH annually, either through the regulatory oversight report addressing nuclear power reactors or by other reporting means.

20. The Commission accepts OPG's financial guarantee in the amount of $167,180,000[29] in the form of a Letter of Credit. OPG's financial guarantee is discussed in section 3.7.2 of this *Record of Decision*.

21. As detailed in section 3.6.5 of this *Record of Decision*, the Commission directs CNSC staff to implement the following commitments and accommodations specified in

[29] In 2022 Canadian dollars.

sections 4.1.1 and 4.3.6 of CMD 24-H3.F, and section 1.2 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application*, as follows:

- "CNSC staff are committed to continuing long-term engagement and collaboration with the Michi Saagiig Nations, through the existing terms of reference for long-term engagement, which could include creating a plan with the Michi Saagiig Nations to outline how they want to engage, collaborate and consult with the CNSC on future projects, policy discussions and work plans."
- "CNSC staff are committed to having policy discussions with the Michi Saagiig Nations to solicit their feedback regarding the CNSC's approach to Consultation, engagement, regulatory framework, UNDA/UNDRIP implementation and phased licensing approach."
- "The CNSC is committed to continuing to evolve [its] approaches to align with best practices and guidance that emerge through whole-of-government implementation of UNDA, and the *UNDA Action Plan*, including those that relate to FPIC. This includes initiating formal consultation on proposed updates and amendments in 2024-2025 to the CNSC's REGDOC-3.2.2: *Indigenous Engagement* to provide nuclear proponents and licensees with further guidance and clarity with regards to how their approach to engagement and partnership with Indigenous Nations can align with UNDA"
- "CNSC staff are committed to supporting Indigenous Nations and communities by either providing information about the appropriate contacts and channels for addressing broader concerns or coordinating meetings between the CNSC, the First Nations with other federal departments, as appropriate. For example, this could include discussions with Natural Resources Canada on UNDA policy and approach to addressing legacy issues."
- "CNSC staff are committed to supporting interested Michi Saagiig Nations in conducting a longer-term broader RIA covering all CNSC-regulated facilities in their territory, driven by the Nations and based on, but not limited to the Indigenous Knowledge study and cumulative effects assessment. CNSC staff view is that this would not be a project specific RIA and would take the form of a study and assessment of cumulative effects on the rights and interests of the Michi Saagiig Nations as it relates to the nuclear sector. The results of this study could inform future regulatory processes for nuclear projects and activities in their territory, should the First Nations wish to share and incorporate the information into project specific assessments in the future."
- "CNSC staff are committed to the ongoing collaboration with the Michi Saagiig Nations and OPG on supporting an Indigenous Knowledge study to gather more information and data regarding the Michi Saagiig Nations rights and interests as it relates to the DNNP and surrounding territory. This includes providing funding, informational, and other support to complete these studies as appropriate. CNSC staff have been informed that the Michi Saagiig Nations are working on a governance framework for the studies and that the work on the studies will not begin until after a framework is in place. CNSC staff are able to provide funding and support for the study when requested by the Michi Saagiig Nations."

- "CNSC staff commit to supporting and ongoing collaboration with the Michi Saagiig Nations on completing a cumulative effects study, which could include a cumulative effect on rights analysis as it relates to the nuclear sector in their traditional and treaty territories."
- "CNSC staff are committed to continuing to work with the Michi Saagiig Nations to determine how they want the results of these studies, when provided to CNSC and OPG, to be incorporated, considered and reflected in the CNSC's regulatory processes and ongoing oversight of the DNNP, should the project proceed. CNSC staff commit to adjusting the approach to oversight of the DNNP as new information is shared with regards to the Michi Saagiig Nations knowledge, land use, rights and interests. As outlined in the draft LCH this could include but is not limited to OPG incorporating the outcomes of these studies into its Environmental Monitoring and Environmental Assessment Follow-Up Plan. The knowledge and information could also help inform the CNSC's Independent Environmental Monitoring Program (IEMP) as well as help inform CNSC compliance and oversight activities for the DNNP. However, CNSC staff have not specified the exact timing, mechanisms or approach as this process needs to be driven by the Michi Saagiig Nations and in collaboration with OPG."
- "CNSC staff are committed to collaborating with the Michi Saagiig Nations to update RIAs [rights impact assessments] as new information is gathered and provided by both the Michi Saagiig Nations and OPG and to providing updates to the Commission at future phases of the regulatory review and licensing process for the DNNP, such as a potential Licence to Operate, should the project proceed."
- "CNSC staff are committed to collaboratively monitoring OPG's implementation of its proposed mitigation measures and commitments with the Michi Saagiig Nations. CNSC staff are committed to working with the Michi Saagiig Nations to verify the commitments and measures specific to them and report the results and relevant updates to the Commission as appropriate. CNSC staff propose that this is done through a formal working group between OPG, CNSC staff and the 4 Michi Saagiig Nations. CNSC staff propose having quarterly meetings to discuss progress being made on the commitments, any issues or concerns and whether the mitigation measures are working as expected or if adjustments need to be made to ensure that the Nations' rights and interests continue to be protected, and the commitments are upheld. The details of the working group and its implementation and structure will be collaboratively developed with the Nations and OPG should the project proceed."
- "CNSC staff commit to providing information to the Michi Saagiig Nations regarding the status of regulatory hold points. CNSC staff will also provide notification to all the Indigenous Nations and communities identified in the Consultation Report when a decision has been made on whether to release a hold point."
- "CNSC staff commit to collaborating with the Michi Saagiig Nations on the CNSC's Independent Environmental Monitoring Program in relation to the Darlington site, which would include the DNNP, should it proceed. This includes providing opportunities for the Michi Saagiig Nations to review and provide input into the sampling plans, participate in sampling and conduct

ceremony and walk the land prior to conducting sampling. CNSC staff will work with the Michi Saagiig Nations to ensure that their land use, values and knowledge systems are reflected and considered in the CNSC's environmental sampling, as appropriate and where possible."

- "CNSC staff commit to providing the most current information available related to the progress being made on CNSC staff's commitments and accommodation measures to the Michi Saagiig Nations for the DNNP in the annual update report to the Commission."

22. As detailed in section 3.6.5 of this *Record of Decision*, the Commission directs OPG to implement the commitments specified in section 2.0 of OPG's *DNNP Indigenous Engagement Report November 2023 to September 2024* (CMD 24-H1A), including, without limiting the scope of OPG's engagement, the following:

- funding an Indigenous Knowledge study
- developing an environmental monitoring augmentation plan to apply an Indigenous lens to existing monitoring activities
- planning and conducting aquatic offsetting and terrestrial restoration in collaboration with the Michi Saagiig Nations, including quarterly meetings to undertake offsetting and restoration planning, and the establishment of beneficial action areas on the DNNP site
- engaging with the Michi Saagiig Nations regarding permits and approvals tied to activities potentially impacting Aboriginal and/or treaty rights, including monthly meetings to discuss permitting requirements
- including Indigenous ceremony in the Project
- establishing an environment table and a waste table to share knowledge between OPG and the Michi Saagiig Nations on these topics of specific interest
- requiring Indigenous training for all DNNP staff with an emphasis on the Williams Treaties First Nations (WTFN) and the 2018 Settlement Agreement

23. With this decision, the Commission directs CNSC staff to report on the status of the DNNP and OPG's progress toward each regulatory hold point as part of the regular *Status Report on Power Reactors* at each public meeting of the Commission and annually, either through the regulatory oversight report addressing nuclear power reactors or by other reporting means. The Commission also directs CNSC staff to report on the status of CNSC staff's commitments, ongoing engagement, consultation and accommodation measures annually, either through an existing regulatory oversight report or through another reporting mechanism. The Commission expects CNSC staff to provide the most current information available in its annual update. CNSC staff may bring any matter to the Commission's attention, as required.

3 ISSUES AND COMMISSION FINDINGS

24. The Commission's analyses for its decision in this matter are set out within the following sections of this *Record of Decision*:

- Section 3.1 Overview of the Darlington New Nuclear Project

- Section 3.2 Applicability of the *Impact Assessment Act*
- Section 3.3 Views of Hearing Participants
- Section 3.4 Assessment of the Application for a Licence to Construct
- Section 3.5 OPG's Safety and Control Measures with Respect to the Safety and Control Areas
- Section 3.6 Indigenous Engagement and Consultation
- Section 3.7 Other Matters of Regulatory Importance
- Section 3.8 Licence Length and Conditions

3.1 Overview of the Darlington New Nuclear Project

3.1.1 Project Description and History

25. The DNNP is a proposed new nuclear build located on the existing Darlington Nuclear site, on the north shore of Lake Ontario, approximately 10 km east of Oshawa. The Darlington Nuclear site consists of the existing Darlington Nuclear Generating Station (NGS), which has 4 Canada Deuterium Uranium (CANDU) reactors, a tritium removal facility and a waste management facility. OPG designated the eastern third of the overall Darlington Nuclear site for the DNNP (the DNNP site).

26. The NSCA and the *Class I Nuclear Facilities Regulations*[30] (CINFR) establish the lifecycle of a nuclear facility into distinct licensing phases: site preparation, construction, operation, and decommissioning. The DNNP is currently in the site preparation phase at the time of this decision.

27. In September 2006, OPG submitted a preliminary application for a licence to prepare site at the DNNP site, for up to 4 Class IA nuclear power reactors, with a combined net output of 4800 MW electrical (MWe). The project was referred to a JRP under the CEAA 1992 and OPG submitted an Environmental Impact Statement (EIS) and an updated application for a licence to prepare site in September 2009.

28. At the time the EIS was prepared for the EA, which the legislation directed should be done as early as practicable in the planning process of a project, the Government of Ontario had not yet selected a specific reactor technology. OPG therefore prepared its EIS using a plant parameter envelope (PPE)[31] approach, and the EA examined the potential environmental effects of several possible reactor technologies expected to generate up to 4800 megawatts of electricity for delivery to the Ontario grid.

29. In August 2011, the JRP issued its EA report[32] for the DNNP, stating its conclusions and recommendations regarding the environmental effects of the Project. Following the Government of Canada's response[33] to the JRP recommendations in May 2012, the

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[30] SOR/2000-204.
[31] The plant parameter envelope is a set of data derived from available vendor information, for multiple reactor technologies, and provides a bounding envelope of plant design and site parameter values for use in the EA.
[32] Joint Review Panel, Environmental Assessment Report – Darlington New Nuclear Power Plant Project, August 2011.
[33] *Government of Canada's Response to the Joint Review Panel Report for the Proposed Darlington New Nuclear Power Plant Project in Clarington Ontario*, Government of Canada, May 2, 2012.

JRP, as a Panel of the Commission, issued OPG a 10-year power reactor site preparation licence for the DNNP. In October 2021,[34] the Commission renewed the licence for a 10-year period.

30. In December 2021, OPG selected the GEH BWRX-300 reactor as the reactor technology for deployment at the DNNP. OPG submitted a LTC application to build one (1) BWRX-300 reactor. In October 2022, OPG submitted a revised PPE report[35,36] and a report documenting its review of the EIS for the BWRX-300,[37,38] for the Commission's consideration of whether the BWRX-300 was fundamentally different from the reactor technologies assessed in the DNNP EA.

31. In April 2024,[39] the Commission determined that the BWRX-300 reactor technology was not fundamentally different than the technologies considered in the EA, and that a new EA was not required.

3.1.2 BWRX-300 Reactor Technology Description

32. In section 2.0 of CMD 24-H3.1, OPG submitted that the BWRX-300 is a 10th generation boiling water reactor (BWR) designed by GEH, with a 327 MWe output and a water-cooled natural circulation cycle that uses light water as both the coolant and the moderator. In section 4.5.4 of CMD 24-H3.1, OPG noted that the BWRX-300 reactor design is an evolution of GEH's Economic Simplified Boiling Water Reactor (ESBWR) which has been certified by the United States Nuclear Regulatory Commission (US NRC).

33. OPG provides the basic design parameters for the BWRX-300 reactor in Table 1 of CMD 24-H3.1 and a conceptual overview of the BWRX-300 plant systems in Figure 8 of CMD 24-H3.1. OPG also provides a plain language description of the BWRX-300 design in section 3.0 of CMD 24-H3.1C. OPG reported that the BWRX-300 reactor design employs a simplified system layout that requires fewer systems and components and employs passive and inherent safety features.

34. In section 2.0 of CMD 24-H3.1, OPG submitted that the BWRX-300 design incorporates several innovative features including:

- integral reactor isolation valves on the reactor pressure vessel
- large capacity isolation condenser system

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[34] *Record of Decision in the matter of Ontario Power Generation Inc.'s Application to Renew the Power Reactor Site Preparation Licence for the Darlington New Nuclear Project*, DEC 21-H4, CNSC, October 12, 2021.
[35] OPG submission, *Use of Plant Parameters Envelope to Encompass the Reactor Designs being Considered for the Darlington Site*, N-REP-01200-10000, revision 5, October 5, 2022.
[36] OPG submission, *Use of Plant Parameters Envelope to Encompass the Reactor Designs being Considered for the Darlington Site*, N-PRE-02100-10000, revision 6, July 2023.
[37] OPG submission, *Darlington New Nuclear Project Report for the Review of the Environmental Impact Statement for Small Modular Reactor BWRX-300*, revision 0, NK054-REP-07730-00055, October 5, 2022.
[38] OPG report, *Darlington New Nuclear Project Environmental Impact Statement Review Report for Small Modular Reactor BWRX-300*, revision 1, NK054-REP-07730-00055, June 28, 2023.
[39] *Record of Decision in the matter of the Determination of Applicability of Darlington New Nuclear Project Environmental Assessment to OPG's Chosen Reactor Technology*, CNSC, April 19, 2024.

- dry containment constructed using a diaphragm-plate steel composite system
- standardized equipment as well as in-factory modular construction

3.1.3 OPG's Commitments

35. The JRP recommendations directed to OPG are documented and managed through the *OPG DNNP Commitments Report*,[40] discussed in Appendix D.1 of CMD 24-H3, and included in Appendix E of the proposed LCH. The JRP recommendations span the lifecycle of the DNNP. CNSC staff informed the Commission that, as of June 2024, 38 JRP recommendations had been closed and 28 remained open.[41]

36. As discussed throughout section 3.5 of this *Record of Decision*, OPG will be required to provide additional information to the CNSC to support its compliance with regulatory requirements under a number of safety and control areas. These commitments are detailed in Appendix D.2 of CMD 24-H3, under the relevant licence conditions in the proposed LCH, and tracked by CNSC staff in licensing basis document *BWRX- 300 Licensing Regulatory Actions*. Commitments that are essential for CNSC staff to verify compliance with regulatory requirements related to the safety analysis and design of structures, systems, and components (SSCs) that are important to safety are tied to proposed regulatory hold points. Regulatory hold points are discussed further in section 3.8.3 of this *Record of Decision*.

3.2 Applicability of the *Impact Assessment Act*

37. In coming to its decision, the Commission is first required to determine whether any requirement under the IAA applies to OPG's LTC application and whether an impact assessment is required.

38. The IAA came into force on August 28, 2019. The DNNP EA was conducted and approved under CEAA 1992, which was the federal legislation in force at the time. The DNNP EA considered the entire life cycle of the DNNP, including site preparation, construction, operation, and decommissioning.

39. The Commission finds that the IAA does not apply to the construction of the DNNP because a decision has already been rendered by the JRP and the Government of Canada on this proposed project under the CEAA 1992. Therefore, the Commission concludes that there is no requirement under the IAA for an impact assessment to be completed and there are no other applicable requirements of the IAA to be addressed in this matter.

40. In its intervention, the Mississaugas of Scugog Island First Nation (MSIFN; CMD 24-H3.81, CMD 24-H3.81A) expressed concerns regarding what they see as gaps between CEAA, 1992 and the IAA. In their joint oral presentation, the Michi Saagiig Nations also requested that the CNSC require OPG to conduct a gap analysis to consider the

[40] *Darlington New Nuclear Project Commitments Report*, NK054-REP-01210-00078 Revision 9, OPG, November 2023.
[41] Transcript, October 2, 2024, pages 135-137.

discrepancies between CEAA 1992 and the IAA. The Commission heard and considered these concerns as part of its April 2024 determination on the applicability of the DNNP EA to the BWRX-300 reactor technology.[42]

3.3 Views of Hearing Participants

41. In its consideration of OPG's LTC application, the Commission gave careful consideration to all submissions and perspectives received, in accordance with its mandate and the scope of this hearing. The Commission appreciates the efforts and contributions of all hearing participants.

42. OPG applied for a 10-year licence to construct one BWRX-300 reactor and supporting facilities on the existing Darlington Nuclear site. In section 6 of CMD 24-H3.1, OPG submitted that it is qualified to carry on the activities that the LTC would authorize and that OPG will 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. OPG noted that it has a history of safe operating performance and has experience managing large-scale projects such as the Darlington NGS Refurbishment Project.

43. In section 1.9 of CMD 24-H3, CNSC staff recommended that the Commission:

- conclude, pursuant to paragraphs 24(4)(a) and (b) of the NSCA, that OPG is qualified to carry on the activities that the LTC would authorize and, in doing so, will 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
- issue the proposed power reactor construction licence to OPG for a 10-year period
- accept the financial guarantee proposed by OPG
- delegate authority for the administration of the regulatory hold points in the proposed licence to the CNSC's Executive Vice President and Chief Regulatory Operations Officer

44. In section 4.5 of CMD 24-H3.F, based on the information to date and acknowledging the opportunities for Indigenous Nations and communities to participate in the regulatory process, CNSC staff recommended that the Commission determine the duty to consult, and where appropriate, accommodate under section 35 of the *Constitution Act, 1982* as having been discharged in an appropriate and adequate manner.

45. The Commission received 85 interventions for this hearing. Intervenors expressed views on the following issues:

- the completeness of the design and safety analysis at this licensing stage

[42] Paragraphs 43 and 44, *Record of Decision in the matter of the Determination of Applicability of Darlington New Nuclear Project Environmental Assessment to OPG's Chosen Reactor Technology*, CNSC, April 19, 2024.

- OPG's qualification to complete a large-scale construction project
- the use of regulatory hold points during the proposed licence period
- the BWRX-300 design, including the independence of the shutdown systems, safety function of the reactor isolation valves, and overpressure protection
- the proximity of the proposed location of the DNNP to the Darlington NGS
- OPG's plan for radioactive waste that would be produced from the future operation of the BWRX-300 reactor
- how the Project may contribute to the proliferation of nuclear weapons
- emergency preparedness
- the CNSC's phased approach to licensing
- decommissioning
- general concern with new nuclear power plants
- consultation and engagement with Indigenous Nations and communities, including upholding the UNDRIP and FPIC, CNSC staff's approach to the rights impact assessment, and the completion of Indigenous Knowledge and cumulative effects studies
- how CNSC staff will hold OPG accountable to fulfill its commitments to Indigenous Nations and communities regarding the DNNP
- support for the DNNP

46. The issues raised by hearing participants, and their bearing on the deliberations of the Commission, are discussed in the appropriate subject-specific sections of this *Record of Decision*. Issues raised by Indigenous Nations and communities related to Indigenous engagement and consultation are detailed in section 3.6.3 of this *Record of Decision*.

3.4 Assessment of the Application for a Licence to Construct

47. On October 31, 2022, OPG submitted its application.[43] In its consideration of this matter, the Commission assessed the application submitted by OPG, as required by the NSCA, the *General Nuclear Safety and Control Regulations*[44] (GNSCR), the CINFR, and other applicable regulations made under the NSCA. The proposed BWRX-300 reactor would be a Class IA nuclear facility per section 1 of the CINFR.

48. Section 3 of the GNSCR and section 3 of the CINFR provide the general requirements for a licence application. Section 5 of the CINFR provides the specific requirements for an application for a licence to construct a Class I nuclear facility. CNSC regulatory document[45] REGDOC-1.1.2, *Licence Application Guide: Licence to Construct a Reactor Facility*,[46] clarifies the requirements for, and provides guidance on, submitting an application for a licence to construct.

49. In Appendix A of its application, OPG provided a matrix outlining how its application

[43] *Darlington New Nuclear Project – Application for a Licence to Construct a Reactor Facility*, OPG, October 31, 2022.
[44] SOR/2000-202.
[45] CNSC regulatory documents are typically referred to as REGDOCs.
[46] REGDOC-1.1.2, *Licence Application Guide: Licence to Construct a Reactor Facility*, Version 2, CNSC, October 2022.

satisfied the requirements set out in each applicable clause of the NSCA and applicable regulations. In section 1.6 of CMD 24-H3, CNSC staff submitted that it assessed OPG's application and determined that it provided sufficient information for a licence to construct application.

50. Several intervenors including the Ecojustice Working Group (CMD 24-H3.38), Northwatch (CMD 24-H3.58), Mary Veltri (CMD 24-H3.72), and Victor Lau (CMD 24-H3.75) questioned the completeness of OPG's application. The intervenors were of the view that OPG's application did not contain adequate information on the BWRX-300 design and safety case, emergency planning, radioactive waste management, environmental monitoring, and decommissioning. The Commission is satisfied that OPG's licence to construct application includes adequate information, as required by the GNSCR, the CINFR, and REGDOC-1.1.2. The specific regulatory requirements for a licence to construct, and how OPG satisfies them, are discussed throughout section 3.5 of this *Record of Decision*.

51. Several intervenors including Christine Drimmie (CMD 24-H3.11, CMD 24-H3.11A), Alderville First Nation (CMD 24-H3.62, CMD 24-H3.62A) Nuclear Transparency Project (CMD 24-H3.68), Mississaugas of Scugog Island First Nation (CMD 24-H3.81, CMD 24-H3.81A), Saugeen Ojibway Nation (CMD 24-H3.82), Curve Lake First Nation (CMD 24-H3.83, CMD 24-H3.83A), and Hiawatha First Nation (CMD 24-H3.85, CMD 24-H3.85A) expressed concerns that the phased approach to licensing the DNNP prevented the impacts of the project from being considered holistically. CNSC staff noted that the licensing process for the DNNP has followed the phased approach described in the NSCA and the CINFR. CNSC staff expressed that, the phased approach to licensing the DNNP has allowed for the large project to be planned, conducted, and assessed in a careful and incremental manner that is in line with international best practices. CNSC staff also noted that the EA had considered the entire lifecycle of the DNNP.[47]

52. The Commission concludes that OPG's application for a licence to construct is complete and complies with regulatory requirements. The Commission finds that OPG's application is comprehensive and sufficient for it to consider the application, pursuant to subsection 24(2) of the NSCA.

3.5 OPG's Safety and Control Measures with Respect to the Safety and Control Areas

53. The Commission examined OPG's proposed safety and control measures with respect to the CNSC's safety and control area (SCA) framework, for the purpose of evaluating OPG's application for a licence to construct.

54. In section 2 of CMD 24-H3, CNSC staff submitted that 12 of the 14 SCAs are applicable to OPG's application for a licence to construct, as outlined by REGDOC-1.1.2:

[47] Transcript, January 9, 2025, pages 197-203.

- Management System
- Human Performance Management
- Operating Performance
- Safety Analysis
- Physical Design
- Radiation Protection
- Conventional Health and Safety
- Environmental Protection
- Emergency Management and Fire Protection
- Waste Management
- Security
- Safeguards and Non-Proliferation

The Fitness for Service SCA is not applicable because fitness for service considerations are addressed within the Physical Design SCA and commissioning considerations are addressed within the Operating Performance SCA. The Packaging and Transport SCA is not applicable because it applies to the safe packaging and transport of nuclear substances. OPG's application did not request authorisation of use of nuclear substances and radiation devices, therefore, there are no packaging or transport requirements.

3.5.1 Management System

55. The management system SCA covers the framework that establishes the processes and programs required to ensure that OPG achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

56. Paragraph 3(1)(k) of the GNSCR states that a licence application shall contain "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;"

57. Paragraph 3(d) of the CINFR states that an application for a licence in respect of a Class I nuclear facility shall contain "the proposed management system for the activity to be licensed, including measures to promote and support safety culture." Paragraph 5(c) of the CINFR states that an application for a licence to construct a Class I nuclear facility shall contain "the proposed construction program, including its schedule".

58. Section 4.1 of REGDOC-1.1.2 specifies that an application for a licence to construct should describe the management system that has been, or will be, put in place to protect health, safety and the environment, and should also describe the organizational management structure.

59. CSA N286-12, *Management System Requirements for Nuclear Facilities*[48] provides an overall management framework and direction to develop and implement sound management practices and controls for the licensing basis. REGDOC-2.1.2, *Safety*

[48] CSA N286-12, *Management System Requirements for Nuclear Facilities,* CSA Group, 2012 (R2022).

Culture[49] sets out requirements and guidance for fostering a healthy safety culture and conducting safety culture assessments.

60. In section 4.1 of CMD 24-H3.1, section 4.1 of its application, and section 6.1 of CMD 24-H3.1C, OPG provided information on its management system for the DNNP including information on the DNNP Integrated Project Delivery (IPD) model and organization structure, management system governance documentation, configuration management and change control processes, and safety culture. In CMD 24-H3.1G, OPG provided a map of DNNP project plans and how they relate to OPG's overall nuclear management system.

61. In section 4.1 of CMD 24-H3.1, OPG submitted information on the structure of the DNNP organization and the specific roles of OPG and each of its contract partners under the IPD model. The responsibilities of OPG and its contract partners are as follows:

- OPG: The owner and licence holder; OPG will maintain responsibility for the project, including oversight of licensed activities, operator training, commissioning, Indigenous engagement, and stakeholder outreach
- GEH: The technology developer; provides design, procurement of major components and engineering support
- AtkinsRéalis: The architect engineer; provides design, engineering and procurement support
- Aecon: The constructor; will provide construction planning and execution

62. In section 4.1.1 of CMD 24-H3.1, OPG reported that each contract partner is required to implement a quality assurance program and management system, in compliance with CSA N286-12. OPG submitted that it had audited each contract partner to verify compliance with the requirements of CSA N286-12 and CSA N299.1, *Quality Assurance Program Requirements for the Supply of Items and Services for Nuclear Power Plants*,[50] and that it had qualified them on OPG's approved suppliers list. OPG noted that it regularly conducts follow-up audits to ensure ongoing compliance.

63. In section 4.1.3 of CMD 24-H3.1, OPG provided information on the DNNP configuration management plan. OPG submitted that this plan establishes a means to maintain consistency between design requirements, the design, the physical plant configuration, and configuration information. OPG reported that it conducts configuration oversight using a graded approach such that complex or safety significant activities will have more frequent and intrusive oversight.

64. Regarding the maintenance of safety culture, OPG submitted, in section 4.1.4 of CMD 24-H3.1, that OPG and its contract partners integrate a healthy nuclear safety and security culture throughout their management system polices and procedures. OPG also reported that the DNNP nuclear safety and security culture program establishes a framework for ongoing monitoring of safety culture, including the execution of safety

[49] REGDOC-2.1.2, *Safety Culture*, CNSC, April 2018.
[50] CSA N299.1, *Quality Assurance Program Requirements for the Supply of Items and Services for Nuclear Power Plants,* CSA Group, 2016.

and security culture assessments.

65. In section 2.1 of CMD 24-H3. CNSC staff submitted that OPG has a management system in place that satisfies the requirements of CSA N286-12 and is sufficient to manage the activities that would be authorized under the proposed licence to construct. Specifically, CNSC staff reported that:

- OPG has demonstrated that its change management process, as documented in the DNNP program management and execution plans, meets regulatory requirements
- OPG's configuration management process, as applicable to the licence to construct for the DNNP, is documented as required
- OPG has demonstrated that its approach to fostering a healthy safety culture will be in accordance with CSA N286-12 and REGDOC-2.1.2

CNSC staff also identified additional information regarding the management system SCA that OPG would be required to submit prior to the consideration of removal of the first regulatory hold point, should the Commission issue the licence to construct as proposed. Such information includes additional information on the procurement of long-lead items, procurement oversight, and quality assurance standards for SSCs important to safety. OPG will have to provide the required information, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

66. The Commission asked OPG how it would ensure that expectations are clear for each IPD partner. An OPG representative explained that the IPD model is currently in use under OPG's site preparation licence for the DNNP and that processes to allow the IPD partners to work together effectively are already in place.[51] Asked how information is shared between IPD partners, an OPG representative said that the IPD partners use a common computer system to share DNNP documentation; this system is already in use for current activities under OPG's site preparation licence.[52]

67. The Commission asked for additional information on how conflict between IPD contract parties is managed. An OPG representative explained that its management system includes a dispute resolution process to manage internal conflicts. CNSC staff noted that, should the Commission issue the licence to construct, CNSC staff's compliance verification activities would include verification that OPG is taking accountability to work through disputes with its contract partners to ensure that the licensing basis is maintained.[53]

68. Asked how OPG applied lessons learned to the DNNP management system, an OPG representative explained that OPG had integrated lessons learned from the Darlington NGS Refurbishment Project and international new build projects, such as Hinkley Point

[51] Transcript, October 2, 2024, pages 154-155.
[52] Transcript, October 2, 2024, page 113.
[53] Transcript, January 8, 2025, pages 100-102.

C[54] and the Vogtle Project,[55] into its management system for the DNNP. Another OPG representative noted that OPG had also implemented lessons learned from the site preparation phase of the DNNP. Such lessons learned included the management of traffic on site, onboarding of staff, and engagement with Indigenous Nations and communities regarding the issuance of permits. CNSC staff noted that it also tracked lessons learned throughout the site preparation period and have applied those lessons to its compliance verification plan.[56]

69. Several intervenors including Judith Fox Lee (CMD 24-H3.66), the Canadian Coalition for Nuclear Responsibility (CCNR) and Prolet Inc. (CMD 24-H3.67), and Piotr Ciompa (CMD 24-H3.86) expressed concerns that OPG and CNSC staff were rushing the DNNP licensing process. Asked to comment on the DNNP project timeline, an OPG representative explained that the DNNP began in 2006, the EA was conducted in 2011, the Commission issued OPG's site preparation licence in 2012, and OPG selected the BWRX-300 reactor technology for the DNNP in 2021.[57] Since 2021, the Commission has renewed OPG's site preparation licence and determined that the DNNP EA remains applicable to the BWRX-300 technology. CNSC staff confirmed that it has taken no shortcuts in its regulatory review of OPG's application for a licence to construct, or on OPG's previous applications regarding the DNNP. CNSC staff noted that its assessment of the application is consistent with the CNSC's mandate to ensure nuclear safety.[58]

70. The Commission asked CNSC staff to explain its approach to assessing OPG's application for a licence to construct. CNSC staff explained that, prior to receiving OPG's application, CNSC staff had prepared a licence application review plan and conducted benchmarking with international regulators to assess the CNSC's readiness to license small modular reactor technologies. CNSC staff also held discussions with OPG regarding the REGDOCs, codes, and standards that would be applicable to this licensing phase. CNSC staff stated that its licence application review was an iterative process that involved assessments by CNSC staff's technical specialists and 630 information requests to OPG. CNSC staff noted that 70 of those requests remain open and have dedicated regulatory review teams working on them.[59]

71. Asked how disagreements are managed between OPG and CNSC staff, particularly regarding the open information requests, CNSC staff explained that its goal is to have the necessary information provided so as to assess whether OPG meets requirements. If CNSC staff and OPG are unable to come to an agreement on a matter, the matter can ultimately be brought before the Commission for its decision.[60]

72. In section 2.1.2.1 of CMD 24-H3, CNSC staff submitted that OPG was in the process of revising its definition of oversight in the DNNP project assurance program

[54] Hinkley Point C is a nuclear reactor new build project currently under construction in the United Kingdom.
[55] The Vogtle Project refers to an expansion project to build two new nuclear reactors at the Vogtle Electric Generating Plant in the United States. This project is now complete, with the second new nuclear reactor entering commercial operation in 2024.
[56] Transcript, October 2, 2024, pages 137-140 and 147-148.
[57] Transcript, January 8, 2025, pages 103-104.
[58] Transcript, January 14, 2025, pages 41-42.
[59] Transcript, January 14, 2025, pages 12-18.
[60] Transcript, January 8, 2025, pages 102-103.

management plan to satisfy CNSC staff's expectation. Asked for an update on this matter, CNSC staff reported that OPG had updated its definition of intrusive oversight in a manner that is acceptable to CNSC staff.[61]

73. The Commission asked for more information on how OPG would verify that the BWRX-300 facility is constructed in accordance with the final design. An OPG representative explained that OPG has both an engineering oversight team and a construction center of excellence organization that will review the work done to ensure that construction quality and design accuracy is maintained. CNSC staff also confirmed that it will have experienced inspectors on site to verify the completion of construction and quality assurance activities.[62]

74. On the topic of safety culture, the Commission asked OPG to explain how safety culture would be maintained during construction activities. An OPG representative explained that onboarding for all DNNP workers includes safety culture training and that OPG maintains a database where workers can freely raise safety culture issues.[63] Another OPG representative informed the Commission that OPG has also conducted two DNNP safety culture assessments which it has used to identify opportunities to improve its safety culture. OPG's most recent safety culture assessment utilized feedback from over 2,000 people working either full or part-time on the DNNP. The OPG representative stated that OPG plans to continue assessing its safety culture throughout the licence to construct phase of the Project.[64]

75. Regarding the adequacy of the supply chain to support the construction of the DNNP, an OPG representative explained that OPG identifies its supply needs early in the project planning phase and engages with the supply chain to ensure that those project needs can be met. OPG audits suppliers to ensure that their quality processes and programs satisfy regulatory requirements before adding the supplier to OPG's approved suppliers list. OPG ensures that it has redundancy in its approved suppliers and also aims to maximize its use of the local supply chain within Ontario and Canada.[65] The Municipality of Clarington (CMD 24-H3.54) encouraged OPG to increase its use of the local supply chain.

76. The Commission concludes that OPG has an appropriate management system in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing management system programs and processes are adequate to support the licensed activities
- OPG's management system includes measures to promote and support safety culture, and meets regulatory requirements, including CSA N286-12 and REGDOC-2.1.2
- OPG has successfully implemented the IPD model under its current site preparation licence for the DNNP and has clearly outlined the responsibilities of

[61] Transcript, January 14, 2025, page 32-33.
[62] Transcript, January 9, 2025, pages 73-76.
[63] Transcript, January 14, 2025, pages 44-47.
[64] Transcript, October 2, 2024, pages 152-153.
[65] Transcript, January 9, 2025, pages 32-33 and 295-297.

each IPD partner under the licence to construct
- OPG is required to submit additional information on the procurement of long-lead items, procurement oversight, and quality assurance standards for SSCs important to safety to the CNSC, prior to the consideration of removal of the first regulatory hold point
- CNSC staff will review all additional management system information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.2 Human Performance Management

77. The human performance management SCA encompasses activities that ensure that OPG staff are sufficient in number in all relevant job areas and have the necessary knowledge, skills, procedures, and tools in place to safely carry out their duties.

78. Paragraph 3(d.1) of the CINFR states that an application for a licence in respect of a Class I nuclear facility shall contain "the proposed human performance program for the activity to be licensed, including measures to ensure workers' fitness for duty." Paragraphs 5(1) and 5(m) of the CINFR state that an application for a licence to construct a Class I nuclear facility shall contain "the proposed program and schedule for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility" and "a description of any proposed full-scope training simulator for the nuclear facility."

79. Section 4.2 of REGDOC-1.1.2 specifies that an application for a licence to construct shall document the graded approach it is planning to implement to comply with the requirements and guidance in the CINFR, REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue*,[66] and REGDOC-2.2.4, *Fitness for Duty Volume II: Managing Alcohol and Drug Use*.[67] The application shall also describe a training system that is in accordance with REGDOC-2.2.2, *Personnel Training*.[68] REGDOC-2.2.2 sets out requirements and guidance for the analysis, design, development, implementation, evaluation, documentation and management of training at nuclear facilities within Canada, including the essential principles and elements of an effective training system.

80. In section 4.2 of CMD 24-H3.1, section 4.2 of its application, and section 6.2 of CMD 24-H3.1C, OPG provided information on its human performance management program, including information on personnel training and certification, resource management. OPG also provided information on its oversight of its contractors' human performance programs.

81. OPG submitted that training for personnel engaged in the activities that would be licensed under the proposed licence to construct include:

- training of staff and contractors conducting construction and commissioning

[66] REGDOC-2.2.4, *Fitness for Duty*: *Managing Worker Fatigue*, CNSC, March 2017.
[67] REGDOC-2.2.4, *Fitness for Duty, Volume II*: *Managing Alcohol and Drug Use*, Version 3, CNSC, January 2021.
[68] REGDOC-2.2.2, *Performance Training*, Version 2, CNSC, December 2016.

activities
- initial training and qualification programs for certified staff (including simulator training), field operations personnel, maintenance, and associated OPG instructors.

OPG reported that its training program will follow a systematic approach to training (SAT) approach that focuses on BWR technology and the DNNP management system. OPG noted that its contracted partners are responsible for the training and qualification of their staff and sub-contractors under their respective management systems.

82. OPG submitted that its initial training and qualification programs will also support the certification of workers.[69] OPG noted that this certification would be completed as part of a future application for a licence to operate the reactor, and prior to fuel-in commissioning. In section 2.2 of CMD 24-H3, CNSC staff identified that OPG would be required to submit its program to train and qualify reactor workers to CNSC staff, prior to the consideration of removal of the third proposed regulatory hold point, should the Commission issue the licence to construct. OPG has committed to provide the requested information, as described in the proposed LCH.

83. In section 2.2 of CMD 24-H3, CNSC staff submitted that OPG has a human performance management program in place that meets regulatory requirements, including REGDOC-1.1.2 and REGDOC 2.2.2. CNSC staff reported that OPG has a satisfactory SAT-based training program in place at the Darlington NGS which has been implemented under OPG's fleet-wide training program. OPG's human performance management program, training program, and the procedures under it, will be applied to work during the licence to construct phase of the DNNP to ensure that workers are trained and qualified to carry out the proposed licensed activities.

84. Regarding worker fitness for duty, CNSC staff noted that nuclear substances will not be on-site during the construction phase and, therefore, REGDOC-2.2.4 and REGDOC-2.2.4 Volume II will not apply. OPG will be required to use these REGDOCs during development of its fitness for duty program in advance of an application for a licence to operate the DNNP. CNSC staff noted that, during the licence to construct phase, OPG's contractors are required to manage their employees' fitness for duty in compliance with all applicable provincial employment and health and safety legislation as well as the master service agreements between OPG and its contractors. CNSC staff added that OPG will be required to oversee the contractors' compliance with these requirements.[70]

85. On the topic of training contract workers, an OPG representative explained that OPG has an established training program that its contract partners must follow. The program includes DNNP-specific onboarding training which all workers must complete before they can enter the site and work.[71]

86. The Commission asked for more information on the training that workers would require to support the construction of the BWRX-300 reactor. An OPG representative

[69] Personnel certification relates to the qualification of certain workers that are employed in positions of immediate relevance to nuclear safety.
[70] Section 2.2 of CMD 24-H3.
[71] Transcript, January 14, 2025, pages 156-158.

responded that the construction of the BWRX-300 reactor will utilize well-understood excavation, building, and assembly practices. All workers would be trained, and have demonstrated their abilities, before they would be allowed to work in the field.[72]

87. The Commission asked about OPG's approach to building a workforce to support the DNNP. An OPG representative explained that OPG has a DNNP resource management plan in place which is updated annually to reflect staffing needs. OPG also engages with trade unions and training centres, and conducts outreach activities with local colleges and secondary schools in order to help develop the next generation of workers.[73]

88. The Commission asked for additional information on OPG's plans to train operators ahead of the operations phase of the DNNP. An OPG representative said that OPG is currently developing its operator training program and expects to have authorized staff in training by mid-2026.[74] The OPG representative noted that OPG has integrated industry operational experience from the American BWR operator Tennessee Valley Authority (TVA) into its operator training program, and has sent OPG staff to TVA to experience their processes first-hand.[75] Asked about the status of the simulator, an OPG representative informed the Commission that the simulator is currently under development and would be ready for use at the end of 2025.[76]

89. The Commission asked how OPG was planning to involve operations staff in the licence to construct phase of the DNNP. An OPG representative informed the Commission that OPG has established a dedicated operations and maintenance team within the DNNP organization.[77] Another OPG representative informed the Commission that the DNNP operations and maintenance teams have already started integrating with the DNNP construction team on the development of commissioning plans.[78]

90. Regarding CNSC staff's readiness to verify compliance for the DNNP, CNSC staff informed the Commission that it has a plan in place for the licence to construct phase of the DNNP. CNSC staff explained that it developed its compliance plan based on experience from the Darlington NGS Refurbishment Project and on international regulatory experience from the US NRC. CNSC staff noted that it has assessed resource requirements for this compliance plan, and that the CNSC will ensure that it is staffed appropriately.[79]

91. The Commission concludes that OPG has an appropriate human performance management program in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

[72] Transcript, January 14, 2025, pages 60-61.
[73] Transcript, January 9, 2025, pages 65-67.
[74] Transcript, October 2, 2024, pages 159.
[75] Transcript, January 14, 2025, pages 47-49.
[76] Transcript, October 2, 2024, page 164.
[77] Transcript, January 14, 2025, pages 47-48.
[78] Transcript, January 14, 2025, pages 62-63.
[79] Transcript, January 9, 2025, pages 67-70.

- OPG has a SAT-based training program that is adequate to support the activities that would be licensed under the licence to construct
- OPG's SAT-based training program integrates international lessons learned and meets regulatory requirements, including REGDOC-2.2.2
- OPG has proposed measures to verify that its contract partners comply with all fitness for duty requirements during the licence to construct phase
- OPG is working on finalizing its personnel certification program in preparation for its future application for a licence to operate
- OPG has provided an adequate program and schedule for recruiting, training and qualifying workers, and a description of a full-scope training simulator for the nuclear facility, that meet the requirements of the CINFR
- OPG is required to submit its program to train and qualify reactor workers to the CNSC, prior to the consideration of removal of the third regulatory hold point
- CNSC staff will review the additional training program information when submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.3 Operating Performance

92. The operating performance SCA includes an overall review of the conduct of the activities to be licensed and the activities to enable effective performance at the DNNP.

93. Paragraphs 3(1)(b) and 3(1)(c) of the GNSCR state that a licence application shall contain "the activity to be licensed and its purpose" and "the name, maximum quantity, and form of any nuclear substance to be encompassed by the licence." Paragraph 5(c) of the CINFR states that an application for a licence to construct a Class I nuclear facility shall contain "the proposed construction program, including its schedule".

94. Sections 3.2 and 4.3 of REGDOC-1.1.2 specify that an application for a licence to construct shall describe the programs and their proposed measures, policies, methods, and procedures for constructing and commissioning the nuclear facility. For activities conducted under the licence to construct, the applicant shall characterize the risks to health, safety and the environment that may be encountered by workers and the public, and shall outline the strategy that the applicant will take upon discovery of additional risks to the health and safety of the public that were not anticipated during the licence application process.

95. REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*[80] sets out the timing and information that nuclear power plant licensees are required to report to the CNSC. REGDOC-2.3.1, *Conduct of Licensed Activities: Construction and Commissioning Programs*[81] sets out requirements and guidance for the construction and commissioning of reactor facilities in Canada.

96. In section 4.3 of CMD 24-H3.1 and section 4.3 of its application, OPG provided

[80] REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, Version 2, CNSC, July 2022.
[81] REGDOC-2.3.1, Conduct of Licensed Activities: Construction and Commissioning Programs, CNSC, January 2016.

information on its procedures, construction program, and commissioning program. OPG also provided a high-level construction schedule in Figure 1.1-2 in its application. OPG acknowledged that it will have the primary responsibility for the safety and security of construction and commissioning activities at the DNNP site, including the work carried out on its behalf by contractors.

97. In section 2.3 of CMD 24-H3, CNSC staff submitted that OPG has in place the necessary procedures to meet the expectations of REGDOC-1.1.2 and REGODC-2.3.1. CNSC staff also noted that OPG has proposed adequate measures to meet the reporting requirements of REGDOC-3.1.1. CNSC staff identified additional information regarding the operating performance SCA that OPG would be required to submit prior to the consideration of removal of the first regulatory hold point, should the Commission issue the licence to construct. OPG will have to provide the requested information, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

98. The Commission asked OPG about how components received on site would be protected from foreign materials during construction activities. An OPG representative explained that OPG has processes in place to receive, inspect, and store components on site in a manner that would protect them from foreign materials, extreme temperatures, and other hazards. OPG also plans to build warehouses on site to safely store components. CNSC staff confirmed that it would conduct compliance verification activities to verify the implementation of OPG's foreign material exclusion processes.[82]

99. Asked for more information on the fuel-out commissioning activities that would be conducted under the proposed licence to construct, an OPG representative explained that fuel-out commissioning would include all the testing activities that could be executed without fuel in the reactor core. The OPG representative added that OPG will finalize its commissioning procedures once the BWRX-300 design is complete.[83]

100. The Commission concludes that OPG has an adequate operating performance program in place for the conduct of the activities that would be authorized under the proposed licence to construct. The Commission finds that:

- OPG has in place the necessary procedures to meet the expectations of REGDOC-1.1.2, REGODC-2.3.1, and REGDOC-3.1.1 while conducting the activities under the proposed licence to construct
- OPG has adequate processes in place to ensure that the BWRX-300 is constructed with quality and in line with the final design
- OPG is leveraging industry BWR operating experience in the preparation of operating procedures for the BWRX-300
- CNSC inspectors will maintain an on-site presence throughout the licence to construct phase
- OPG is required to submit additional information on the operating performance SCA to the CNSC, prior to the consideration of removal of the first regulatory hold point
- CNSC staff will review all additional operating performance program

[82] Transcript, October 2, 2024, pages 171-174.
[83] Transcript, January 14, 2025, pages 64-65.

information when submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.4 Safety Analysis

101. The safety analysis SCA includes maintenance of the safety analysis that supports the overall safety case for the DNNP. Safety analysis includes a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventive measures and strategies in reducing the effects of such hazards.

102. Paragraph 3(1)(i) of the GNSCR states that a licence application shall contain "a description and the results of any test, analysis or calculation performed to substantiate the information included in the application." Paragraph 5(f) of the CINFR states that an application for a licence to construct a Class I nuclear facility shall contain "a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility."

103. Section 4.4 of REGDOC-1.1.2 specifies that an application for a licence to construct shall include a preliminary safety analysis report for the reactor facility. The report should include a deterministic safety analysis, a probabilistic safety assessment, and a hazards analysis, commensurate with the level of design. The application should demonstrate that all levels of defence in depth are addressed and should confirm that the facility's design is capable of meeting the applicable dose acceptance criteria and safety goals.

104. In section 4.4 of CMD 24-H3.1, section 4.4 of its application, and sections 2.0 and 3.4 of CMD 24-H3.1C, OPG submitted information on its safety analysis program including information on safety objectives, defence in depth, postulated initiating events, deterministic safety analysis, hazard analysis, probabilistic safety assessment, severe accident analysis, and accident management.

105. OPG provided the *BWRX-300 Preliminary Safety Analysis Report*[84] (PSAR) alongside its application. OPG reported that its PSAR and supporting safety analyses demonstrate that the BWRX-300 reactor will be capable of meeting the safety goals defined in REGDOC 2.5.2, *Design of Reactor Facilities*.[85] OPG noted that the BWRX-300 design and safety analysis are progressing in parallel and iteratively, as per guidance of REGDOC-1.1.2. OPG added that it would provide additional information to CNSC staff as the design and safety analysis are finalized.

106. Regarding defence-in-depth, OPG submitted, in section 4.4.1 of CMD 24-H3.1, that the BWRX-300 reactor is designed for international deployment and utilizes International Atomic Energy Agency (IAEA) standards in its safety methodology. OPG reported that the BWRX-300 safety strategy relies on five defence lines (DLs) consistent with the IAEA defence-in-depth concept and REGDOC-2.5.2, REGDOC-2.4.1, and REGDOC-

[84] *Darlington New Nuclear Project – BWRX-300 Preliminary Safety Analysis Report*, Revision 1, GEH, March 31, 2023.
[85] REGDOC 2.5.2, Design of Reactor Facilities, Version 2, CNSC, April 2023.

2.4.2 requirements. The five defence lines include:

- DL1 – includes features and functions that are aimed at the prevention of deviations from normal operation and the prevention of failures of SSCs important to safety.
- DL2 – includes features and functions that are aimed at detection and control of deviations from normal operation.
- DL3 – includes functions that are intended to act to mitigate postulated initiating events leading to accident conditions.
- DL4 – includes DL4a and DL4b functions. DL4a functions detect and mitigate design extension conditions that occur without core damage. DL4b functions detect and mitigate design extension conditions that cause core damage.
- DL5 – includes features and functions that are intended to mitigate or reduce the consequences of radioactive releases through implementation of emergency preparedness measures.

The application of the defence-in-depth concept is discussed further in section 3.5.5.2 of this *Record of Decision*.

107. In section 2.4 and Appendix A.1 of CMD 24-H3, and in section 3 of CMD 24-H3.F, CNSC staff provided information on its review of OPG's safety analysis submissions. CNSC staff reported that OPG had provided sufficient information to enable CNSC staff to recommend that the Commission issue a licence to construct, with conditions. CNSC staff noted that safety analysis is an iterative process and that there are areas where OPG will be required to provide additional information to demonstrate compliance with regulatory expectations, as the BWRX-300 design and safety analysis progress. OPG will have to provide the requested information, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

108. CNSC staff further noted that OPG would be required to revise the PSAR based on the final BWRX-300 design. This updated safety analysis report would be required as part of a future application from OPG for a licence to operate.

109. The Commission asked CNSC staff to clarify its determination of the adequacy of the PSAR, and how the safety analysis may be impacted as the design progresses. CNSC staff explained that, at this stage of the design, the safety analysis was sufficiently developed to provide quantitative and qualitative evidence that the BWRX-300 design will meet its safety goals with adequate margin. CNSC staff noted that the exact margin may increase or decrease as the design is finalized, however, CNSC staff have enough information to be confident that the safety goals will not be challenged.[86]

3.5.4.1 Hazard Analysis

110. OPG provided the methodology and preliminary results for its hazard analysis in section 15.1 of the PSAR, and in the supporting documents *BWRX-300 DNNP Hazard*

[86] Transcript, January 9, 2025, pages 113-117 and 251-252.

Analysis Methodology[87] and *BWRX-300 DNNP Hazard Analysis Results.*[88]

111. In section 2.4.2.1 and Appendix A.1.1 of CMD 24-H3, CNSC staff reported that OPG's hazard analysis methodology was based on internationally accepted guidelines. CNSC staff was satisfied with OPG's fire, seismic, wind, meteorological, and flooding hazards assessments, and explained why it was of the view that OPG had adequately considered the hazards posed by climate change. OPG will be required to provide more detailed information on its hazards analysis results prior to consideration of the removal of the first regulatory hold point. OPG's requirement in this respect is detailed in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

112. In Appendix A.1.1 of CMD 24-H3, CNSC staff reported that OPG's hazard screening analysis identified that seismic hazards, high winds, internal fires, internal floods, and drops of heavy loads were hazards to be assessed in detail in the probabilistic safety assessment. CNSC staff found the results of OPG's hazards screening analysis to be adequate and in line with CNSC expectations.

113. Several intervenors, including the Nuclear Transparency Project (CMD 24-H3.68) and Durham Nuclear Awareness, Slovenian Home Association, and Canadian Environmental Law Association (CELA; CMD 24-H3.84, CMD 24-H3.84A) raised concerns regarding the impacts of climate change on the DNNP, including how severe weather events may impact the future safe operation of the facility. Asked for more information on OPG's consideration of climate change, an OPG representative stated that OPG had completed a two-phased climate change risk assessment which considered environmental conditions at the Darlington Nuclear site to the year 2100. The OPG representative added that the assessment provided the basis on which OPG was confident in the ability of the DNNP facility to withstand current and future environmental conditions.[89]

114. On the topic of climate change, CNSC staff stated that OPG's contingency plans for flooding and other extreme weather hazards were being tracked under JRP commitment D-C-7, as detailed in the *DNNP Commitments Report*. CNSC staff noted that it found OPG's plans to be compliant with REGDOC-1.1.2 and recent guidance from Environment and Climate Change Canada. CNSC staff noted that commitment D-C-7 remains open pending additional clarifications from OPG, however, CNSC staff expect this action to be able to be closed in the near future.[90]

115. The intervention by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) raised a concern that external flooding could impact the BWRX-300 reactor building, given the proximity of the facility to Lake Ontario. Asked to respond to this concern, an OPG representative clarified that the reactor building would be located approximately 200 metres from the lake shore, and described the construction techniques and design features that would protect the BWRX-300 reactor building from external flooding. These measures include the diaphragm-plate steel composite reactor building structure,

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[87] *BWRX-300 DNNP Hazard Analysis Methodology*, NK054-REP-01210-00144, OPG, September 2022. Confidential.
[88] *BWRX-300 DNNP Hazard Analysis Results*, NK054-REP-01210-00158, OPG, October 2022. Confidential.
[89] Transcript, January 14, 2025, pages 237-239.
[90] Transcript, January 14, 2025, pages 239-240.

sealing the external surface of the reactor building, and backfilling the area to prevent groundwater intrusion. The OPG representative added that the design includes internal sump pumps to remove any water, should those measures fail.[91]

116. Regarding OPG's flood hazards assessment, CNSC staff confirmed that it had reviewed the assessment and found no safety concerns related to external flooding hazards, either from groundwater levels or from the proximity to Lake Ontario. CNSC staff noted that the BWRX-300 reactor building was designed to withstand the maximum extent of flood and highest groundwater level, in accordance with the requirements of REGDOC 2.5.2. CNSC staff further noted that the flood hazards assessment is updated every five years, along with all external hazards assessments and the probabilistic safety assessment.[92]

117. The intervention by the CEDAR Project Environment & Society Program (CMD 24-H3.14) referenced a 2015 University of Toronto PhD thesis[93] which asserted that seismic assessments for the Darlington Nuclear site had been inadequate. Asked to comment on this assertion, a representative from Natural Resources Canada (NRCan) explained that seismic hazard assessments are performed to consider all possible cases of earthquakes and how they could contribute to the ground shaking at a particular site. The NRCan representative explained that OPG conducted a seismic hazard study which found that the seismic hazard at the Darlington site is more sensitive to large-scale background seismicity and that the local features of the site did not contribute as significantly. NRCan found OPG's assessment to be acceptable.[94]

118. Asked how seismic events could impact the below-grade BWRX-300 reactor building, an OPG representative noted that seismic waves are amplified as they travel from the bedrock up through soil layers following a seismic event. The OPG representative explained that the BWRX-300 reactor building foundation will be embedded directly onto bedrock which will reduce the impacts on the reactor building structure during a seismic event. CNSC staff concurred with the OPG representative on this matter.[95]

119. The Commission asked for additional information on what risk seismically-induced liquefaction[96] may pose to the DNNP facility. CNSC staff informed the Commission that OPG considered seismically-induced liquefaction under both the design-basis earthquake and the beyond-design-basis earthquake event scenarios in the hazard analysis. CNSC staff added that OPG would replace soil above the 80-metre elevation with non-liquifiable engineered backfill to mitigate any potential liquefaction hazard.[97] OPG is required to provide the CNSC with the results of backfill verification and test activities, prior to the consideration of removal of the first regulatory hold point, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

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[91] Transcript, January 9, 2025, pages 230-231.
[92] Transcript, January 9, 2025, pages 232-236.
[93] *Geologic Record of Intraplate Seismicity in Southern Ontario,* Katherine Ellen Wallace, Doctorate of Philosophy, Graduate Department of Physical and Environmental Sciences, University of Toronto Scarborough, 2015.
[94] Transcript, January 10, 2025, pages 17-19.
[95] Transcript, January 10, 2025, pages 19-20.
[96] Seismically-induced liquefaction is a phenomenon in which the strength and stiffness of saturated soil is reduced by earthquake shaking, causing the soil to behave like a fluid.
[97] Transcript, January 14, 2025, pages 26-28.

120. Asked if blasting activities during construction could present a liquefaction risk, an OPG representative clarified that the vibrations caused by construction blasts would be significantly lower than those caused by a design-basis earthquake. The OPG representative added that, given the replacement of soil with engineered backfill, OPG was confident that liquefaction would not present a risk to the BWRX-300 facility either during construction activities or as the result of a seismic event.[98]

121. Regarding seismic qualification, an OPG representative explained that OPG was conducting a review of which SSCs are required to perform their design function both during and following a design basis earthquake and therefore need to be seismically qualified. The OPG representative noted that OPG uses industry seismic testing data along with its own testing to validate the performance of SSCs during a seismic event, and that this performance information is then factored into the PSA to ensure that safety goals can be met. CNSC staff noted that it will review OPG's seismic qualification information prior to the consideration of removal of the first regulatory hold point.[99]

122. The interventions from CCNR and Prolet Inc. (CMD 24-H3.67) and CELA (CMD 24-H3.84, CMD 24-H3.84A) raised concerns regarding the proximity of the Darlington NGS to the DNNP facility and the impacts of a potential nuclear emergency at the Darlington NGS. On this topic, an OPG representative explained that:

- an accident at the neighbouring Darlington NGS was considered as an external hazard in the DNNP hazard analysis but was screened out due to very low probability
- the Darlington NGS and DNNP facility would be entirely separate from each other and would not share any infrastructure or support systems

CNSC staff concurred with the response provided by OPG and noted that OPG conducted its hazards analysis in accordance with regulatory requirements.[100]

123. CNSC staff noted that, as part of the final safety analysis (which would be required as part of a future application for a licence to operate) OPG will be required to provide additional information to show that workers within the BWRX-300 control room would not be negatively impacted by radiological releases during the unlikely scenario of a nuclear emergency at the Darlington NGS.[101]

3.5.4.2 Probabilistic Safety Analysis

124. REGDOC-2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*[102] sets out requirements and guidance for probabilistic safety assessments for reactor facilities.

125. OPG provided the methodology and preliminary results for its PSA in section 15.6 of

[98] Transcript, January 14, 2025, pages 28-31.
[99] Transcript, January 13, 2025, pages 26-30.
[100] Transcript, January 10, 2025, pages 132-137.
[101] Transcript, January 13, 2025, pages 143-144.
[102] REGDOC 2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants,* Version 2, CNSC, May 2022.

the PSAR, and in the supporting documents *BWRX-300 DNNP Probabilistic Safety Assessment Methodology*[103] and *BWRX-300 DNNP Probabilistic Safety Assessment Summary*.[104] In section 4.4.1.5 of CMD 24-H3.1, OPG reported that it conducted its PSA in accordance with REGDOC-2.4.2 and that the results of the PSA demonstrate that the BWRX-300 design meets the quantitative safety goals for core damage frequency (CDF), small release frequency (SRF), and large release frequency (LRF), as established in REGDOC-2.5.2, with significant margin.

126. In section 2.4.2.2.2 of CMD 24-H3, CNSC staff submitted that OPG's PSA is sufficient for a licence to construct. CNSC staff noted, however, that OPG will be required to provide additional information as the BWRX-300 design is finalized. OPG will have to provide updated PSA submissions as the design progresses, including uncertainty, sensitivity, and importance analyses, as well as a specific calculation of the SRF. OPG's requirements in this respect are detailed in Appendix D.2 of CMD 24-H3 and in the proposed LCH. CNSC staff reported that OPG has a sufficient process in place to perform and update PSA results, and that the current preliminary results indicate that the safety goals will be met.

127. The Commission asked how the safety goals for the BWRX-300 compared to those of larger BWRs in operation internationally. CNSC staff responded that the safety goals set in REGDOC-2.5.2, are consistent with international standards, particularly for water-cooled reactors. An OPG representative reiterated that current results show that the BWRX-300 will meet the safety goals established in REGDOC-2.5.2 with significant margin; for example, the LRF for the BWRX-300 has a frequency that is approximately seven percent of the regulatory safety goals.[105]

128. The Commission asked why a break between the reactor pressure vessel and a reactor isolation valve was not a postulated initiating event considered in the PSA. A representative from GEH clarified that a break in this area was considered in the PSA, however, such an event has an extremely low probability of occurrence. The GEH representative noted that the reactor isolation valves would be attached to the reactor pressure vessel via a robust flange assembly and that there would be no piping segments between the two components.[106]

129. The Commission also asked about the possibility of a break between a reactor isolation valve and the outer containment isolation valve. A GEH representative explained that a break in that area was also considered in the PSA, however, the probability of the event occurring was low enough that the event was considered to be a beyond design-basis event. The GEH representative noted that reactor was designed such that cooling could be maintained if a break in that area were to occur.[107]

130. The Commission asked for more information on the results of the seismic PSA. An

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[103] *BWRX-300 DNNP Probabilistic Safety Assessment Methodology*, NK054-REP-01210-00143, OPG, September 2022. Confidential.
[104] *BWRX-300 DNNP Probabilistic Safety Assessment Summary*, NK054-REP-01210-00163, OPG, September 2022. Confidential.
[105] Transcript, October 2, 2024, pages 214-216.
[106] Transcript, January 9, 2025, pages 218-219.
[107] Transcript, January 9, 2025, pages 219-220.

OPG representative explained that the preliminary seismic PSA had produced a low CDF and LRF when compared to the requirements of REGDOC 2.5.2. The OPG representative added that, because other hazards contribute very little to the overall risk and the BWRX-300 is a low-risk facility, seismic risk has an overall larger contribution to the PSA.[108]

131. Asked about the impacts of a seismic event on reactor components, an OPG representative explained that OPG had assessed seismic-induced component failures, and their impact on the safety of the facility, as part of the DNNP PSA. CNSC staff confirmed that the PSA results found that OPG had sufficient margin to meet its safety goals. CNSC staff further noted that OPG would be required to update the seismic PSA to reflect the final design and also to confirm that the conclusion of the current seismic PSA results are still valid and bounding.[109]

132. The Commission asked for more information concerning the assumptions OPG made in its seismic PSA.[110] An OPG representative provided the Commission with detailed information on how the analysis modelled the behaviour of soil and structures on the DNNP site in response to a seismic event. The OPG representative explained that, as is typical with complex modelling, OPG made some assumptions regarding soil properties and the behaviour of structures, which OPG then used to optimize the analysis. The OPG representative also noted that OPG had conducted extensive geotechnical investigations to understand the characteristics of the soil layers on the DNNP site and model them accurately. CNSC staff reported that OPG's seismic analysis was conducted in compliance with regulatory requirements. OPG will be required to provide additional information on this matter as the design is finalized, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.[111]

133. Asked if the main control room would be seismically qualified, a GEH representative explained that the main control room would not be qualified for a design-basis earthquake. Instead, the design includes a seismically qualified transit route to bring operators to a secondary control room. CNSC staff stated that it is awaiting more information from OPG on its choice to not seismically qualify the main control room. OPG will provide this information to CNSC staff prior to consideration of the removal of the first regulatory hold point.[112]

3.5.4.3 Deterministic Safety Analysis

134. REGDOC-2.4.1, *Deterministic Safety Analysis*[113] sets out requirements and guidance for the preparation and presentation of a safety analysis that demonstrates the safety of a nuclear facility.

135. By way of CMD 24-H3-Q, the Commission asked OPG and CNSC staff for specific

[108] Transcript, January 14, 2025, pages 101-105.
[109] Transcript, January 13, 2025, pages 20-24.
[110] Transcript, January 13, 2025, pages 24-26.
[111] Transcript, January 14, 2025, pages 4-10.
[112] Transcript, January 14, 2025, pages 105-106.
[113] REGDOC 2.4.1, *Deterministic Safety Analysis,* CNSC, May 2014.

information regarding use of the Transient Reactor Analysis Code GEH (TRACG) computer code to model the safety of the BWRX-300 design, including the modelling of start-up instabilities and the behaviour of the "Global Nuclear Fuel Mk. 2" (GNF2) fuel. CNSC staff and OPG responded to the Commission's questions in CMD 24-H3.F and CMD 24-H3.1C, respectively. In the responses, OPG and CNSC staff provided information including:

- TRACG was qualified under ASME standard NQA-1 *Quality Assurance Requirements for Nuclear Facility Applications*,[114] and CSA N286.7-16, *Quality Assurance of Analytical, Scientific, and Design Computer Programs*[115]
- TRACG validation was based on scaled and full-scale experimental data as well as data from operating BWRs, including natural circulation BWRs, and was subject to additional validation focused on novel BWRX-300 features
- the BWRX-300 design incorporates several features to mitigate power oscillations and enhance stability during startup
- voiding within the GNF2 fuel assemblies during start up is minimal
- there is no direct measurement indicative of boiling transition in the fuel assemblies. Instead, core monitoring precludes boiling transition and calculates critical power[116] for all fuel channels
- for conditions where the power coefficient of reactivity may be positive (e.g. below "hot standby"[117]), operators would maintain reactor power control using normal start-up or shutdown procedures. Operator actions would be supported by the wide range neutron monitoring system
- CNSC staff confirmed the adequacy of the GNF2 fuel bundle design
- OPG is required to provide additional information on TRACG qualification and the BWRX-300 stability analysis to the CNSC prior to the consideration of removal of specified regulatory hold points
- operating procedures such as startup procedures are not yet available and would be required as a part of a future application for a licence to operate

The Commission was satisfied with the responses provided by CNSC staff and OPG.[118]

136. Asked for more information on the verification of computer codes used in the BWRX-300 safety analysis, CNSC staff stated that it is OPG's responsibility to verify and validate the codes used, in line with CSA N286.7 and OPG's quality assurance program. CNSC staff used these codes to independently reproduce and verify the assumptions, methodology, and results of the provided analysis.[119]

137. Northwatch (CMD 24-H3.58) raised concerns regarding differences in the deterministic

[114] ASME NQA-1, *Quality Assurance Requirements for Nuclear Facility Applications*, American Society of Mechanical Engineers (ASME), 2022.
[115] CSA N286.7, *Quality Assurance of Analytical, Scientific, and Design Computer Programs,* CSA Group, 2016 (R2021).
[116] Critical power is the fuel bundle thermal power at the onset of boiling transition.
[117] "Hot standby" refers to core conditions where the coolant pressures and temperatures are at nominal values (7.2 MPa and 260 degrees Celsius, respectively), but the reactor is not producing electric output.
[118] Transcript, January 8, 2025, pages 89-90.
[119] Transcript, January 14, 2025, pages 112-115.

safety analysis conducted for the ESBWR and the analysis conducted respecting the BWRX-300. CNSC staff clarified that the ESBWR and BWRX-300 are different reactor designs and, as such, not all accident scenarios considered for the ESBWR are applicable to the BWRX-300. In addition, some accident scenarios considered under the analyses for both reactor designs were labelled differently in each analysis. An OPG representative noted that the deterministic safety analysis conducted for the BWRX-300 was done in accordance with REGDOC-2.4.1.[120]

138. The Commission asked how large and small pipe breaks would be managed by the BWRX-300 reactor. An OPG representative responded that, in the case of a large pipe break, the reactor pressure vessel would be isolated and the isolation condenser system would be placed in service to cool the core. For a small pipe break or leak, fuel cooling would not be challenged and the systems that maintain reactor cooling would already be in service.[121] CNSC staff noted that it is expecting additional analysis from OPG regarding the small loss of coolant accident scenario as part of the final safety analysis for the BWRX-300.[122]

3.5.4.4 Criticality Safety

139. REGDOC-2.4.3, *Nuclear Criticality Safety*[123] sets out requirements for nuclear criticality safety and provides guidance on how those requirements may be met.

140. OPG provided nuclear criticality analysis in the PSAR and supporting document *BWRX-300 DNNP Out of Core Criticality Safety Analysis Demonstration*.[124] In section 2.4.2.5 of CMD 24-H3, CNSC staff reported that OPG's criticality safety analysis was sufficient for the purposes of a licence to construct. CNSC staff noted that OPG is required to update its safety analysis with detailed criticality safety information as the design is finalized. This updated safety analysis report would be required as part of a future application from OPG for a licence to operate.

3.5.4.5 Severe Accident Analysis

141. The purpose of severe accident analysis is to evaluate the ability of the reactor to withstand challenges posed by beyond design-basis accidents and to identify any potential plant vulnerabilities. In section A.1.5 of CMD 24-H3, CNSC staff reported that it reviewed the severe accident analysis documented in chapter 15 of the PSAR as well as supporting documentation. CNSC staff found that OPG was required to provide additional information on its severe accident analysis to demonstrate compliance with REGDOCs 1.1.2, 2.4.1 and 2.5.2. OPG will have to provide this information prior to the consideration of removal of the first regulatory hold point, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

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[120] Transcript, January 14, 2025, pages 89-92.
[121] Transcript, January 9, 2025, pages 227-228.
[122] Transcript, January 14, 2025, page 111.
[123] REGDOC 2.4.3, *Nuclear Criticality Safety,* Version 1.1, CNSC, September 2020.
[124] *BWRX-300 DNNP Out of Core Criticality Safety Analysis Demonstration*, OPG, December 2023.

3.5.4.6 Conclusions on the Safety Analysis SCA

142. The Commission concludes that OPG's safety analysis program is adequate for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG has submitted a preliminary safety analysis report and supporting analyses that include a deterministic safety analysis, a probabilistic safety assessment, and a hazards analysis, commensurate with the level of design, in compliance with REGDOC-1.1.2, REGDOC-2.4.1, and REGDOC-2.4.2
- OPG's preliminary safety analysis has enough detail at this stage of licensing to show that the BWRX-300 will be able to meet its safety goals with sufficient margin to account for design changes as the design is finalized
- OPG is required to submit additional safety analysis information to the CNSC as the design is finalized, prior to the consideration of removal of the first regulatory hold point
- the additional safety analysis information that will be required to be submitted for consideration of removal of the first regulatory hold point has been adequately articulated
- CNSC staff will review all additional safety analysis information submitted by OPG to ensure that OPG satisfies its requirements and that the safety goals continue to be met

3.5.5 Physical Design

143. The physical design SCA includes the activities that affect the ability of SSCs to meet and maintain their design basis, given new information arising over time and taking changes in the external environment into account. The design basis is the range of conditions and events, according to established criteria, that the facility must withstand without exceeding authorized limits for the planned operation of safety systems.

144. Paragraph 3(1)(d) of the GNSCR states that a licence application shall contain "a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence." Paragraphs 3(a) and 3(b) of the CINFR state that an application for a licence in respect of a Class I nuclear facility shall contain "a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone" and "plans showing the location, perimeter, areas, structures and systems of the nuclear facility."

145. Paragraphs 5(a), 5(b), 5(d), 5(e), and 5(g) of the CINFR state that an application for a licence to construct a Class I nuclear facility shall contain:

- a description of the proposed design of the nuclear facility, including the manner in which the physical and environmental characteristics of the site are taken into account in the design
- a description of the environmental baseline characteristics of the site and the surrounding area

- a description of the structures proposed to be built as part of the nuclear facility, including their design and their design characteristics
- a description of the systems and equipment proposed to be installed at the nuclear facility, including their design and their design operating conditions
- the proposed quality assurance program for the design of the nuclear facility

146. Section 4.5 of REGDOC-1.1.2 specifies requirements and guidance for the information that an applicant for a licence to construct should provide related to physical design. Such information includes a general description of the overall conceptual physical design of the reactor facility, the design practices, the safety concepts, as well as the approach followed for the general design of SSCs. Additional guidance is provided regarding the provision of information pertaining to site characterization, design authority, defence in depth, safety classification of SSCs, and design change control.

147. In section 4.5 of CMD 24-H3.1, section 4.5 of its application and sections 2.0 and 3.0 of CMD 24-H3.1C, OPG provided information on the design of the BWRX-300, and the physical design program including the iterative design process, design considerations, safety classification of SSCs, and design change control. In section 1.8 of CMD 24-H3.1, section 3.0 of its application, and section 6.5 of CMD 24-H3.1C, OPG also provided information on the DNNP site including on site characterization as it relates to plant design.

148. OPG noted that GEH will remain the Design Authority for the BWRX-300 facility up until plant start-up; OPG will be an informed customer, providing owner oversight and operator inputs. OPG's role will include reviews and acceptance of design deliverables as well as surveillance of engineering activities performed by GEH and the other contract partners in accordance with their respective management systems.

149. In section 2.5 and Appendix A.2 of CMD 24-H3, and in section 3 of CMD 24-H3.F, CNSC staff provided information on its review of OPG's physical design program. CNSC staff submitted that the information provided by OPG for the design of the reactor, along with OPG's commitments to provide additional information as the design progresses, is sufficient for CNSC staff to determine that OPG has met regulatory requirements and to support a recommendation that the Commission issue a licence to construct.

Completeness of the Design

150. Several intervenors, including Ecojustice Working Group (CMD 24-H3.38), Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A), Northwatch (CMD 24-H3.58), Judith Fox Lee (CMD 24-H3.66), CCNR and Prolet Inc. (CMD 24-H3.67), CELA (CMD 24-H3.84, CMD 24-H3.84A), and Piotr Ciompa (CMD 24-H3.86) expressed concerns that the BWRX-300 design was not sufficiently complete for the Commission to authorize construction. A complete design is not required at the licence to construct stage; rather sufficient design information is needed to meet the requirements of the GNSCR, the CINFR, and REGDOC-1.1.2, as detailed above. Evidence that these requirements have been met is provided throughout section 3.5.5 of this *Record of Decision*. In section 3 of CMD 24-H3.F, CNSC staff reported that, as the design progresses, it will ensure that regulatory requirements continue to be met through ongoing compliance verification.

151. Regarding the status of the DNNP facility design, an OPG representative informed the Commission that the standard plant design was 95 percent complete.[125] CNSC staff noted that, based on international benchmarking, construction licences are typically issued when a design is approximately 30 percent complete.[126]

152. Asked for more information on how CNSC staff would be involved as the design is finalized, CNSC staff responded that it has proposed the use of regulatory hold points to ensure that OPG provides information to satisfy CNSC staff's outstanding design questions prior to the start of relevant construction milestones. The use of regulatory hold points is discussed further in section 3.8.3 of this *Record of Decision*. CNSC staff noted that it would also continue its regular compliance verification activities throughout the licence to construct phase, including regular inspections.[127]

153. The intervention by the CCNR and Prolet Inc. (CMD 24-H3.67) asserted that the US NRC had not granted a licence to construct a BWRX-300 reactor in the United States based on the incomplete BWRX-300 design. Asked to comment on this assertion, CNSC staff clarified that the CNSC and the US NRC are currently in different places in the regulatory process regarding the licensing of a BWRX-300 reactor. CNSC staff stated that the US NRC had not yet received an application for a licence to construct and, as such, the CNSC had received more information to review regarding the design. CNSC staff noted that the US NRC is a separate regulatory body with a different licensing process than the CNSC. CNSC staff noted that it has collaborated with the US NRC throughout the BWRX-300 licensing process to compare regulatory approaches.[128]

Design Changes and Configuration Management

154. In section 4.5.5.1 of CMD 24-H3.1, OPG reported that the BWRX-300 design configuration will be maintained throughout the lifecycle of the DNNP through the engineering change control process overseen by the Design Authority. An OPG representative clarified that OPG provides review and acceptance of design changes through the engineering change control process and provides a design change report to the CNSC on a quarterly basis. OPG also provides CNSC staff with early notification of any significant design changes.[129]

155. Asked how OPG would manage new technologies that may arise during the design process, an OPG representative noted that design changes may be submitted for new technologies, such as the latest logic and controls systems, as the design is finalized and OPG contacts vendors for those systems. Any design changes will follow OPG's established engineering change control process. CNSC staff noted that it would review any such design changes to ensure that OPG can implement the change safely while remaining within the licensing basis.[130]

[125] Transcript, January 13, 2025, page 180.
[126] Transcript, January 14, 2025, page 43.
[127] Transcript, January 8, 2025, pages 89-93.
[128] Transcript, January 9, 2025, pages 91-96.
[129] Transcript, January 13, 2025, pages 192-193.
[130] Transcript, January 13, 2025, pages 207-209.

156. The Commission asked for more information regarding CNSC staff's review of design changes. CNSC staff stated that it reviews OPG's quarterly design change reports and engages with OPG when notified of significant design changes. CNSC staff review the changes to ensure that OPG is accounting for the aggregate impact of all design changes, and that the design changes do not invalidate the existing licensing basis. CNSC staff noted that if it were concerned that the licensing basis may be impacted by a design change, it would bring the matter before the Commission for its determination.[131]

3.5.5.1 Key BWRX-300 Design Features

157. The Commission considered the material on the record pertaining to the key features of the BWRX-300 design.

Reactor Isolation Valves

158. In section 2.1.1 of CMD 24-H3.1, OPG submitted that the BWRX-300 design includes reactor isolation valves (RIVs) that are integral to the reactor pressure vessel. The RIVs consist of two redundant valves, each able to automatically isolate the reactor pressure vessel to quickly stop leakage from the vessel in the scenario of a downstream pipe break.

159. The interventions from Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised several concerns regarding the reactor isolation valves including:

- OPG's claim that the RIVs are integral to the reactor pressure vessel
- the reliability of the RIVs

160. Asked how the RIVs are attached to the reactor pressure vessel, a GEH representative explained that the RIV is attached to the reactor pressure vessel nozzle via a flange assembly, and that the nozzle is integral to the vessel itself. The GEH representative explained that a flange connection was chosen because it provides a robust connection while avoiding the need for piping, and thereby eliminating the potential of a piping failure between the reactor pressure vessel and RIV.[132] CNSC staff stated that it expects OPG to provide additional information on how the RIV and reactor pressure vessel meet valve and vessel code requirements, respectively, as the design is finalized.[133]

161. Regarding the reliability of the RIVs, an OPG representative explained that the reliability and redundancy of the RIVs was considered in the design and safety analysis for the BWRX-300. The RIVs consist of two ball valves in series which are each independently able to isolate the pipes connected to the reactor pressure vessel. The valves are designed to fail safe, in the closed position, and would be continuously monitored for leakage. The OPG representative noted that this style of valve is

[131] Transcript, January 8, 2025, pages 93-96.
[132] Transcript, January 9, 2025, pages 215-218.
[133] Transcript, January 9, 2025, pages 144-145.

commonly used in the oil and gas industry and has a low probability of failure.[134]

162. The Commission asked how failure of the RIVs had been considered in the DNNP PSA. CNSC staff noted that the reliability of the RIVs was considered in the preliminary PSA based on reliability data from operating BWRs. CNSC staff noted that uncertainty regarding the reliability data used for the valves is considered in the PSA uncertainty analysis. OPG will be required to submit an updated uncertainty analysis alongside its final PSA, when the design is finalized.[135] OPG's requirements in this respect are detailed in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

Containment

163. In sections 2.1.4 through 2.1.6 of CMD 24-H3.1, OPG submitted information on the design of the BWRX-300 containment system. The containment structure comprises a leak-tight steel-plate composite containment vessel and uses a nitrogen-inert atmosphere during most operating modes. The containment vessel is located within the deeply embedded reactor building and encloses the reactor pressure vessel and some of its related systems and components. Containment temperature is maintained via a containment cooling system and passive containment cooling system.

164. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised concerns that the BWRX-300 design does not include overpressure relief valves on the containment structure. A GEH representative explained that the peak containment pressure for a design basis accident is significantly below the design pressure of the containment structure. In the unlikely case of a beyond design-basis accident that greatly exceeds containment pressure, the containment structure has a rupture diaphragm that would relieve containment pressure into a pool above containment. The pool would quench any steam and scrub any potential radioactive products.[136]

165. The Commission asked OPG to provide additional information on the operation of the passive containment cooling system (PCCS). An OPG representative explained that the PCCS is always in-service and requires no signals or operator action to actuate. The PCCS pipes contain water that transfers heat from the containment atmosphere to an equipment pool above containment via natural convection. There is never vapour in the PCCS tubes. Asked if condensation on the outside of the PCCS pipes would impact the ability of the PCCS to remove heat from containment, the OPG representative explained that the PCCS pipework in containment has sufficient surface area to facilitate effective heat transfer even if condensation is present.[137]

166. The Commission asked for additional information on the design decision to deeply embed the reactor building. An OPG representative explained that deeply embedding the reactor building provided benefits including resilience to seismic events, security, and allowing refuelling activities to occur at ground level. The OPG representative also noted that embedding the reactor building is a practice being used by many new reactor

[134] Transcript, January 9, 2025, pages 139-143 and pages 236-239.
[135] Transcript, January 9, 2025, pages 144-147.
[136] Transcript, January 9, 2025, pages 245-247.
[137] Transcript, October 2, 2024, pages 185-187.

new builds internationally.[138]

Main Condenser and Condenser Cooling Water System

167. In sections 2.3.1 and 2.3.3 of CMD 24-H3.1, OPG submitted information on the BWRX-300's main condenser system and its cooling water supply. The main condenser system is the heat sink during power generation and normal reactor cooldown and startup activities. The main condenser is cooled, through separate piping, by the condenser cooling water system using water from Lake Ontario.

168. The intervention by RESD Inc. (CMD 24-H3.20, CMD 24-H3.20A) provided an analysis of flow-induced vibrations for the BWRX-300 condenser tubes during normal operation. An OPG representative noted that OPG had provided technical information to the intervenor to support their assessment, and that OPG appreciated the intervenor's efforts. The OPG representative noted that OPG and GEH had considered flow-induced vibration mitigation in the design of the condenser and that a detailed flow-induced vibration assessment calculation would be performed when the design is finalized.[139]

169. Asked about the status of the condenser design, an OPG representative explained that OPG was finalizing the detailed design of the condenser. OPG had determined the required condenser size, selected the materials, and was conducting a structural analysis. The OPG representative noted that the selected turbine set is a well understood design and therefore the required condenser performance to support the selected turbine is also very well understood. CNSC staff noted that it would review the final condenser design and related analysis when it is complete.[140]

170. The Commission asked if rising lake temperatures could impact the ability to cool the reactor. An OPG representative explained that the design of the condenser cooling system had accounted for projected lake temperature changes in Lake Ontario out to the year 2100. The OPG representative further noted that the BWRX-300 design does not rely on external water for nuclear safety.[141]

Isolation Condenser System

171. In section 2.1.3 of CMD 24-H3.1, OPG submitted information on the design of the BWRX-300's isolation condenser system (ICS). The ICS removes decay heat after any reactor isolation and shutdown event during power operations. The ICS consists of three redundant independent trains, each containing a heat exchanger that is submerged in a dedicated pool of water above the reactor pressure vessel and is connected to the reactor pressure vessel by steam supply and condensate return piping. Reactor heat is transferred from each heat exchanger tube to the surrounding pool water by condensation and natural circulation.

172. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised concerns that the BWRX-300 design did

[138] Transcript, January 13, 2025, pages 13-16.
[139] Transcript, January 13, 2025, pages 72-74.
[140] Transcript, January 13, 2025, pages 77-79.
[141] Transcript, October 2, 2024, page 182.

not include an emergency core cooling system. In section A.2.5.5.2 of CMD 24-H3, CNSC staff submitted that the BWRX-300's ICS would perform the emergency core cooling safety function. CNSC staff explained that, in the case of a loss of coolant accident, the RIVs would close to isolate the reactor pressure vessel and maintain coolant within the core.[142] The ICS would then be placed in service to remove decay heat from the reactor core.

173. The Commission asked if placing the ICS in service could result in fluid hammer[143] that would impact the pressure boundary. A GEH representative stated that fluid hammer risk was considered in the design of the ICS, and that fluid hammer is not expected during actuation of the ICS because the system is pressurized prior to actuation, and there is significant margin between the operating pressure and the pressure rating of the system. An OPG representative added that there are specific design requirements for the valve type and opening time of the ICS valves to help prevent fluid hammer. CNSC staff noted that it was in discussion with OPG to receive additional information regarding the risk of fluid hammer in the ICS.[144]

174. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised concerns that the BWRX-300 design does not include overpressure relief valves on the reactor pressure vessel. In section 3.2 of CMD 24-H3.1C, OPG reported that the large capacity of the ICS, in conjunction with the large steam volume in the reactor pressure vessel, provides overpressure protection for the reactor pressure vessel and eliminates the need for pressure relief valves.

Means of Shutdown

175. In section 2.1.2 of CMD 24-H3.1, OPG submitted that the control rod drive system provides the primary means of shutting down the BWRX-300 reactor. The control rod drive system uses stored hydraulic energy to insert neutron-absorbing control rods into the reactor core from the bottom of the reactor pressure vessel. A second means of shutdown is provided by the fine motor control rod drive system which uses battery-powered electric motors to drive the control rods into the core and shutdown the reactor. OPG is of the view that these two systems meet the expectation to have two independent means of shutdown, as set out in REGDOC-2.5.2.

176. Several intervenors including Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A), the CCNR and Prolet Inc. (CMD 24-H3.67), and CELA (CMD 24-H3.84, CMD 24-H3.84A) expressed concerns regarding the independence of the BWRX-300's shutdown systems. An OPG representative explained that the shutdown systems for the BWRX-300 are two fully capable drive mechanisms, one hydraulic and one electric, that would insert the same set of control rods into the reactor core to shut down the reactor. The OPG representative stated that the two drive mechanisms are functionally independent and that the failure of one would not prevent the actuation of the other. The OPG representative noted that there is also sufficient redundancy within the

[142] Transcript, January 9, 2025, page 144.
[143] Fluid hammer is a pressure surge that occurs when a fluid in motion is forced to stop or change direction suddenly.
[144] Transcript, January 14, 2025, pages 211-216.

shutdown systems as there are almost twice as many rods as is required for a successful shutdown.[145]

177. Asked to comment on this issue, CNSC staff stated that the two means of shutdown proposed by OPG are not fully independent because they share the same set of control rods. CNSC staff acknowledged that the probability of failure of both insertion mechanisms was very low. CNSC staff noted that it has implemented a cross-functional regulatory team to determine whether the shutdown means proposed by OPG satisfy the alternative approach requirements outlined in REGDOC-2.5.2.[146] OPG will have to provide additional information on this matter prior to the consideration of release of the first regulatory hold point, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

178. The Commission asked for more information on the BWRX-300's boron injection system.[147] An OPG representative explained that the boron injection system provides an alternative means of shutdown in the beyond design-basis scenario where a sufficient number of control rods cannot be driven into the reactor core. CNSC staff clarified that it would be conducting a further review of the design of the boron injection system when OPG submits its detailed severe accident analysis, as OPG is required to do prior to the consideration of removal of the first regulatory hold point.[148]

Spent Fuel Pool

179. In section 2.2 of CMD 24-H3.1 and section 9A.1 of the PSAR, OPG submitted information on the BWRX-300's fuel handling and storage systems, including the spent fuel pool. OPG reported that the spent fuel pool is located in the reactor building, directly above the reactor, and can accommodate up to 8 years of spent fuel. The spent fuel pool is cooled by the fuel pool cooling and cleanup system.

180. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised concern that the location of the spent fuel pool would make it vulnerable to malevolent acts such as an airplane crash. An OPG representative noted that the spent fuel pool is located immediately above the reactor, in a highly protected area of the facility. CNSC staff clarified that, per the *Nuclear Security Regulations* and REGDOC-2.5.2, OPG is required to design its reactor facility, including the spent fuel pool, so that it can withstand design-based threats, including malevolent acts. CNSC staff noted that OPG is required to submit a robustness analysis to demonstrate that the aforementioned requirements have been met. The robustness analysis is due in June 2025 and is required to be approved by CNSC staff prior to the consideration of release of the first regulatory hold point.[149]

Electrical Power and Control Systems

181. In section 2.5 of CMD 24-H3.1, OPG submitted that the BWRX-300 electrical

[145] Transcript, January 10, 2025, pages 141-143.
[146] Transcript, January 10, 2025, pages 143-146.
[147] The boron injection system dispenses a neutron-absorbing boron solution into the core to provide a means of making the reactor subcritical in a beyond design basis event.
[148] Transcript, January 10, 2025, pages 149-151.
[149] Transcript, January 9, 2025, pages 136-139.

distribution system provides an integrated power supply and transmission system for the BWRX-300 facility. In section 2.4.1 of CMD 24-H3.1, OPG submitted that the BWRX-300 distributed control and information system (DCIS) provides control, monitoring, alarming, and recording functions for the facility. Both the electrical distribution system and the DCIS are arranged into three safety classified segments and one non-safety classified segment, each having appropriate levels of hardware and software quality corresponding to the system functions they control and their defence line.

182. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) raised concerns that the BWRX-300 design did not include sufficient emergency power. Asked to respond to this concern, CNSC staff said that OPG had provided high-level information on its electrical power system that satisfied the requirements of REGDOC-2.5.2 for this stage of the design. CNSC staff explained that the BWRX-300 design includes back-up power provided by two standby diesel generators and emergency back-up power provided by batteries with a 72-hour capacity.[150]

183. The Commission asked for more information on the BWRX-300 DCIS. A GEH representative explained that the DCIS was designed in alignment with the five defence lines and associated safety classes, and described the different control schemes for the systems in each safety class. CNSC staff noted that it has confidence in the robustness of the BWRX-300's DCIS design and that it will continue to review the robustness of the DCIS as the design is finalized.[151]

184. Asked how new DCIS software would be qualified, an OPG representative explained that OPG has a software qualification assurance program in place to ensure that software is designed and qualified in accordance with regulatory requirements. CNSC staff also confirmed that it will conduct detailed verification activities, commensurate with the safety class of the system, to ensure that software has been qualified in accordance with requirements.[152]

Break Exclusion Methodology

185. In section 4.5.4 of CMD 24-H3.1, OPG proposed the application of the break exclusion zone (BEZ) methodology for all high- and moderate- energy[153,154] piping penetrating containment in the BWRX-300 design.

186. The Commission asked for more information on the BEZ methodology proposed by OPG. CNSC staff explained that the BEZ methodology uses increased engineering

[150] Transcript, January 14, 2025, pages 225-227.
[151] Transcript, January 14, 2025, pages 227-233.
[152] Transcript, January 14, 2025, pages 233-237.
[153] Per section 3.4.4.2.1 of the PSAR, high-energy piping refers to piping that is part of a system that, during normal plant conditions, is either in operation or is maintained pressurized under conditions where maximum operating temperature exceeds 93.3°C and/or maximum operating pressure exceeds 1.9 MPaG.
[154] Per section 3.4.4.2.1 of the PSAR, moderate-energy piping refers to piping that is part of a system that, during normal plant conditions, is either in operation or is maintained pressurized (above atmospheric pressure) under conditions where maximum operating temperature is 93.3°C or less and/or maximum operating pressure is 1.9 MPaG or less.

design margin and other factors to eliminate the need to analyze for dynamic effects resulting from the postulated rupture of high-energy piping. CNSC staff explained that the Canadian regulatory framework does not explicitly allow for the BEZ approach, however, it does allow for alternate approaches to be proposed by an applicant as long as they demonstrate an equivalent or superior level of safety in accordance with REGDOC-2.5.2. CNSC staff noted that it was of the view that OPG had not yet demonstrated this equivalency, though progress had been made towards the resolution of this technical issue. OPG will have to provide additional information on this matter to the CNSC prior to consideration of the release of specific regulatory hold points, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.[155]

3.5.5.2 Defence in Depth and Safety Classification of SSCs

187. As discussed in section 3.5.4 of this *Record of Decision*, OPG submitted that the BWRX-300 safety strategy relies on five defence lines. In section 2.5.2.2.5 of CMD 24-H3, CNSC staff confirmed that OPG's implementation of defence in depth within the BWRX-300 design was adequate for this stage of the design. CNSC staff reported that OPG will be required to provide additional information to ensure the defence in depth concept is implemented in accordance with REGDOC-2.5.2, as the design progresses. OPG's requirement in this respect is detailed in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

188. Regarding the safety classification of SSCs, OPG reported, in section 4.5.3 of CMD 24-H3, that the BWRX-300 SSC classification approach is directly correlated to the defence lines in which an SSC performs a function, and the relative safety importance of that function. OPG reported that its approach is in line with IAEA SSR-2/1 *Safety of Nuclear Power Plants: Design*[156] and IAEA SSG-30, *Safety Classification of Structures, Systems and Components in Nuclear Power Plants*.[157] In section 2.5.2.2.6.1 of CMD 24-H3, CNSC staff submitted that OPG had provided sufficient information to support a recommendation that the Commission issue a licence to construct, however, CNSC staff had some concerns regarding OPG's approach to safety classification. OPG is required to provide additional information on safety classification, as outlined in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

189. The interventions by Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67), raised concerns that the simplified BWRX-300 design removed important safety features of previous BWR generations. Asked if the simplified design of the BWRX-300 impacted the application of the defence-in-depth concept, a GEH representative described how the defence-in-depth concept influenced the design of the BWRX-300. GEH first identified the functions that each defence line would rely upon and then identified how those functions would be satisfied by specific SSCs. The GEH representative also noted that the simplified design helped to improve safety by reducing the number of possible initiating events. CNSC staff concurred that the simplification of the BWRX-300 design has not

[155] Transcript, January 14, 2025, pages 77-88.
[156] IAEA SSR-2/1 *Safety of Nuclear Power Plants: Design*, Rev 1, IAEA, 2016.
[157] IAEA SSG-30, *Safety Classification of Structures, Systems and Components in Nuclear Power Plants*, IAEA, 2014.

challenged the defence-in-depth concept.[158]

190. Several intervenors including Stephen Lawrence (CMD 24-H3.59), Catherine Vakil (CMD 24-H3.73), Dr. Sunil Nijhawan (CMD 24-H3.39, CMD 24-H3.39A) and the CCNR and Prolet Inc. (CMD 24-H3.67) referenced the 2011 accident at Fukushima Daiichi[159] and raised concern regarding how the BWRX-300 would withstand a similar event. A GEH representative said that the Fukushima design was reliant on active safety systems and lacked diversity between the defence-in-depth defence lines. The GEH representative explained that the BWRX-300 design thoroughly applies the defence-in-depth concept and relies on passive safety systems that do not require external sources of power or operator actions to perform their safety functions. CNSC staff noted that the BWRX-300 is being designed in alignment with the CNSC's modern regulatory framework, which has been updated to incorporate lessons learned from the Fukushima accident.[160]

191. The Commission asked how GEH assessed the effectiveness of the proposed defence lines. A GEH representative stated that the defence-in-depth strategy is assessed through various methods including analytical modelling, design reviews, deterministic safety analysis, and probabilistic safety assessments. The GEH representative noted that the design process is iterative and that the effectiveness of the defence-in-depth strategy is continually monitored as the design progresses.[161]

192. The Commission asked for an update on OPG's approach to the safety classification of SSCs. CNSC staff informed the Commission that it had a regulatory focus team dedicated to reviewing OPG's safety strategy and safety classification methodology. CNSC staff confirmed that the team has found the overall strategy to be acceptable and that the highest risk SSCs had been appropriately classified. CNSC staff noted that it is conducting ongoing discussions with OPG regarding the classification for lower risk SSCs.[162]

3.5.5.3 Conclusions on Physical Design

193. The Commission concludes that OPG's physical design program is adequate for the conduct of the activities under the proposed licence to construct, and that the design is at an adequate stage to authorize a licence to construct. The Commission finds that:

- OPG's existing programs and processes related to the physical design SCA are adequate to support the licensed activities under the licence to construct
- OPG's existing physical design program meets regulatory requirements, including REGDOC-2.5.2
- OPG has submitted sufficient information on the physical design of the BWRX-300 facility, commensurate with the stage of the Project, to satisfy the

[158] Transcript, January 9, 2025, pages 103-105.
[159] *Fukushima Daiichi Nuclear Accident*, IAEA, retrieved from the IAEA's website: https://www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident, January 23, 2025.
[160] Transcript, January 14, 2025, pages 92-98.
[161] Transcript, January 9, 2025, pages 108-113.
[162] Transcript, October 2, 2024, pages 199-201.

requirements of REGDOC-1.1.2
- OPG has provided sufficient detail on the BWRX-300 design to support the completion of the preliminary safety analysis
- OPG is required to provide additional design information to the CNSC, as the design is finalized, prior to the consideration of release of specified regulatory hold points
- CNSC staff will review all additional design information provided by OPG to ensure that regulatory requirements for the physical design SCA continue to be satisfied

3.5.6 Radiation Protection

194. The radiation protection SCA covers the implementation of a radiation protection program in accordance with the *Radiation Protection Regulations*.[163] The radiation protection program must ensure that radiation doses to persons and contamination levels are monitored, controlled, and maintained as low as reasonably achievable (ALARA), with social and economic factors taken into consideration.

195. Paragraphs 3(1)(e) and 3(1)(f) of the GNSCR state that a licence application shall contain "the proposed measures to ensure compliance with the *Radiation Protection Regulations*, the *Nuclear Security Regulations*[164] and the *Packaging and Transport of Nuclear Substances Regulations, 2015*"[165] and "any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations*."

196. Section 4.7 of REGDOC-1.1.2 specifies that an application for a licence to construct shall include a radiation protection program and should demonstrate how the design of that program is commensurate with the radiological hazards associated with, or encountered during, the licensed activities. The application shall also describe how radiological hazards will be monitored and controlled during construction activities, as applicable.

197. In section 4.7 of CMD 24-H3.1 and section 4.7 of its application, OPG provided information on radiation protection during the construction phase of the DNNP, radiation protection considerations in the BWRX-300 design, and projected occupational exposures during the operation phase of the Project.

198. In section 4.7 of CMD 24-H3.1, OPG explained that the activities that would be authorized under the proposed licence to construct do not include the possession or use of nuclear substances and are not expected to result in radiation doses to workers or the public. OPG clarified that some radioactive sources, such as those used by contract companies in nuclear gauges and exposure devices, may be required at the DNNP site during construction. Those devices are licensed separately by the CNSC and would be used in accordance with the respective licensee's CNSC-approved radiation protection program.

[163] SOR/2000-203.
[164] SOR/2000-209.
[165] SOR/2015-145.

199. In section 4.7.2 of CMD 24-H3.1, OPG reported that radiation protection considerations in the BWRX-300 reactor design include:

- reducing the amount of personnel time required in radiation areas (e.g. remote operations of plant equipment)
- reducing radiation levels in routinely occupied plant areas (e.g. efficient removal of radioactivity from the reactor coolant using filters and demineralizers)

200. In section 2.6 of CMD 24-H3, CNSC staff provided information on its assessment of OPG's radiation protection program. CNSC staff submitted its view that OPG would implement sufficient measures in accordance with the *Radiation Protection Regulations* for the protection of workers conducting licensed activities under the proposed licence to construct. CNSC staff noted that, due to the very low level of exposure anticipated, those workers will not be considered nuclear energy workers (NEWs), as defined by the NSCA.

201. In section 2.6.2.2 of CMD 24-H3, CNSC staff reported that radiological doses to workers on-site under the current site preparation licence are below the regulatory dose limits for a person who is not a NEW. Should the Commission issue a licence to construct, CNSC staff expect that the radiological doses to workers performing licensed activities will remain well below regulatory dose limits throughout the construction phase.

202. Regarding projected occupational exposure during the operations phase of the DNNP, OPG reported, in section 4.7.4 of CMD 24-H3.1, that OPG estimated the annual collective occupational dose during the operations phase to be approximately 490 person-mSv, based on the BWRX-300 conceptual design. This estimate is equivalent to less than the 1 person-Sv annual collective dose target OPG established for the BWRX-300 reactor. OPG will be required to provide more detailed information on the predicted occupational dose for individual NEWs prior to the consideration of removal of the second regulatory hold point, as detailed in Appendix D.2 of CMD 24-H3 and in the proposed LCH. During the hearing, an OPG representative noted that the dose assessment was conservative and would be refined as the BWRX-300 design is finalized.[166]

203. The Commission concludes that OPG has an adequate radiation protection program in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG has implemented a radiation protection program that meets the requirements of the *Radiation Protection Regulations*
- The activities that would be authorized under the proposed licence to construct do not include the possession or use of nuclear substances and are not expected to result in radiation doses to workers or the public
- The workers conducting licensed activities under the proposed licence to

[166] Transcript, October 2, 2024, pages 217-218.

construct will not be NEWs.

- OPG is required to submit additional information on the predicted occupational dose for individual NEWs during the operations phase to the CNSC, prior to the consideration of removal of the second regulatory hold point
- CNSC staff will review the individual occupational dose information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.7 Conventional Health and Safety

204. The conventional health and safety SCA covers the implementation of a program to manage workplace safety hazards and to protect workers.

205. The NSCA provides that the Commission must be satisfied that the applicant will adequately provide for the health and safety of persons. Paragraph 3(f) of the CINFR states that an application for a licence in respect of a Class I nuclear facility shall contain "the proposed worker health and safety policies and procedures."

206. Section 4.8 of REGDOC-1.1.2 provides specific requirements and guidance for the information that an applicant should provide related to conventional health and safety, including information on the identification and management of workplace hazards, safety inspections, and accident monitoring.

207. CNSC REGDOC-2.8.1, *Conventional Health and Safety*[167] sets out information regarding conventional health and safety and the implementation and maintenance of a conventional health and safety program. In addition, OPG's activities must comply with the *Canada Labour Code*[168], the associated *Canada Occupational Health and Safety Regulations*[169], and Ontario's *Occupational Health and Safety Act*.[170]

208. In section 4.8 of CMD 24-H3.1, section 4.8 of its application, and section 6.2 of CMD 24-H3.1C, OPG provided information on its conventional health and safety program including information on safety training, risk management, contractor oversight, and safety event reporting. In section 6.2 of CMD 24-H3.1C, OPG reported that specific hazards associated with the DNNP construction project include those associated with blasting, underwater tunneling, deep foundation trenching, material handling, and the use of heavy equipment.

209. In section 4.8 of CMD 24-H3.1, OPG noted that, while OPG will be responsible for safety under the proposed licence, the lead contractor for construction would assume the role of constructor under the Ontario *Occupational Health and Safety Act*. OPG reported that each contractor is required meet the regulatory requirements for conventional health and safety and submit project-specific safety plans that detail the management and control of specific hazards. OPG, as the owner, would perform field

[167] REGDOC-2.8.1, *Conventional Health and Safety*, CNSC, July 2019.
[168] R.S.C., 1985, c. L-2.
[169] SOR/86-304.
[170] R.S.O. 1990, c. O.1.

assessments to confirm compliance with contractual terms and the constructor's project-specific plans. OPG would report safety events and non-conformances to the CNSC per the requirements of REGDOC-3.1.1.

210. In section 2.7 of CMD 24-H3, CNSC staff reported that OPG has an established conventional health and safety program in place that meets the requirements of REGDOC-1.1.2, REGDOC-2.8.1, the *Canada Labour Code*, and its associated regulations. CNSC staff noted that OPG is using its fleet-wide health and safety policy along with a site-specific DNNP health and safety plan to manage conventional health and safety for the DNNP. CNSC staff's view is that OPG's conventional health and safety program is appropriate for the activities that would be authorized under the proposed licence to construct.

211. The Commission asked OPG how it benchmarks its conventional health and safety program against international operators. An OPG representative explained that OPG benchmarks its health and safety metrics annually against industry metrics.[171]

212. The Commission asked OPG for additional information on how it would ensure safety during excavation activities. An OPG representative explained that, for each excavation activity, a job hazard and safety plan would be produced, reviewed, and approved before being accepted into the construction work package for execution in the field. The job hazard and safety plans would include information such as the type of equipment to be used, any special provisions required by the depth of the excavation activity, and the required personnel qualifications.[172]

213. Asked about additional considerations respecting health and safety during tunnel boring activities, an OPG representative explained that OPG had selected a contractor with extensive tunnel boring experience and that OPG had considered industry operating experience when selecting its tunnel construction methodology. Regarding the geotechnical risks during tunnel boring, CNSC staff noted that OPG had conducted a comprehensive geotechnical site investigation to confirm the site conditions and identify hazards. CNSC staff explained that, during tunnel boring activities, OPG is required to monitor hazards such as methane gas per the *Ontario Occupational Health and Safety Act*.[173]

214. Regarding CNSC staff's oversight of OPG's conventional health and safety practices, CNSC staff explained that it conducts on-site oversight activities including verification of personnel qualifications, reviewing pre-job briefings, and ensuring that OPG has implemented the safety provisions described in its job hazard and safety plans. CNSC staff also noted that it has a memorandum of understanding with the Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD). The MLITSD will lead, and CNSC staff will support, any investigations that should arise related to conventional health and safety matters.[174]

215. The Commission concludes that OPG has an adequate conventional health and safety

[171] Transcript, January 9, 2025, pages 59-61.
[172] Transcript, January 14, 2025, pages 150-152.
[173] Transcript, January 10, 2025, pages 56-66.
[174] Transcript, January 14, 2025, pages 153-155 and 161.

program in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG's has implemented and maintained a conventional health and safety program that meets regulatory requirements, including REGDOC-2.8.1 and the *Canada Labour Code*
- OPG has clearly identified the roles and responsibilities of OPG and its contract partners as they pertain to conventional health and safety, per Ontario's *Occupational Health and Safety Act*
- CNSC staff has adequate plans in place to verify OPG's implementation of conventional health and safety measures during construction

3.5.8 Environmental Protection

216. The environmental protection SCA covers programs that identify, control, and monitor all releases of radioactive and hazardous substances and effects on the environment, from facilities or as the result of licensed activities. The *Radiation Protection Regulations* prescribe the dose limit for the public, which, pursuant to subsection 1(3), is 1 mSv per calendar year.

217. Paragraphs 3(e), 3(g), and 3(h) of the CINFR state that an application for a licence in respect of a Class I nuclear facility shall contain:

- 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
- the proposed environmental protection policies and procedures
- the proposed effluent and environmental monitoring programs

218. Paragraphs 5(b), 5(i), 5(j), and 5(k) of the CINFR state that an application for a licence to construct a Class I nuclear facility shall contain:

- a description of the environmental baseline characteristics of the site and the surrounding area
- the effects on the environment and the health and safety of persons that may result from the construction, operation, and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects
- 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
- the proposed measures to control releases of nuclear substances and hazardous substances into the environment

219. Section 4.9 of REGDOC-1.1.2 specifies that an application for a licence to construct shall include a set of environmental protection measures that meet the requirements of

REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures.*[175] The application should also include detailed information related to the potential environmental effects resulting from the conduct of construction and commissioning activities, the proposed timelines and milestones for the development of provisions for environmental protection during the construction phase, and a description of any proposed environmental protection measures that would apply during fuel-in commissioning and reactor facility operation.

220. The following CSA Group N288 series of standards provides requirements and guidance for the environmental management of nuclear facilities:

- CSA N288.4, *Environmental monitoring programs at nuclear facilities and uranium mines and mills*[176] provides guidance on the design and operation of environmental monitoring programs for nuclear facilities
- CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*[177] provides guidelines on the design, implementation, and management of an effluent monitoring program
- CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*[178] provides guidance on environmental risk assessments for Class I nuclear facilities and uranium mines and mills
- CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*[179] provides requirements and guidance for the design, implementation, and management of a groundwater protection program to manage risks posed to the environment or the health and safety of humans and non-human biota from groundwater

221. In section 4.9 of its application, section 4.9 of CMD 24-H3.1, and in CMD 24-H3.1E, OPG provided information on its environmental protection program including its environmental management plan, environmental risk assessments, environmental monitoring and EA follow-up program, and effluent and emissions monitoring.

222. In section 2.8 of CMD 24-H3 and section 3 of CMD 24-H3.F, CNSC staff provided information on its review of OPG's environmental protection program. CNSC staff reported that OPG had met regulatory requirements regarding environmental protection and that OPG had demonstrated a continued commitment to provide for the protection of the public and the environment. CNSC staff also identified additional information regarding environmental protection that it would require from OPG, should the Commission issue a licence to construct. OPG is required to provide the requested information to the CNSC prior to the consideration of release of specific regulatory hold points, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

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[175] REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures*, Version 1.2, CNSC, September 2020.
[176] CSA N288.4, *Environmental monitoring programs at nuclear facilities and uranium mines and mills*, CSA Group, 2010 (R2019).
[177] CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*, CSA Group, 2022.
[178] CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills,* CSA Group, 2022.
[179] CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills,* CSA Group, 2015 (R2020).

223. In section 2.8.2.3 of CMD 24-H3, CNSC staff noted that OPG will also be required to comply with mitigation or compensation measures to minimise the impact of construction activities on at-risk or endangered species, or on their habitats, in accordance with any approvals issued under either the federal *Species at Risk Act*[180] or Ontario's *Endangered Species Act*.[181]

Environmental Risk Assessment

224. An environmental risk assessment (ERA) is a systematic process used to identify, quantify, and characterize the risk posed by contaminants (radiological and non-radiological) and physical stressors in the environment on biological receptors. Receptors include humans and non-human biota. Human receptors are assessed through a human health risk assessment and ecological receptors (i.e., non-human biota) are addressed through an ecological risk assessment.

225. In section 4.9.2 of CMD 24-H3.1, OPG reported that the most recent ERA for the Darlington Nuclear site was issued in 2021, revised in 2022, and encompassed the DNNP site. The ERA was conducted in compliance with regulatory requirements and concluded that the Darlington Nuclear site is being operated in a manner that is protective of human and ecological receptors in the surrounding area. In CMD 24-H3.1E, OPG provided its predictive environmental risk assessment (PERA) which encompassed the site preparation, construction, and operation phases of the DNNP. Based on the results of the PERA, OPG reported that the DNNP is not predicted to result in any adverse effects to the evaluated human or ecological receptor groups.

226. In CMD 24-H3.F, CNSC staff reported that it was still reviewing the PERA, however, CNSC staff had not identified any major concerns regarding unreasonable risk to people or the environment. CNSC staff noted that, should the PERA identify any new or elevated risks to receptors due to construction-related activities, OPG would be required to address those risks and update its mitigation measures prior to beginning construction.

227. The Commission asked OPG to comment on why the PERA included a new "harvester" critical receptor. An OPG representative explained that the harvester receptor is meant to better represent an Indigenous person who may live and/or work near the Darlington Nuclear site and harvest traditional foods in the area. OPG added this receptor in response to engagement with the Williams Treaties First Nations.[182]

228. Asked for more information on the environmental effects considered by the PERA, CNSC staff clarified that the PERA considered all contaminants of potential concern that could be released from the DNNP, how those could interact with the surrounding environment, and the risk posed by those interactions. CNSC staff reiterated that its review of the PERA was still ongoing, however, CNSC staff expect the conclusions to align with those of the EA.[183] CNSC staff noted that its acceptance of the PERA is

[180] S.C. 2002, c. 29.
[181] S.O. 2007, c. 6.
[182] Transcript, January 14, 2025, pages 164-165.
[183] Transcript, January 14, 2025, pages 167-168.

required prior to the consideration of release of the first regulatory hold point, should the Commission issue the licence to construct as proposed.

Environmental Management System

229. In section 4.9 of CMD 24-H3.1, OPG submitted that it has an established environmental management system which is certified under ISO 14001, *Environmental Management Systems*[184] and implements the requirements of OPG's fleet-wide environmental policy. OPG reported that, under the environmental management system, activities under the licence to construct will be executed by way of the following plans:

- Environmental Management and Protection Plan (EMPP)
- Site-Specific Environmental Management Plan (SSEMP)
- Environmental Monitoring and Environmental Assessment Follow-Up (EMEAF) Plan

230. In section 2.8.2.5 of CMD 24-H3, CNSC staff reported that OPG's environmental management system has established an environmental protection program that meets regulatory requirements, including those outlined in REGDOC-2.9.1. CNSC staff noted that OPG's existing environmental management system is sufficient for the activities that would be licensed under the proposed licence to construct.

Effluent and Emissions Control

231. In section 4.9.2 of CMD 24-H3.1, OPG reported that effluents and emissions during the construction phase will be limited to non-radiological discharges including stormwater runoff, dewatering activities, blasting, and airborne emissions from construction equipment. OPG noted that the management and monitoring of such emissions will be addressed through the EMPP and EMEAF plan.

232. In section 2.8.2.2 of CMD 24-H3, CNSC staff reported that OPG maintains an effluent and emissions monitoring program for the Darlington Nuclear site that complies with regulatory requirements, including REGDOC 2.9.1 and CSA N288.5. OPG will continue to implement this program, along with the DNNP-specific EMPP and EMEAF plan, under the proposed licence to construct.

233. The Commission asked CNSC staff for additional information on the environmental impact of condenser cooling water (CCW) system intake and discharge during the construction and operations phases of the Project. Regarding CCW discharge during the operations phase, an OPG representative explained that OPG had conducted a receiving water impact assessment and a thermal effects assessment which found that the CCW discharge would meet the Ontario Ministry for Environment, Conservation and Parks' provincial water quality and thermal discharge objectives.[185] Regarding CCW intake, the OPG representative also noted that Darlington NGS operating experience was considered to improve the design of the CCW in-water structures to minimize the

[184] ISO 14001, *Environmental Management Systems,* International Organization for Standardization, 2015.
[185] Transcript, January 14, 2025, pages 119-121.

possibility of fish impingement or entrainment.[186] CNSC staff stated that it is currently reviewing OPG's CCW design and water impact assessments.[187]

234. Regarding the construction phase, an OPG representative explained that two areas of the lakebed would be disturbed during construction of the CCW structures; where the intake structure is installed and where the discharge diffuser pipes come up through the lakebed. The OPG representative explained that these structures would be installed at a depth of 11 metres, which OPG identified as the optimal depth to minimize impacts to aquatic species. The OPG representative also noted that OPG had applied for the necessary permits to conduct lakebed construction activities.[188]

Assessment and Monitoring

235. In section 4.9.2 of CMD 24-H3.1, OPG reported that it maintains on environmental monitoring program for the entire Darlington Nuclear site in compliance with CSA N288.4 and N288.7. The program monitors off-site air, water, aquatic samples, and terrestrial samples. OPG uses data gathered from this site-wide program to assess the annual radiological dose to members of the public in the vicinity of the site. In CMD 24-H3.1 5B, the Regional Municipality of Durham noted that it also provides OPG with municipal water samples and air monitoring data.

236. In section 4.9.2 of CMD 24-H3.1, OPG reported that environmental monitoring specific to the DNNP licence to construct phase is established through the EA follow-up program and associated EMEAF plan. OPG explained that DNNP EA follow-up monitoring activities will be conducted as supplementary studies to the site-wide environmental monitoring program. The intent of the EA follow-up program is to verify the predictions made in the DNNP EIS, confirm the effectiveness of mitigation measures, and provide assurance that regulatory criteria are being met.

237. In section 4.9.1 of CMD 24-H3.1, OPG provided additional information on its efforts to monitor and protect terrestrial, aquatic, and wildlife habitats under the EMPP and SSEMP. OPG provided specific information on mitigation measures to protect fish, the threatened Bank Swallow, and eight species of bats (including three endangered species). OPG explained that it would conduct all construction activities in accordance with the conditions of an *Endangered Species Act* permit for construction and the conditions of a Fisheries and Oceans Canada *Fisheries Act* authorization and associated fish habitat compensation plan.

238. In section 2.8.2.3 of CMD 24-H3, CNSC staff confirmed that OPG has maintained an environmental monitoring program for the Darlington Nuclear site that meets the regulatory requirements outlined in REGDOC 2.9.1 and CSA N288.4. CNSC staff noted that OPG's site-wide environmental monitoring program will be updated, as needed, following CNSC staff acceptance of the PERA.

239. In section 2.8.2.3 of CMD 24-H3, CNSC staff submitted that there is potential for dust emissions to exceed short-term criteria during DNNP construction activities and that

[186] Transcript, January 14, 2025, page 123.
[187] Transcript, January 14, 2025, page 125.
[188] Transcript, January 14, 2025, page 122.

noise levels are expected to increase. To manage these effects, OPG has committed to implementing a dust management plan and a noise management plan under the EMPP.

240. Regarding the environmental impacts of construction activities, an OPG representative explained that OPG is developing a green construction implementation plan to minimize environmental impacts during construction. Some of the early measures taken by OPG under this plan include using temporary electrical power supplies to reduce the use of diesel generators and calculating carbon emissions during construction activities. CNSC staff noted that OPG has committed to implement Environment and Climate Change Canada best practices to reduce air emissions from construction and demolition activities. CNSC staff will conduct verification activities to ensure that OPG is following its environmental management system and conducting sufficient environmental monitoring during construction activities. CNSC staff noted that it is already conducting similar verification activities for OPG's activities under its site preparation licence for the DNNP.[189]

241. Asked if concrete production would impact the dust and noise emissions from the DNNP construction site, an OPG representative clarified that excavated rock would be shipped to the nearby St. Marys Cement for processing and would not be processed on the DNNP site.[190]

242. The intervention from the Nuclear Transparency Project (CMD 24-H3.68) raised concerns regarding the potential impact to Bank Swallows during construction of the DNNP facility. Asked for more information on measures to mitigate impacts to the Bank Swallows, an OPG representative explained that the current DNNP construction plan does not involve removing the bluff where the Bank Swallow nesting habitat is located or installing any shoreline protection along the lower part of that bluff. The OPG representative clarified that any potential effects to Bank Swallows from construction activities would be captured in an *Endangered Species Act* permit which would have necessary conditions to offset and mitigate any impacts. As part of its *Endangered Species Act* permit application, OPG has proposed mitigation measures including incremental test blasts, noise and vibration monitoring, and observation of the Bank Swallow behaviour in their nesting habitat. A representative from the Ontario Ministry of Environment, Conservation, and Parks confirmed that OPG has followed the correct processes for applying for, and abiding by, *Endangered Species Act* permits with respect to the DNNP.[191]

243. The Commission asked OPG how it engaged with Indigenous Nations and communities regarding environmental monitoring for the DNNP. An OPG representative explained that OPG had shared the EMEAF plan with rights-holders and incorporated their feedback into the plan. Regarding the larger Darlington Nuclear site, the OPG representative also noted that OPG engages with the Williams Treaties First Nations on the annual results of the Darlington Nuclear site environmental monitoring plan and invites their participation in environmental monitoring activities on site.[192]

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[189] Transcript, January 13, 2025, page 14 and pages 88-95.
[190] Transcript, January 13, 2025, page 97.
[191] Transcript, January 14, 2025, pages 171-174.
[192] Transcript, January 14, 2025, pages 174-176.

244. Regarding the update frequency for OPG's environmental protection plans, an OPG representative explained that the EMPP and SSEMP have both been updated for the licence to construct phase of the Project. The EA follow-up program and associated EMEAF plan cover the full lifecycle of the DNNP and are not updated routinely because they are based on the requirements the came out of the EA process. The OPG representative clarified that each of the environmental monitoring plans can be updated on an as-needed basis, such as when applicable Indigenous Knowledge is provided by Indigenous Nations and communities.[193]

Dose to the Public

245. In section 2.8.2.4 of CMD 24-H3, CNSC staff reported that, during the licence to construct phase, the DNNP will not produce any radiological releases and will not contribute to doses received by members of the public from activities at the Darlington Nuclear site. CNSC staff also noted that development of DNNP-specific radiological licensed release limits and action levels will not be required until OPG applies for a licence to operate.

246. Alongside its application, OPG submitted *Dose Calculations for Human and Non-Human Biota to Support Gap Analysis for DNNP*,[194] which estimated the doses to members of the public from the deployment of four BWRX-300 reactors. In section 5 of CMD 24-H3.F, CNSC staff reported that, for the operation of a single BWRX-300 reactor, OPG conservatively estimated that the dose to the most impacted individual would be 0.305 micro-Sieverts per year (µSv/y). This is well below the 1.0 milli-Sievert (mSv)[195] annual public dose limit as defined in the *Radiation Protection Regulations*. OPG would be required to submit more detailed information on public dose should it choose to apply for a licence to operate.

CNSC Independent Environmental Monitoring Program

247. As described in section 2.8.2.3 of CMD 24-H3, the CNSC has implemented its Independent Environmental Monitoring Program (IEMP) to support its assessments of whether the public and the environment around licensed nuclear facilities are safe. The IEMP is separate from, but complementary to, the CNSC's ongoing compliance verification program. The IEMP involves taking samples from public areas around nuclear facilities and measuring and analyzing the amount of radiological and hazardous substances in those samples. CNSC staff collect the samples and send them to the CNSC's independent laboratory for testing and analysis.

248. In section 2.8.2.3 of CMD 24-H3, CNSC staff clarified that the IEMP focuses on operating facilities where there are releases of radionuclides and hazardous substances. CNSC staff will continue to conduct IEMP monitoring around the Darlington Nuclear site during the DNNP licence to construct phase, however, that monitoring will be focused on the contaminants that are being released from the Darlington NGS.[196] The

[193] Transcript, January 14, 2025, pages 176-178.
[194] *Dose Calculations for Human and Non-Human Biota to Support Gap Analysis for DNNP*, NK054-REP-07730-00064, OPG, July 2023.
[195] 1 mSv is equivalent to 1000 µSv.
[196] Transcript, January 14, 2025, page 170.

last IEMP campaign for the Darlington Nuclear site was conducted in 2023 and the result are available on the CNSC website.

249. The Commission asked CNSC staff if recent IEMP data for the Darlington Nuclear site aligned with CNSC staff's expectations. CNSC staff stated that, to date, the results of CNSC staff's IEMP sampling campaigns across all nuclear facilities have aligned with the environmental monitoring information submitted by licensees.[197]

250. Regarding the involvement of Indigenous Nations and communities in the IEMP, CNSC staff explained that it engages with Indigenous Nations and communities on each IEMP campaign and have welcomed their participation in the IEMP sampling activities.[198]

Conclusion on Environmental Protection

251. The Commission concludes that OPG has an appropriate environmental protection program in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing environmental protection program meets regulatory requirements, including REGDOC-2.9.1, and is adequate to support the licensed activities
- OPG has a satisfactory EA follow-up program and associated EMEAF plan to verify that the conclusions of the EA remain valid throughout the DNNP construction phase
- CNSC staff will continue to conduct IEMP monitoring around the Darlington Nuclear site during the construction phase of the DNNP
- OPG has conducted an ERA for the Darlington Nuclear site that meets the requirements of REGDOC-2.9.1 and CSA N288.6
- OPG has conducted a DNNP-specific PERA which is under review by CNSC staff and must be accepted by CNSC staff prior to the consideration of removal of the first regulatory hold point
- Under the licence to construct, the DNNP will not produce any radiological releases and will not contribute to doses received by members of the public from activities at the Darlington Nuclear site
- OPG is required to submit additional environmental protection information to the CNSC, prior to the consideration of removal of specified regulatory hold points
- CNSC staff will review the additional environmental protection information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.9 Emergency Management and Fire Protection

252. The emergency management and fire protection SCA covers emergency plans and

[197] Transcript, January 14, 2025, page 169.
[198] Transcript, January 14, 2025, page 170.

emergency preparedness programs that exist for emergencies and for non-routine conditions at the DNNP.

253. Subsection 24(4) of the NSCA provides that the applicant, in carrying out the proposed licensed activity, will 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.

254. Paragraph 3(1)(d) and of the GNSCR states that a licence application shall contain "a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence."

255. Section 4.10 of REGDOC-1.1.2 specifies that an application for a licence to construct shall provide details of the emergency preparedness program that is proposed to be implemented under the licence to construct a reactor facility. The emergency preparedness program shall also meet all requirements applicable to the licence to construct phase within REGDOC-2.3.1, REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*,[199] and CSA N1600:21, *General Requirements for Nuclear Emergency Management Programs*.[200]

256. In section 4.10 of CMD 24-H3.1 and section 4.10 of its application, OPG submitted that it has implemented an effective emergency management and fire protection program under OPG's consolidated nuclear emergency plan. OPG reported that there is no possibility for a radiological emergency originating from the DNNP site to occur during the construction phase as there will be no nuclear fuel on site. OPG has prepared a DNNP nuclear emergency preparedness plan which details the protocols to be implemented on the DNNP site in the unlikely event of a nuclear emergency at the neighbouring Darlington NGS or other hazards require activation of OPG's emergency response organization.

257. In section 4.10 of CMD 24-H3.1, OPG clarified that, while OPG will maintain overall responsibility for safety under the proposed licence to construct, the lead contractor for construction will oversee emergency response on the DNNP site. OPG has reviewed the site-specific emergency response plan prepared by its contractor. This emergency response plan includes worksite evacuation procedures, nearest regional emergency services, and crisis management contact lists.

258. In section 4.10.1 of CMD 24-H3.1 and section 4.10 of its application, OPG submitted that fire protection during the licence to construct phase is conventional in nature and would be governed by the constructor under the broader conventional health and safety plan, as described in section 3.5.7 of this *Record of Decision*. OPG reported that Clarington Emergency and Fire Services will be the primary responders as reflected in a memorandum of understanding between OPG and the Municipality of Clarington. OPG will conduct oversight activities to ensure that fire protection measures implemented by contractors are compliant with regulatory requirements.

[199] REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, Version 2, CNSC, February 2016.
[200] CSA N1600 *General Requirements for Nuclear Emergency Management Programs*, CSA Group, 2021.

259. In section 2.9 of CMD 24-H3 and section 3 of CMD 24-H3.F, CNSC staff submitted that OPG has an emergency management and fire protection program in place that meets regulatory requirements, including the applicable requirements within REGDOC-1.1.2 and REGDOC-2.10.1. CNSC staff noted that a detailed nuclear emergency planning basis is not required at the licence to construct phase, however, OPG will be required to update its planning basis as part of a future application for a licence to operate, as documented in the *DNNP Commitments Report*.

260. In section 2.9.2.2 of CMD 24-H3, CNSC staff noted that OPG also has a memorandum of understanding with Emergency Management Ontario (EMO) to revise the *Provincial Nuclear Emergency Response Plan* (PNERP) prior to the operations phase of the DNNP. This revision would include a revised Darlington implementing plan, or a separate DNNP-specific implementing plan. The implementing plan would specify the emergency planning zones for the DNNP and require a revised evacuation time estimate study.

261. In section 2.9.1 and section 2.5.2.5.12 of CMD 24-H3, CNSC staff noted that OPG would be required to submit updated fire protection assessments, fire protection design documentation, and a third-party review of the fire protection system design to CNSC staff for review and approval once the BWRX-300 design is finalized. OPG is required to provide the requested information prior to the consideration of removal of the first regulatory hold point, as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

262. Asked if the new design of the BWRX-300 would present any unique challenges regarding emergency response during the construction phase, an OPG representative stated that the construction methods that would be used to build the BWRX-300 reactor are similar any large-scale construction project.[201]

263. Asked if Clarington Emergency and Fire Services had the capacity to respond to the DNNP site, the Mayor of Clarington confirmed that the municipality would have sufficient capacity to respond to emergencies during the licence to construct phase of the project. The Mayor informed the Commission that the Municipality of Clarington was undergoing discussions with OPG to ensure that the municipality would continue to have adequate capacity to respond to the DNNP site during the licence to operate phase. [202]

264. Asked if the Regional Municipality of Durham had the capacity to respond to the DNNP site during the construction phase, the Region clarified, in CMD 24-H3.15B, that Durham Region's emergency services, including the Durham Region Police Department and Region of Durham Paramedic Services, were prepared to respond to the site, as required.

265. The Commission asked for more information regarding evacuation of the DNNP construction site in the unlikely event of an emergency at the neighbouring Darlington NGS. CNSC staff confirmed that OPG had updated its nuclear emergency response

[201] Transcript, January 9, 2025, pages 15-16.
[202] Transcript, January 9, 2025, pages 16-17.

plan to respond to a nuclear emergency at the Darlington NGS during the construction phase of the DNNP. The plan includes strategies and procedures to evacuate and to implement protective actions for those on the DNNP site. [203]

266. The intervention by CELA (CMD 24-H3.84, CMD 24-H3.84A) raised concern that the size of the emergency planning zone around the DNNP was insufficient. In section 3 of CMD 24-H3.F, CNSC staff submitted that EMO is responsible for determining the final emergency planning zone sizing for the DNNP. CNSC staff noted that emergency planning zone sizing is an iterative process based on the progression of the design and arrangements between the response organizations. OPG will be required to have the final sizing information available as part of its application for a licence to operate. Representatives from OPG and CNSC staff noted that they will continue to collaborate with EMO in the determination of an appropriately sized emergency planning zone.[204]

267. Regarding the PNERP update, an EMO representative reported that the new draft PNERP was on track for completion by the end of the 2024-2025 fiscal year. The EMO representative explained that the new draft PNERP is an evergreen document that is technology neutral and is based upon a new technical study and methodology that is in accordance with national and international best practices and standards. The EMO representative noted that, throughout the PNERP update project, EMO has engaged and consulted with First Nations, Métis, and Indigenous communities that have traditional territories near licensed CNSC facilities.[205]

268. Asked for additional information on the installation of the fire water system, an OPG representative clarified that the fire water system is being installed at the DNNP site under the current licence to prepare site. The OPG representative explained that OPG will be connecting the fire water system to the DNNP buildings before the buildings are occupied, in accordance with the DNNP project plan.[206]

269. The Commission asked OPG for additional information on how OPG would respond to a fire on the DNNP construction site. An OPG representative explained that the constructor would call Clarington Emergency and Fire Services to respond and would also alert Darlington NGS security personnel for their awareness. The OPG representative clarified that the constructor is authorized to use fire extinguishers to put out small fires as outlined in their site-specific emergency response plan, if they feel safe to do so.[207]

270. The Commission concludes that OPG has adequate emergency management and fire protection programs in place for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing emergency management and fire protection program meets regulatory requirements, including REGDOC-1.1.2 and REGOC-2.10.1, and is

[203] Transcript, January 10, 2025, page 36.
[204] Transcript, January 10, 2025, pages 41-46.
[205] Transcript, January 10, 2025, pages 22-28.
[206] Transcript, January 14, 2025, pages 181-182.
[207] Transcript, January 14, 2025, pages 183-184.

adequate to support the activities that would be authorized under the licence to construct
- OPG has reviewed the site-specific emergency response plan prepared by its contractor to ensure that it aligns with OPG's emergency management program
- Clarington Emergency and Fire Services has the capacity to respond to the DNNP site during the construction period
- OPG's emergency response plans have considered the unlikely scenario of an emergency at the neighbouring Darlington NGS
- OPG is required to submit additional fire protection system design information to the CNSC, prior to the consideration of removal of the first regulatory hold point
- CNSC staff will review the additional fire protection design information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.10 Waste Management

271. The waste management SCA covers internal waste-related programs that form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. This SCA also covers the planning for decommissioning.

272. Paragraph 3(1)(j) of the GNSCR states that a licence application shall contain "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."

273. Paragraphs 3(e) and 3(k) of the CINFR state that an application for a licence in respect of a Class I nuclear facility shall contain "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" and "the proposed plan for the decommissioning of the nuclear facility or of the site"

274. Paragraphs 5(j) and 5(k) of the CINFR state that an application for a licence to construct a Class I nuclear facility shall contain "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" and "the proposed measures to control releases of nuclear substances and hazardous substances into the environment."

275. Section 4.11 of REGDOC-1.1.2 provides specific requirements and guidance for the information that an applicant should provide related to waste management, including information on hazardous substances, hazardous wastes, waste minimization, and decommissioning practices.

276. REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*[208] sets out requirements and guidance for managing radioactive waste and REGDOC-2.11.2, *Decommissioning*[209] sets out requirements and guidance regarding the planning and preparation for, as well as the execution and completion of decommissioning.

277. In section 4.11 of CMD 24-H3.1 and section 4.11 of its application, OPG provided information on its waste management program including information on hazardous substances, future radioactive waste, waste minimization, and decommissioning practices. OPG also provided its solid radioactive waste management plan alongside its application, and provided its updated hazardous substance list in CMD 24-H3.B. OPG reiterated that the activities proposed under the licence to construct would not generate any radioactive wastes and that, during the licence to construct phase, non-nuclear hazardous substances and waste will be managed through site-specific environmental protection plans and procedures.

278. Regarding decommissioning practices, OPG submitted two preliminary decommissioning plans (PDP) alongside its application. The first PDP is an 'as-built' PDP which considers a scenario where decommissioning occurs prior to fuel load and the second is an "end of life" PDP which considers the scenario where decommissioning occurs after the plant has ceased operations. Only the 'as-built' PDP is required for the construction phase of the Project. OPG's PDPs are discussed further in section 3.7.2 of this *Record of Decision*.

279. In section 2.10 of CMD 24-H3 and section 3 of CMD 24-H3.F, CNSC staff provided information on its review of OPG's waste management program and reported that OPG had met regulatory requirements regarding waste management and decommissioning as outlined in REGDOC-2.11.1 and REGDOC-2.11.2. CNSC staff identified additional information regarding the management of hazardous wastes that it would require from OPG prior to the consideration of removal of the first proposed regulatory hold point. OPG's requirement in this respect is described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

280. Regarding future radioactive waste, CNSC staff reported that OPG had described the strategies and potential future plans for the management of radioactive waste in chapter 11 of the PSAR and in OPG's solid radioactive waste management plan. CNSC staff noted that OPG's plan described the expected future radioactive waste management activities, including a preliminary characterisation of the wastes expected, consistent with the intent of the regulatory requirements. OPG's plans for the management of radioactive waste, beyond the scope of OPG's licence to construct application, are discussed in section 3.6.3.2 of this *Record of Decision*.

281. On the topic of decommissioning, CNSC staff submitted, in section 2.10 of CMD 24-H3, that OPG had adequately described the proposed activities for decommissioning the 'as-built' facility and had provided a credible cost estimate for those activities. This cost estimate, and the associated financial guarantee for decommissioning, are further discussed in section 3.7.2 of this *Record of Decision*.

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[208] REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*, CNSC, January 2021
[209] REGDOC-2.11.2, *Decommissioning*, CNSC, January 2021.

282. Asked about waste management during construction activities, an OPG representative explained that the waste produced during the construction phase would be typical construction waste including excavated soil and rock. All excavated soil will be stored and managed on site and some of the excavated rock will be used to produce concrete for the Project. An OPG representative also noted that the volume of soil to be managed is significantly less than what was originally anticipated under the DNNP EA.[210]

283. Asked to clarify the requirements for waste management planning during the licence to construct phase, CNSC staff explained that REGDOC-1.1.2 details three primary requirements for waste management and decommissioning. These requirements include information pertaining to hazardous waste inventories, information on how the reactor has been designed for decommissioning, and the PDP for the state of the facility at the end of construction. CNSC staff stated that it received and reviewed documents pertaining to these three requirements and determined that OPG meets the regulatory requirements for the licence to construct phase.[211]

284. The Commission noted that many intervenors, including Northwatch (CMD 24-H3.58), Mississaugas of Scugog Island First Nation (CMD 24-H3.81, CMD 24-H3.81A), Saugeen Ojibway Nation (CMD 24-H3.82), and CELA (CMD 24-H3.84, CMD 24-H3.84A) had raised concerns regarding the readiness of OPG's radioactive waste management plans at this phase in the project. The Commission asked CNSC staff when it expected to receive complete plans from OPG regarding waste management. CNSC staff clarified that OPG would be required to provide detailed information on radioactive waste management for the DNNP, including information on waste streams, storage, disposal, and transport, as part of a future application for a licence to operate.[212]

285. The Commission is satisfied that OPG has an adequate waste management program in place to safely manage waste for the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing waste management program meets regulatory requirements, including REGDOC-2.11.1, and is adequate to support the activities that would be authorized under the licence to construct
- OPG has provided a PDP that meets regulatory requirements, including REGDOC-2.11.2
- No radioactive waste will be produced under the licence to construct
- OPG will be required to provide additional information regarding the management of hazardous wastes to the CNSC, prior to the consideration of removal of the first regulatory hold point
- CNSC staff will review the additional waste management information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

[210] Transcript, January 13, 2025, page 14 and pages 88-95.
[211] Transcript, January 9, 2025, pages 190-191.
[212] Transcript, January 10, 2025, pages 190-192.

3.5.11 Security

286. The security SCA covers the programs required to implement and support the security requirements stipulated in the regulations, the licence, orders, or in expectations for the facility or activity.

287. Paragraphs 3(1)(d), 3(1)(e), 3(1)(g), and 3(1)(h) of the GNSCR state that a licence application shall contain:

- a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence
- 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*
- the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information
- the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information

288. Paragraphs 3(a), 3(b), and 3(i) of the CINFR state that an application for a licence in respect of a Class I nuclear facility shall contain:

- a description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone
- plans showing the location, perimeter, areas, structures and systems of the nuclear facility
- 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

289. Section 4.12 of REGDOC-1.1.2 provides specific requirements and guidance for the information that an applicant should provide related to its security program, including cyber security.

290. In section 4.12 of CMD 24-H3.1 and section 4.12 of its application, OPG provided high-level information on its security program including information on physical security and cyber security for the DNNP site. OPG provided detailed security information to the Commission in a confidential information package submitted alongside its application. This package contained a site security plan, construction site threat and risk assessment, and a BWRX-300 security assessment.

291. In section 3.4.7 of its application, OPG reported that the construction site threat and risk assessment confirmed that the Darlington Nuclear site remains suitable, and that any security risks can be effectively mitigated. OPG reported that it will conduct additional threat and risk assessments at each project phase.

292. Regarding cyber security, OPG reported that OPG has implemented a comprehensive cyber security plan which it applies to its entire nuclear power plant fleet, including the

DNNP. OPG also reported that it has a specific BWRX-300 cyber security program plan, which is used to apply security principles throughout the development and lifecycle of the BWRX- 300 instrumentation and control systems.[213]

293. CNSC staff provided information on its review of OPG's security program, as it applies to OPG's LTC application, in section 2.11 of CMD 24-H3, and in CMD 24-H3.C and CMD 24-H.D.[214] CNSC staff are of the view that OPG's security program meets regulatory requirements and that there are no concerns, from a security or cyber security perspective, with the activities that would be authorized under the proposed licence to construct. CNSC staff identified additional information that it would require from OPG during the construction phase, should the Commission issue a licence to construct. OPG will have to provide the requested information as described in Appendix D.2 of CMD 24-H3 and in the proposed LCH.

294. The Commission concludes that OPG has an adequate security program in place to for the conduct of the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing security program is adequate to support the activities that would be authorized under the licence to construct
- OPG's security program meets regulatory requirements and includes measures for both physical and cyber security
- OPG conducted a construction site threat and risk assessment which found that any security risks during the construction phase can be effectively mitigated
- OPG will be providing additional security-related information to the CNSC as it becomes available, prior to the consideration of removal of the first regulatory hold point
- CNSC staff will review the additional security-related information submitted by OPG to ensure that OPG satisfies its commitments and regulatory requirements

3.5.12 Safeguards and Non-Proliferation

295. The safeguards SCA covers the programs and activities required for the successful implementation of the obligations arising from the Canada/International Atomic Energy Agency (IAEA) safeguards agreements as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons*[215] (NPT). Pursuant to the NPT, Canada has entered into a *Comprehensive Safeguards Agreement*[216] and an *Additional Protocol*[217] (safeguards agreements) with the IAEA. The objective of these safeguards agreements is for the IAEA to provide credible assurance on an annual basis to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there is no undeclared nuclear material or activity in this country.

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[213] Section 4.12.1 of CMD 24-H3.1.
[214] CMD 24-H3.C and CMD 24-H3.D contain prescribed information and are not available to the public.
[215] INFCIRC/140.
[216] INFCIRC/164.
[217] INFCIRC/164/Add.1.

296. Paragraphs 3(1)(c), 3(1)(g), and 3(1)(h) of the GNSCR state that a licence application shall contain:

- the name, maximum quantity and form of any nuclear substance to be encompassed by the licence
- the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information
- the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information

297. Paragraph 5(h) of the CINFR states that an application for a licence to construct a Class I nuclear facility shall contain "the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement."

298. Section 4.12 of REGDOC-1.1.2 provides specific requirements and guidance for the information that an applicant should provide related to safeguards and non-proliferation, including the licensee's arrangements to discharge Canada's obligations and provide information to the IAEA.

299. REGDOC-2.13.1, *Safeguards and Nuclear Materials Accountancy*[218] sets out requirements and guidance for safeguards programs for applicants and licensees who possess nuclear material, operate a uranium and/or thorium mine, carry out specified types of nuclear fuel-cycle related research and development work, and/or carry out specified types of nuclear-related manufacturing activities.

300. In section 4.13 of CMD 24-H3.1 and section 4.13 of its application, OPG provided information on its safeguards and non-proliferation program for the DNNP. OPG reiterated that the activities that the proposed licence to construct would authorize would not include the receipt or handling of nuclear fuel. With that noted, OPG provided information on its plans for installing safeguards equipment, providing access and assistance to the IAEA, and for future nuclear material accountancy and control.

301. In section 4.13.1 of its application, OPG submitted that it provided a design information questionnaire to the CNSC alongside its application. OPG reported that this questionnaire provided CNSC staff and the IAEA with information pertaining to the facility's design, operation, and locations of nuclear material inventory and nuclear material flow points to ensure that the IAEA has the necessary information to establish safeguards measures. OPG reported that it would update the questionnaire as construction progresses.

302. With respect to granting access and assistance to the IAEA, in section 4.13.3 of CMD 24-H3.1, OPG reported that it would provide access to the IAEA for all reasonable requests on short notice for access to applicable DNNP facilities and equipment.

303. In section 2.12 of CMD 24-H3 and section 3 of CMD 24-H3.F, CNSC staff submitted that OPG had maintained a safeguards program across all of its operating nuclear facilities that is compliant with REGDOC-2.13.1. While not all elements of the

[218] REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy*, CNSC, February 2018.

program are applicable during the licence to construct phase, CNSC staff noted the requirement to provide IAEA inspectors with access and assistance, along with the submission of operational and design information reporting, would be required. CNSC staff is of the view that OPG has adequate measures in place to achieve safeguards and non-proliferation objectives.

304. Regarding non-proliferation, CNSC staff noted that OPG would continue to exchange controlled nuclear information pertaining to the BWRX-300 reactor technology with GEH during the construction phase.[219] In section 4.13 of CMD 24-H3.1, OPG reported that it maintains a set of import and export licences which authorize the exchange of controlled nuclear information with specified international parties. OPG submitted that it would continue to manage these licences separately from the current licence to prepare site and the proposed licence to construct.

305. Asked about the installation of IAEA monitoring equipment, an OPG representative stated that OPG is committed to providing access to the IAEA to install its equipment as needed. The OPG representative noted that there were no novel features in the BWRX-300 design that would impact the IAEA's ability to conduct its monitoring activities.[220]

306. Regarding the design information provided to the IAEA, CNSC staff noted that, per REGDOC-2.13.1, the IAEA would be informed about any changes to the design information questionnaire 270 days before the commencement of construction activities.[221]

307. Several intervenors including Chris Corey (CMD 24-H3.28), Barbara Schumacher (CMD 24-H3.33), Marilyn Hay (CMD 24-H3.34), Mary Ludwig (CMD 24-H3.44), and Stephen Lawrence (CMD 24-H3.59) expressed concern regarding how the Project may contribute to the proliferation of nuclear weapons. While out of scope for the licence to construct phase, the Commission notes that, in section 3 of CMD 24-H3.F, CNSC staff explained that it implements a licensing and compliance program to ensure that imports and exports of nuclear and nuclear-related dual use items conform to regulatory requirements, as well as to Canada's nuclear non-proliferation policy and international obligations. CNSC staff reported that OPG has demonstrated an intent to comply with CNSC import and export licensing requirements for controlled nuclear substances and equipment, at the appropriate licensing stages, and that it has adequate measures in place to achieve the non-proliferation objectives.

308. The Commission concludes that OPG has an appropriate safeguards program in place to accommodate the activities under the proposed licence to construct. The Commission finds that:

- OPG's existing safeguards and non-proliferation program is adequate to support the activities that would be authorized under the licence to construct
- OPG's safeguards and non-proliferation program meets regulatory requirements, including those set out in REGDOC-2.13.1

[219] Section 2.12, CMD 24-H3.
[220] Transcript, January 14, 2025, pages 186-190.
[221] Transcript, January 14, 2025, pages 188.

- OPG has provided preliminary design information to CNSC staff and the IAEA and will update that information no later than 270 days prior to the start of construction
- OPG has committed to provide the IAEA with access to DNNP facilities and equipment
- OPG has the appropriate licences to authorize the exchange of controlled nuclear information with GEH

3.5.13 Conclusions on OPG's Safety and Control Measures with Respect to the Safety and Control Areas

309. Based on its analysis of the information provided and discussed above, the Commission is satisfied that OPG is qualified to carry on the licensed activities that the licence to construct would authorize. In addition, the Commission finds that OPG has adequate programs and measures in place, or that will be in place, with respect to the 12 applicable SCAs to ensure that the health and safety of workers, the public and the environment will be protected. The Commission further concludes that OPG has adequate measures in place to provide for the maintenance of national security and to implement international obligations to which Canada has agreed.

310. OPG is required to provide additional information to the CNSC to support its compliance with regulatory requirements under a number of safety and control areas. OPG will have to provide this information, as described in Appendix D.2 of CMD 24-H3, in the proposed LCH, and throughout section 3.5 of this *Record of Decision*. The Commission expects CNSC staff to track OPG's completion of these commitments in licensing basis document *BWRX-300 Licensing Regulatory Actions*. Commitments that are essential to verify compliance with regulatory requirements related to the safety analysis and design of SSCs that are important to safety are tied to proposed regulatory hold points, as described in section 3.8.3 of this *Record of Decision*.

3.6 Indigenous Engagement and Consultation

311. The common law duty to consult is grounded in the key principle of the honour of the Crown. The foundation of the duty in the Crown's honour and the goal of reconciliation mean that the duty arises when the Crown has knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it.[222] The Commission acknowledges its obligation to fulfill the duty to consult and ensure that it upholds Aboriginal and/or treaty rights, pursuant to section 35 of the *Constitution Act, 1982* in the matter before it. The Commission is also mindful that its determination of what the duty to consult and accommodate requires is informed by the principles and the provisions of the UNDRIP as a result of its adoption into Canadian law via the UNDA.

312. OPG's Darlington facility falls within the area of historic Southern Treaties (1764-

[222] *Haida Nation*, supra note 9 at paragraph 35.

1862) entered into following the Royal Proclamation of 1763.[223] These treaties include the Niagara Treaty (1764), the Treaty of Paris (1783), and the Upper Canada Treaties of 1764-1846. The most recent treaty agreements are the Williams Treaties, signed in 1923.

313. With respect to the Williams Treaties, in 2018, a Settlement Agreement was reached between the Crown and the Chippewa and Mississauga peoples who signed the Williams Treaties, providing recognition of pre-existing treaty harvesting rights in certain areas, financial compensation, potential for additional reserve lands, and apologies from Canada and Ontario for their narrow interpretation which denied Chippewa and Mississauga peoples of the rights solidified in the 1923 treaties.[224] The signatories to the Williams Treaties are:

- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Beausoleil First Nation
- Chippewas of Rama First Nation

314. The CNSC's consultation process provides for Indigenous Nations and communities to:

- receive and assess project information
- participate in public proceedings
- apply for participant funding
- make submissions—both oral and written—about their concerns, how their concerns could be accommodated, and with respect to potential or actual impacts to Aboriginal and/or treaty rights
- integrate ceremony into public proceedings

315. In meeting its obligations towards Indigenous Nations and communities, the Commission may rely on consultation undertaken by CNSC staff as well as the opportunities for Indigenous Nations and communities to make submissions directly to the Commission and to participate in the hearing process. The Commission may also rely on the engagement work of OPG. This consideration does not mean that the consultation undertaken by CNSC staff stops or is replaced by OPG's engagement, but rather that both continue concurrently.[225]

316. The Commission considered the information provided by CNSC staff and OPG regarding Indigenous consultation and engagement activities in respect of this matter.

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[223] On October 7, 1763, King George III issued a Royal Proclamation for the administration of British territories in North America, which set out the core elements of the relationship between First Nations and the Crown, established the recognition of First Nation rights in Canada, and laid the foundation of the treaty-making process and Canada's territorial evolution. Retrieved online from the Government of Canada website - Indigenous History in Canada - Royal Proclamation of 1763.

[224] Honourable Carolyn Bennett, Minister of Crown-Indigenous Relations on behalf of the Government of Canada *Statement of Apology for the Impacts of the 1923 Williams Treaties*, November 17, 2018, Rama, Ontario.

[225] *Notice of Public Hearing 2024-H-03*, CNSC, June 27, 2024.

The Commission also considered the oral and written submissions of Indigenous Nations and communities and their representatives regarding their impacted rights and interests.

317. The Commission recognizes that all Indigenous Nations and communities participating in this matter have shared valuable time, energy, and knowledge with the Commission. The Commission has carefully considered the submissions and knowledge provided by the Indigenous Nations and communities with a view to understanding the issues and concerns as presented. The Commission sincerely appreciates the participation of each Indigenous Nation and community. The hearing process provided a valuable opportunity for the Commission to interact and exchange with rights-bearing Indigenous Nations, Indigenous groups and individuals respecting their views, contributions, and considerations important to the matter before the Commission.

318. The matter before the Commission is OPG's application for a licence to construct one BWRX-300 reactor at OPG's Darlington Nuclear site. Licensing decisions of the Commission, where established or potential Aboriginal and/or treaty rights may be adversely impacted, can engage the duty to consult, and the Commission must be satisfied that it has met the duty prior to making the relevant licensing decision. The Commission acknowledges that the matter before the Commission triggers the duty to consult with regards to the rights-holding William Treaties First Nations.

3.6.1 Indigenous Consultation by CNSC Staff

319. In section 3.1.2 of CMD 24-H3, CNSC staff identified the following Indigenous Nations and communities who have Aboriginal and/or treaty rights in the area where the DNNP is proposed. These Indigenous Nations and communities are also referred to as the "potentially impacted" Indigenous Nations and communities.

- Williams Treaties First Nations:
    - Alderville First Nation (AFN)
    - Curve Lake First Nation (CLFN)
    - Hiawatha First Nation (HFN)
    - Mississaugas of Scugog Island First Nation (MSIFN)
    - Chippewas of Beausoleil First Nation
    - Chippewas of Georgina Island First Nation
    - Chippewas of Rama First Nation

CNSC staff also identified the following Indigenous Nations and communities who have expressed an interest in the DNNP:

- Métis Nation of Ontario (MNO)
- Mohawks of the Bay of Quinte
- Saugeen Ojibway Nation (SON)
- Six Nations of the Grand River

The term "identified Indigenous Nations and communities" refers to both the potentially impacted and the interested Indigenous Nations and communities.

320. CNSC staff provided the Commission with information about its consultation and engagement activities with the identified Indigenous Nations and communities in section 3 of CMD 24-H3, section 4 of CMD 24-H3.B, in *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application* (appended to CMD 24-H3), and orally at the hearing. In section 4 and Appendices A and C of CMD 24-H3.F, CNSC staff provided updates on its engagement and consultation efforts, its assessment of potential impacts on rights, and CNSC staff's recommendations related to Indigenous engagement and consultation. CNSC staff's key recommendations were that:

- OPG's licence to construct application has the potential to impact Aboriginal and/or treaty rights; and
- those potential impacts have been appropriately assessed, considered, mitigated, and accommodated based on the commitments and accommodation measures proposed by OPG and CNSC staff

321. CNSC staff submitted that it had consulted and engaged with the identified Indigenous Nations and communities on the DNNP on an ongoing basis since 2007, including during the DNNP EA process, throughout the site preparation licensing process, and on OPG's current application for a licence to construct. CNSC staff also reported that it has Terms of Reference in place for long-term engagement with several of the identified Indigenous Nations and communities, including with HFN, CLFN, MSIFN, MNO and SON.

322. CNSC staff submitted that, in May 2022, it notified the identified Indigenous Nations and communities that OPG was expected to submit a licence to construct application for the DNNP. Following May 2022, CNSC staff continued its consultation and engagement activities with the identified Indigenous Nations and communities including:

- meetings and phone calls
- email correspondence
- conducting workshops
- collaborating on issues tracking tables
- striving to reach consensus on issued raised
- supporting and encouraging participation in the hearing process
- providing funding through the CNSC's Participant Funding Program and Indigenous and Stakeholder Capacity Fund
- providing information, consulting, and engaging on CNSC staff's technical review and assessment of OPG's licence to construct application

CNSC staff provided detailed information on its consultation and engagement activities in section 4, Appendix A, and Appendix B of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application* and in section 4, Appendix A, and Appendix C of CMD 24-H3.F.

323. In the Commission's April 2024 determination[226] on the applicability of the DNNP EA to the BWRX-300 reactor technology, the Commission directed CNSC staff to:

- support OPG's collaborative work on the following study and assessments:
  - rights impact assessments (RIA)
  - Indigenous Knowledge study
  - cumulative impacts assessment
- produce an up-to-date consultation report, to be filed on the record of the public hearing regarding the licence to construct application.

The Commission also stated its expectation for both CNSC staff and OPG to continue their respective consultation and engagement activities with all identified Indigenous Nations and communities, and their representatives, over the lifecycle of the DNNP and with respect to any subsequent applications to the Commission.

324. Regarding the commitment to produce an up-to-date consultation report, CNSC staff submitted *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application* alongside its CMD 24-H3. CNSC staff provided further updates on its consultation efforts in CMD 24-H3.B and CMD 24-H3.F.

325. CNSC staff conducted RIAs for OPG's LTC application which it included in section 4.3 of CMD 24-H3.F. CNSC staff acknowledged that the Michi Saagiig Nations disagreed with the RIA process and the adequacy of the final RIAs. In response, CNSC staff committed to collaborating with the Michi Saagiig Nations to update the RIAs at future DNNP licensing stages, as new information is gathered and provided by the Michi Saagiig Nations. CNSC staff also committed to ongoing collaboration with the Michi Saagiig Nations and OPG on supporting an Indigenous Knowledge study and a cumulative effects study. These commitments are detailed in section 3.6.5.1 of this *Record of Decision*.

326. In sections 4.1.1 and 4.3.6 of CMD 24-H3.F, CNSC staff proposed additional accommodations in response to the concerns raised by the Michi Saagiig Nations during CNSC staff's consultation activities. These accommodations pertain to both CNSC staff's general policies and to OPG's LTC application, specifically, and are detailed throughout section 3.6.5 of this *Record of Decision*. CNSC staff requested that the Commission direct CNSC staff to implement the commitments.

327. CNSC staff noted that the requirements and guidance for licensees regarding Indigenous engagement are set out in REGDOC-3.2.2, *Indigenous Engagement*.[227] While the Crown cannot delegate the duty to consult and is ultimately responsible for ensuring that the discharge of the duty to consult, and where appropriate, accommodate, is fulfilled, the Commission can consider engagement undertaken by OPG, including with respect to avoidance, mitigation or other measures adopted or proposed by OPG for potential accommodation purposes.[228]

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[226] *Record of Decision in the matter of the Determination of Applicability of Darlington New Nuclear Project Environmental Assessment to OPG's Chosen Reactor Technology*, CNSC, April 19, 2024.
[227] REGDOC-3.2.2, *Indigenous Engagement*, Version 1.1, CNSC, August 2019.
[228] *Notice of Public Hearing 2024-H-03*, CNSC, June 27, 2024.

3.6.2 Indigenous Engagement by OPG

328. The Commission examined the information submitted by OPG regarding its ongoing engagement with Indigenous Nations and communities near the proposed DNNP site. OPG provided this information in section 5.4 of its application, section 5.3 of CMD 24-H3.1, in CMD 24-H3.1A, section 5.0 of CMD 24-H3.1C, and orally at the hearing. OPG noted that it engaged with the local rights holders of the Williams Treaties First Nations, including:

- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Chippewas of Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation

OPG also noted that it engaged with Indigenous Nations and communities that had expressed interest in the DNNP, including:

- Huron-Wendat Nation
- Kawartha Nishnawbe
- Métis Nation of Ontario Region 8
- Mohawks of the Bay of Quinte
- Saugeen Ojibway Nation
- Six Nations of the Grand River

329. In section 5.3 of CMD 24-H3.1, OPG submitted that it had engaged with the local rights holders on small modular reactor development since 2018, in accordance with REGDOC-3.2.2. OPG submitted that its engagement activities included:

- regular virtual and in-person meetings
- newsletters
- project permitting reviews and reviews of project activities which may impact Aboriginal and/or treaty Rights
- ongoing discussions on environmental impacts and monitoring
- community visits and meetings with the leadership of Indigenous Nations and Communities

330. In its DNNP Indigenous Engagement Reports, provided in CMD 24-H3.1 and CMD 24-H3.1A, OPG detailed its commitments based on the issues heard through OPG's engagement activities, including:

- funding an Indigenous Knowledge study
- developing an environmental monitoring augmentation plan to apply an Indigenous lens to existing monitoring activities

- planning and conducting aquatic offsetting and terrestrial restoration in collaboration with the Michi Saagiig Nations, including quarterly meetings to undertake offsetting and restoration planning, and the establishment of beneficial action areas on the DNNP site
- engaging with the Michi Saagiig Nations regarding permits and approvals tied to activities potentially impacting Aboriginal and/or treaty rights, including monthly meetings to discuss permitting requirements
- including Indigenous ceremony in the Project
- establishing an environment table and a waste table to share knowledge between OPG and the Michi Saagiig Nations on these topics of specific interest
- requiring Indigenous training for all DNNP staff with an emphasis on WTFN and the 2018 Settlement Agreement

The Commission anticipates that OPG commitments in this regard will evolve and develop as its relationship with the WTFN grows and knowledge from studies and interactions come forward. The Commission expects to see this evolution and looks forward to hearing of it.

331. In section 2.0 of CMD 24-H3.1A, OPG submitted that it had entered into relationship framework agreements with AFN, CLFN, HFN, and MSIFN. The framework agreements allow for dedicated time and capacity funding to support regular engagement on OPG's operations.

332. In the Commission's April 2024 determination on the applicability of the DNNP EA to the BWRX-300 reactor technology, the Commission stated its expectation for OPG to engage and collaborate with interested Williams Treaties First Nations regarding RIAs, an Indigenous Knowledge study, a cumulative impacts assessment, and the EA follow-up and monitoring program. The Commission also outlined its expectations for OPG regarding reporting on its engagement activities.

333. In section 5.1 of CMD 24-H3.1C, OPG provided updated information on its ongoing collaborative efforts with the rights-holding Michi Saagiig Nations of the Williams Treaties First Nations. These efforts include progress towards an Indigenous Knowledge study that would be Indigenous-led and funded by OPG. OPG reported that the Indigenous Knowledge study would run parallel to DNNP project phases as part of OPG's long-term relationship with the Michi Saagiig Nations. The study would encompass and inform the following elements:

- RIA
- cumulative effects study
- enhanced environmental monitoring (EA follow-up) to bridge the 2009 EA to today's standards
- aquatic offsetting and terrestrial restoration planning and execution

334. During its oral presentation at Part 2 of the hearing (CMD 24-H3.1D), OPG updated the Commission on OPG's recent engagement activities. Such activities included engagement with the Williams Treaties First Nations on provincial and federal permits for the DNNP, on-site seed collection, and hosting workshops to identify appropriate areas for terrestrial and aquatic offsetting. OPG also informed the Commission that it

had agreed to two letters of intent with the Michi Saagiig Nations.[229] The first letter of intent is specific to the DNNP and the other relates to the broader relationship between the Michi Saagiig Nations and OPG.

335. In section 4.4 of CMD 24-H3.F, CNSC staff noted that OPG had conducted engagement activities with Indigenous Nations and communities in accordance with REGDOC-3.2.2. CNSC staff also noted that OPG had made a number of commitments to address the issues and requests raised by the Michi Saagiig Nations, as described in paragraph 330 above. CNSC staff have proposed to monitor OPG's engagement activities, and implementation of all regulatory commitments outlined in the draft LCH, under site-specific licence condition 15.4. Licence condition 15.4 is discussed further in section 3.8.2 of this *Record of Decision*.

3.6.3 Submissions by Indigenous Nations and Communities

336. Six Indigenous Nations and communities submitted written or oral interventions on this matter:

- The four Michi Saagiig Nations of the Williams Treaties First Nations:
  - Alderville First Nation (CMD 24-H3.62, CMD 24-H3.62A)
  - Curve Lake First Nation (CMD 24-H3.83, CMD 24-H3.83A)
  - Hiawatha First Nation (CMD 24-H3.85, CMD 24-H3.85A)
  - Mississaugas of Scugog Island First Nation (CMD 24-H3.81, CMD 24-H3.81A)
- Saugeen Ojibway Nation (CMD 24-H3.82)
- Métis Nation of Ontario, Region 8 (CMD 24-H3.57)

3.6.3.1 Submissions by the Michi Saagiig Nations of the Williams Treaties First Nations

337. In their individual written interventions and joint oral intervention, the four Michi Saagiig Nations shared their views regarding the DNNP. The additional issues independently raised by each of the four Michi Saagiig Nations are discussed in the relevant subsections below. Their common outstanding issues include:

- CNSC staff's consultation activities have not upheld the UNDRIP or the *2023-2028 UNDA Action Plan*[230] (*UNDA Action Plan*), and have treated the Michi Saagiig Nations as stakeholders instead of rights holders
- OPG's accountability to its engagement commitments
- an Indigenous Knowledge study and a cumulative effects study have not yet been completed
- CNSC staff did not co-develop the RIA process with the Michi Saagiig Nations, the process was developed from a Western perspective and imposed inappropriate timelines on the Michi Saagiig Nations

[229] Transcript, January 8, 2025, page 29.
[230] *The United Nations Declaration on the Rights of Indigenous Peoples Act Action Plan*, Department of Justice Canada, 2023.

- the phased or "piecemeal" approach to licensing the DNNP has prevented the Michi Saagiig Nations from obtaining a holistic view of the Project and its potential impact on their rights
- the Lake Ontario lakebed at the Darlington Nuclear site is unceded territory and any construction activities that may impact it require the consent of the Williams Treaties First Nations
- OPG's detailed plans for the management of radioactive waste that would be produced from the future operation of the DNNP should have been included in OPG's licence to construct application
- the consent of the Williams Treaties First Nations is required regarding the management of future radioactive waste and the DNNP site
- tight timelines to apply for and receive participant funding are not conducive to securing appropriate support and meeting CNSC process deadlines

The Commission's consideration of these issues is discussed in section 3.6.5 of this *Record of Decision*.

338. In their oral presentation, the Michi Saagiig Nations clarified that they "support [the] clean energy objectives of the federal government and the government of Ontario, but require the implementation of those objectives, including the CNSC's review of the DNNP licence processes, to be fully consistent with Canada's adoption of the UNDRIP, including the action plan which outlines the commitment of the federal government and its ministries and agencies to respect the territorial rights of Indigenous Peoples and to seek their free, prior, and fully informed consent in decisions that affect them, their communities, and territories. And the findings of the Truth and Reconciliation Commission of Canada with respect to the lasting impacts of residential school systems on First Nations Peoples and families."[231]

339. In their joint oral intervention, the Michi Saagiig Nations made the following requests to the Commission specific to OPG's application for a licence to construct:

- "we request that rights-holding First Nation perspectives be fully integrated into the consultation, review, and decision-making processes for the DNNP and future nuclear projects. For certain aspects, our consent is also required"
- "we request that the CNSC adopt a model similar to the Indigenous Advisory Committee and Monitor Program established by the Canadian Energy Regulator under the Ministry of Natural Resources Canada to fulfill its legal obligation for meaningful consultation and consent"
- "we request that the Commission order the establishment of regulatory holdpoints with an enforcement mechanism to sures that OPG fulfills its consultation obligations and uphold the intent of the negotiated LOIs"

The Michi Saagiig Nations also reiterated accommodation requests raised during the January 2024 hearing on the applicability of the DNNP EA to the BWRX-300 technology. The Michi Saagiig Nations requested for the Commission to require the following accommodations:

[231] Transcript, January 8, 2025, page 147.

- "ensure OPG works collaboratively with MSIFN, HFN, CLFN, and AFN to understand and address community concerns regarding nuclear risks and nuclear waste management:
    - Commit to meeting with interested Leadership to review and present a comparison of international best practices for the management and storage of used nuclear fuel with the current practices at the Darlington Site"
- "ensure OPG engages and consults with MSIFN, HFN, CLFN, and AFN on other Federal and Provincial permits and approvals that have been identified as of interest to our Nations"
- "require OPG to work collaboratively with MSIFN, HFN, CLFN, and AFN to develop and undertake
    - a Comprehensive Gap Analysis
    - a Cumulative Effects Assessment
    - a First Nation-led Rights Impact Assessment that, at a minimum, is informed by a Gap Analysis, Regional Indigenous Knowledge Study, and Cumulative Effects Assessment"
- "require OPG to work collaboratively with MSIFN, HFN, CLFN, and AFN tp develop, implement, and participate in:
    - an Environmental Monitoring Plan or Program for the DNNP"
    - an Overall EA Follow Up Program
- "require CNSC and OPG to fund a Regional Indigenous Knowledge Study"
- "require OPG to establish a plan/program for offsite restoration (aquatic and terrestrial) to offset impacts by the projects and to protect and enhance lands and waters important to MSIFN, HFN, CLFN, AFN – which would be supported by a Restoration Fund"

340. In their joint oral presentation, the Michi Saagiig Nations revised their request regarding establishing regulatory hold points for the consideration of impacts to Indigenous rights. Instead of requesting hold points, the four Michi Saagiig Nations requested that two new compliance verification criteria be added to the proposed LTC LCH under licence condition 15.4, noting that this would "better serve our goal of ongoing engagement and relationship-building between the Nations and OPG throughout the licensing period."[232] On January 8, 2025, the Michi Saagiig Nations submitted a letter[233] to the Commission detailing their proposed compliance verification criteria language, which they had drafted in collaboration with OPG. This request is discussed further in section 3.8.2 of this *Record of Decision*.

Mississaugas of Scugog Island First Nation

341. In its written and oral intervention, MSIFN submitted its outstanding issues regarding

[232] Transcript, January 8, 2025, pages 164-166.
[233] *Supplementary Information in consideration of Ontario Power Generation's Licence to Construct application for one BWRX-300 reactor at the Darlington New Nuclear Project Site*, Chief T. Simpson, Chief K. Knott, Chief L. Carr, and Chief K. LaRocca, January 8, 2025.

the DNNP, including:

- DNNP will result in "undeniably new"[234] impacts to MSIFN's Aboriginal and Treaty rights
- an impact assessment under the IAA should have been completed for the DNNP and that "the DNNP process has not provided the Nations with decision-making authority, despite that requirement existing for new projects under current IAA legislation."[235]
- procedural concerns regarding the CNSC's confidentiality process and posting of hearing documentation on the CNSC website
- CNSC processes "not respecting MSIFN as a government of an Indigenous peoples and community with legitimate responsibilities to protect its member and internal processes requiring it to share information with its members" and "not providing adequate notice, specifically in providing MSIFN with adequate time to review and consider all the [hearing] materials"

In its written intervention, MSIFN submitted that it was prepared to provide its consent for OPG's LTC application, on the basis of "progress toward binding agreements with OPG, with the condition of regulatory hold points prior the envisioned licence to operate (LTO) decision."

342. In its written intervention MSIFN made the following additional requests to the Commission:

- "CNSC, OPG and MSIFN [to] work together to develop a process to properly address [MSIFN's] concerns"
- "CNSC Staff to include MSIFN representation in the Review and Verification process to be implemented by the CNSC to confirm compliance with its decisions and orders in this hearing"
- "in conjunction with Indigenous Nations,
  (i) include the continuation of the RIA process as part of the review and verification process and
  (ii) the development of a better RIA guidance document for future applications"

and requested that the Commission commit to the following:

- "CNSC undertaking a full strategic review, alongside Indigenous Nations, of the CNSC's regulatory framework for Indigenous engagement to identify and fill regulatory gaps and updates to the CNSC REGDOC 3.2.2 to reflect UNDRIP and FPIC"
- "including a provision for the CNSC to seek MSIFN's consent for the DNNP and the LTC decision, and the envisioned LTO decision"

[234] Transcript, January 8, 2025, page 161.
[235] Transcript, January 8, 2025, page 165.

Curve Lake First Nation

343. In its written and oral intervention CLFN outlined its outstanding issues regarding the DNNP, including:

- "the programs and processes at the CNSC need to evolve to ensure they create a space for meaningful consultation"
- "DNNP will result in continued and additional impacts to the Inherent, Aboriginal and Treaty Rights of the Michi Saagiig Anishnaabeg, including, but not limited to impacts to fishing, hunting, and harvesting, impacts to spiritual landscapes, and impacts to species and places of cultural significance."
- consultation and engagement activities occur "under the rules and timelines dictated by the proponents and by regulators. This sets up a tone for the relationship that is one-sided."[236]

344. In its written intervention CLFN made the following additional requests to the Commission:

- "CLFN Rights, values, culture and spirituality should not be simply documented. Rather, these need to be integrated into the consultation, review and decision-making process throughout the entirety of the DNNP and future nuclear projects. This should occur through meaningful two-way dialogue and long-term accountability."
- 13 specific requests with the intention of ensuring that the "requests, obligations, and commitments" that came from the Commission's April 2024 determination on the applicability of the DNNP EA to the BWRX-300 reactor technology are afforded the "time and space to be planned and implemented"

Hiawatha First Nation

345. In its oral intervention HFN described its outstanding issues regarding the DNNP and CNSC staff's approach to consultation, including:

- "[the DNNP] limits the exercise of preexisting inherent Treaty and aboriginal rights of the Michi Saagiig, Anishinaabeg, and Williams Treaty's First Nations… We are currently unable to use the lands and waters at the Darlington site, not by choice, but because it is inaccessible to us and has been under government and OPG's control for more than 50 years."[237]
- "the current approach does not work. No longer can the Crown dictate the process for assessing impacts on our rights. No longer can the Crown be the judge of what it considers adequate consultation. No longer can the crown tell us what our rights are."[238]

[236] Transcript, January 8, 2025, page 143.
[237] Transcript, January 8, 2025, page 133.
[238] Transcript, January 8, 2025, page 134.

Alderville First Nation

346. In its oral intervention AFN described its specific outstanding issues regarding the DNNP, including:

- AFN has "particular concerns regarding the CNSC baseline used to assess potential impacts on the environment and on Aboriginal treaty rights, their approach to cumulative impact assessments, legacy impacts, and potential waste management facilities related to the DNNP"[239]
- "current CNSC processes are silent with regard to the directives of [the UNDRIP]."[240]
- "it is absolutely imperative that [the Michi Saaggiig Nations] are fully engaged in, and actively participating in, a meaningful consultation process with the Crown so that we may collaboratively arrive at the appropriate accommodations to achieve free, prior and informed consent of our citizens and communities."[241]

Hearing Discussion

347. The Commission asked CNSC staff for additional information on its proposed accommodation measures with respect to the Michi Saagiig Nations. CNSC staff highlighted two of its proposed accommodations; licence condition 15.4 and a collaborative working group with OPG, the Michi Saagiig Nations, and CNSC staff. CNSC staff stated that all of its proposed accommodations were the result of ongoing dialogue with the Michi Saagiig Nations to gain an understanding of their key outstanding issues regarding OPG's LTC application.[242]

348. The Commission asked the Michi Saagiig Nations for their views on the accommodation measures proposed by CNSC staff. A representative from CLFN acknowledged that the accommodations were the work of months of dialogue between the Michi Saagiig Nations, OPG, and CNSC staff. However, the CLFN representative stated that the Michi Saagiig Nations were still of the view that the compliance verification criteria for licence condition 15.4 should be stronger, as detailed in their January 8, 2025 letter.[243] The Chief of MSIFN also voiced concern that the proposed accommodation measures do not provide the Michi Saagiig Nations with any authority for decision-making or giving consent.[244]

349. Regarding proposed licence condition 15.4, CNSC staff noted that the licence condition would provide a regulatory tool to hold OPG accountable to its commitments made during engagement and during the hearing. CNSC staff also noted its commitment to continue to work with the Michi Saagiig Nations regarding the compliance verification criteria for licence condition 15.4.[245] Licence condition 15.4 and the compliance verification criteria under it are discussed further in section 3.8.2 of this *Record of Decision*.

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[239] Transcript, January 8, 2025, page 187.
[240] Transcript, January 8, 2025, page 187.
[241] Transcript, January 8, 2025, page 203.
[242] Transcript, January 8, 2025, pages 217-219.
[243] Transcript, January 8, 2025, pages 228-229.
[244] Transcript, January 8, 2025, page 219.
[245] Transcript, January 8, 2025, pages 217-219.

350. Asked to comment on how CNSC staff addressed the Michi Saagiig Nations' submission on the issue of decision-making authority, CNSC staff stated that "the intent [of the working group], is to have a partnership approach. The Nations here are our partners, we've seen them as partners for years and really want to continue to build that strong collaborative relationship together to ensure that the decision making and what we're recommending to the Commission is done collaboratively." CNSC staff noted that it would be working with the Michi Saagiig Nations to establish Terms of Reference for the working group.[246]

351. Regarding the accommodations proposed by OPG, OPG representatives provided the Commission with updates on the status of its key commitments and accommodations with respect to the Michi Saagiig First Nations, including an Indigenous Knowledge study, cumulative effects study, environmental augmentation plan, international peer review of best practices for waste management, and engagement on offsetting and restoration at the Darlington Nuclear site. [247]

352. Asked about the status of the Indigenous Knowledge study and cumulative effects study, an OPG representative said that the WTFN had hired a consultant to work on the governance structure for the Indigenous Knowledge study. The OPG representative reiterated OPG's commitment to financially support the Indigenous-led study and clarified that the study will not be DNNP-specific. OPG has proposed a workshop with the WTFN in 2025 to better understand how the Indigenous Knowledge will be gathered, the timeline and budget for the study, and how it will impact a cumulative effects study, the RIAs, and an environmental monitoring augmentation plan.[248]

353. The Commission asked for additional information on the international peer review of best practices for waste management. An OPG representative explained that MSIFN had requested the review, with the goal of determining how independent experts would consider OPG in relation to industry peers regarding the safe interim storage of used fuel. OPG provided funding and MSIFN selected the third party which conducted the review. The review was done in September 2024 and it found that OPG's current and planned practices meet or exceed industry best practices.[249]

354. With respect to the adequacy of consultation and engagement efforts, CNSC staff informed the Commission that CNSC staff's evolving approach to consultation is based on the legal requirement on the Crown, best practices, CNSC policies, and feedback from Indigenous Nations and communities. CNSC staff said that it approaches consultation in "an open, transparent, flexible and honourable way, and [CNSC staff] truly want to get to the understanding of what the concerns are and how we can find workable solutions. And what we're looking for is that two-way dialogue"[250] An OPG representative informed the Commission on how OPG had engaged Indigenous Nations and communities to incorporate Indigenous Knowledge into the DNNP project in areas

[246] Transcript, January 8, 2025, pages 221-222.
[247] Transcript, January 8, 2025, pages 223-227.
[248] Transcript, January 14, 2025, pages 165-167.
[249] Transcript, January 8, 2025, pages 225-226.
[250] Transcript, January 8, 2025, pages 234-239.

such as terrestrial restoration planning and aquatic offsetting.[251]

355. The Chief of MSIFN highlighted what the Michi Saagiig Nations view as shortcomings in the CNSC's approach to consultation on this matter. Regarding the application of the UNDRIP and the UNDA to CNSC staff's consultation approach, the MSIFN representative noted that REGDOC-3.2.2 does not mention the UNDRIP and stated that "because there is zero mention of [the UNDRIP], how can they abide and follow it -- if there's zero mention of it in what is guiding the work?"[252] The MSIFN representative also stated that "It's troubling that the CNSC has chosen not to apply the IAA consultation structure to the DNNP project simply because the 2009 EA is deemed sufficient for the licence to construct."[253]

356. Noting that the Michi Saagiig Nations found the RIA process inadequate, the Commission asked CNSC staff to provide additional information on its path forward for the RIAs. CNSC staff stated that it is committed to updating the RIAs for potential future DNNP licensing phases. These updated RIAs would include any relevant information that comes out of the broader Indigenous Knowledge and cumulative effects studies that the Michi Saagiig Nations will be conducting with support from OPG and the CNSC.[254] CNSC staff also noted that its approach to RIAs is based on best practices set by the IAA.[255]

357. The Commission asked for additional information on the activities being undertaken to help build knowledge of the nuclear sector in the Michi Saagiig Nations' communities. CNSC staff stated that it has a mandate to disseminate objective scientific, technical, and regulatory information to the public and Indigenous Nations and communities. CNSC staff informed the Commission that it disseminates this information through many methods including its website, community information sessions, workshops, and facility tours. CNSC staff also provide support to help facilitate learning through the CNSC's Indigenous and Stakeholder Capacity Fund.[256]

358. On the topic of community education, an OPG representative provided information on OPG's "Generation for Generations" program that it is rolling out in 2025. The OPG representative explained that this program would be used to enable Indigenous Nations and communities and the public to better understand Ontario's electricity industry including renewable generation and nuclear, and nuclear regulation.[257]

359. The Chiefs of AFN, HFN and MSIFN discussed the responsibility that they have to make the right decisions on behalf of their community members and their need to have enough information on nuclear projects to ensure that they can make informed decisions. The Chief of HFN highlighted the importance of plain language and direct communications and noted that not all community members would access online learning, "They're not going to go on the website and go through a program. They're

[251] Transcript, January 8, 2025, pages 28-29.
[252] Transcript, January 8, 2025, page 160.
[253] Transcript, January 8, 2025, page 239.
[254] Transcript, January 14, 2025, pages 190-195.
[255] Transcript, January 14, 2025, pages 199-200.
[256] Transcript, January 8, 2025, pages 252-254.
[257] Transcript, January 8, 2025, pages 254-255.

not going to just pick up a booklet and read it. We are visual. We are oral. We learn that way."[258]

3.6.3.2 Submissions by Saugeen Ojibway Nation

360. In its written and oral intervention (CMD 24-H3.82), SON outlined its outstanding issues related to OPG's LTC application, including:

- OPG's plans to manage radioactive waste that would be produced during the licence to operate phase
- the possibility of future radioactive waste being stored on SON territory without SON consent
- narrowing the scope of the duty to consult due to the phased approach to the DNNP licensing
- CNSC staff's approach to consultation and classification of SON as an "interested" Nation rather than a "potentially impacted" Nation
- application of the UNDRIP and FPIC to the CNSC licensing process
- upholding the commitments made during the DNNP EA process, particularly JRP recommendations #52 and #53

361. In its written intervention, SON also requested that licence condition 11.1 in the proposed licence to construct be revised from the language proposed by CNSC staff in Part 2 of CMD 24-H3 to include language specific to the storage of radioactive waste throughout the DNNP lifecycle. SON's request, and CNSC staff's response, regarding licence condition 11.1 are discussed further in section 3.8.2 of this *Record of Decision*.

362. In CMD 24-H3.1F, OPG submitted a response to SON's concerns regarding the storage of future DNNP radioactive waste on SON territory. OPG stated that:

> "Consistent with the accepted Environmental Assessment, the two options for the storage of the DNNP [low and intermediate-level radioactive waste] L&ILW were:
>
> - Construction of on-site licensed interim storage structures at Darlington; and
> - Off-site transportation to a licensed facility.
>
> Consistent with the Environmental Assessment and, after consideration of both options, OPG is not actively pursuing the option of interim storage of L&ILW generated by the project at OPG's Western Waste Management Facility (WWMF) located within the traditional territory of the Saugeen Ojibway Nation (SON)."

In section 4.2.5 of CMD 24-H3.F, CNSC staff acknowledged that OPG had not submitted an application for a waste management facility for the DNNP. CNSC staff

[258] Transcript, January 8, 2025, page 257.

submitted that it would continue to engage and share information with SON regarding the DNNP and waste management.

Hearing Discussion

363. Noting the phased approach to licensing, and that no radioactive waste would be produced under a licence to construct, the Commission asked OPG to comment on its plans for the storage of radioactive waste that would be produced during the licence to operate phase of the Project, should that materialize. An OPG representative stated that OPG intends to submit an application for a licence amendment in 2026 related to the interim storage of low- and intermediate-level DNNP radioactive waste on the Darlington Nuclear site. Regarding the interim storage of used fuel, the OPG representative explained that used fuel would be stored in the DNNP's used fuel pools before being moved to dry storage containers which would be managed on site.[259]

364. In its written intervention and oral intervention (CMD 24-H3.65, CMD 24-H3.65A) the Nuclear Waste Management Organization (NWMO) reported that it is responsible for the long-term management of Canada's used nuclear fuel, in accordance with the *Nuclear Fuel Waste Act*.[260] In 2023, following the federal government's acceptance of the *Integrated Strategy for Radioactive Waste*,[261] the NWMO was also given the responsibility for the long-term management of Canada's intermediate-level and non-fuel high-level radioactive waste.

365. The NWMO's current plan for Canada's used CANDU fuel is a deep geological repository (DGR) to be built near Ignace, Ontario, outside of SON's traditional territory. The NWMO reported that this DGR would be adaptable to the introduction of new technologies such as BWRX-300 used fuel, should the host community be willing to accept it. For the long-term management of intermediate and non-fuel high-level waste, the NWMO is proposing a second DGR for which it plans to begin a site selection process in 2028. The NWMO reported that it is also exploring the option to include used fuel from the DNNP in this second DGR.

366. Regarding DNNP waste minimization and volume reduction, an OPG representative stated that OPG will finalize its strategy for waste volume reduction for the DNNP at the licence to operate stage. The OPG representative stated that any volume reduction activities that would take place at the WWMF[262] would be subject to a separate licensing process. OPG is also considering other options to conduct waste volume reduction activities outside of SON territory. The OPG representative stated that OPG will continue to engage with Indigenous Nations and communities, including SON, as it finalizes its strategy.[263]

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[259] Transcript, January 9, 2025, page 176.
[260] S.C. 2002, c. 23.
[261] *Integrated Strategy for Radioactive Waste*, NWMO, June 2023.
[262] The Western Waste Management Facility (WWMF) is responsible for the safe handling, management and interim storage of low- and intermediate-level radioactive waste from the Bruce, Darlington, and Pickering NGS. The facility also provides interim storage for used nuclear fuel from the Bruce NGS. The WWMF is a located on the Bruce NGS site, in the municipality of Kincardine, Ontario and on the traditional territory of SON.
[263] Transcript, January 9, 2025, pages 179-180.

367. The topic of waste management, and what waste management requirements apply to the licence to construct phase, are further discussed in section 3.5.10 of this *Record of Decision*.

368. The Commission asked OPG for more information on its relationship with SON. An OPG representative explained that OPG has an ongoing collaboration agreement with SON which was first established in 2004. OPG is committed to continuing its collaboration with SON to address SON's outstanding concerns with the DNNP and to continue to share information on the Project. The OPG representative stated that OPG is also committed to developing a relationship framework with SON regarding the WWMF operations and future plans.[264]

369. The Commission asked CNSC staff to elaborate on its planned consultation and engagement activities, should the DNNP progress. CNSC staff explained that it would assess any future DNNP licence applications for any potential impacts on Aboriginal and/or treaty rights in line with the CNSC's duty to consult obligations. CNSC staff would then consult and engage all potentially impacted or interested Indigenous Nations and communities, including SON. CNSC staff also clarified that it does not only engage with Indigenous Nations and communities on licence applications, but also conducts engagement activities throughout the lifecycle of a facility with the goal of creating long-term relationships. CNSC staff noted that it has an existing Terms of Reference for long-term engagement with SON.[265]

370. Regarding SON's view that JRP recommendation 52 and 53 are not being upheld, licence condition 15.1 of the proposed licence to construct would require OPG to implement the mitigation measures and commitments made during the Joint Review Panel process, including the recommendations of the JRP report. The proposed licence conditions are discussed further in section 3.8.2 of this *Record of Decision*. CNSC staff stated that, as the project progresses to the licence to operate phase or to an amendment to the licence to construct, CNSC staff will consult with SON and ensure that appropriate compliance verification criteria remain in place to make sure that the JRP recommendations are completed.[266]

3.6.3.3 Submissions by Métis Nation of Ontario, Region 8

371. In its written intervention (CMD 24-H3.57), the Métis Nation of Ontario, Region 8 (MNO) submitted its outstanding issues regarding OPG's LTC application, including:

- potential impacts of DNNP construction activities on the Darlington NGS
- emergency preparedness and security of the DNNP site
- access to environmental monitoring data, including the predictive ERA

[264] Transcript, January 9, 2025, page 181.
[265] Transcript, January 9, 2025, pages 194-195.
[266] Transcript, January 9, 2025, page 185.

372. MNO clarified that it does not assert rights over the DNNP site and that the DNNP site is within the administrative boundaries of MNO Region 8 but outside of the Métis traditional territory in Ontario.

Hearing Discussion

373. During the hearing, the Commission considered MNO's submission, as well as those of other intervenors that raised similar concerns regarding emergency preparedness, environmental monitoring data, the proximity of the DNNP site to the Darlington NGS, and sought clarifications and further information from OPG and CNSC staff on these issues. These issues are addressed throughout section 3.5 of this *Record of Decision*.

3.6.4 Application of the UNDRIP, the UNDA and Reconciliation to this Matter

374. The UNDA came into force in Canada on June 21, 2021. Recent jurisprudence confirms that this legislation incorporates the UNDRIP into Canada's positive legal framework, such that the UNDRIP and its articles ought to be used to aid in the interpretation of the scope of section 35 rights and of the duty to consult and accommodate such rights.[267]

375. In section 1.2 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application,* CNSC staff reported that the CNSC is committed to supporting the Government of Canada's whole-of government approach to implementing the UNDA, and the *UNDA Action Plan*, where it intersects with the CNSC's mandate. The principle of free, prior and informed consent (FPIC) is an integral aspect of the UNDA, which is reflected in the *UNDA Action Plan.* Measure #32 in the Shared Priorities chapter of the *UNDA Action Plan* commits to the development of guidance for engaging with Indigenous Peoples on natural resources projects to obtain FPIC. This measure is being led by NRCan with the support of various federal departments and agencies, and is currently in the planning phase.

376. In section 1.2 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application,* CNSC staff noted that it used the following sources for guidance on FPIC:

- *Principles Respecting the Government of Canada's Relationship with Indigenous Peoples* principle #6:

  "The Government of Canada recognizes that meaningful engagement with Indigenous peoples aims to secure their free, prior, and informed consent when Canada proposes to take actions which impact them and their Rights, including their lands, territories and resources."

- *Backgrounder: United Nations Declaration on the Rights of Indigenous Peoples*

[267] *Kebaowek First Nation*, supra note 12 at paragraph 80.

Act: [268]

> "… FPIC describes processes that are free from manipulation or coercion, informed by adequate and timely information, and occur sufficiently prior to a decision so that Indigenous rights and interests can be incorporated or addressed effectively as part of the decision-making process - all as part of meaningfully aiming to secure the consent of affected Indigenous peoples.
>
> FPIC is about working together in partnership and respect. In many ways, it reflects the ideals behind the relationship with Indigenous peoples, by striving to achieve consensus as parties work together in good faith on decisions that impact Indigenous Rights and interests. Despite what some have suggested, it is not about having a veto over government decision making,"

377. In section 1.2.1 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application,* CNSC staff reported that it encourages all nuclear proponents and licensees to pro-actively work with Indigenous Nations and communities who are potentially impacted by their projects to establish a mutually agreeable process to seek the potentially impacted Nation's FPIC. CNSC staff reported that it has had discussions with OPG regarding this matter and has encouraged OPG to work collaboratively with potential impacted Indigenous Nations and communities to address the concerns related to FPIC.

3.6.5 Analysis of Issues raised by Indigenous Nations and Communities

378. The Commission's consideration of the evidence on the record pertaining to the issues raised by Indigenous Nations and communities is discussed in the following section of this *Record of Decision*. The Commission thanks AFN, CLFN, HFN, MSIFN, SON and MNO for their participation in the hearing, and for helping to build a robust hearing record that informed the Commission's recommendations and decisions. The Commission values the participation, knowledge, information, and ceremony that the Indigenous Nations and communities brought to the hearing process.

3.6.5.1 Michi Saagiig Nations of the Williams Treaties First Nations

379. Through their written interventions and joint oral presentation, the Michi Saagiig Nations informed the Commission of many shared issues with OPG's LTC application. The Commission recognizes the individual rights of AFN, CLFN, HFN and MSIFN as independent Williams Treaties First Nations and the Crown's responsibility to discharge the duty to consult and, where appropriate, accommodate with respect to each individual Nation. Though discussed collectively, the Commission considered the shared issues discussed in this section as they apply to each of the four Michi Saagiig Nations.

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[268] Department of Justice Canada, *Backgrounder: United Nations Declaration on the Rights of Indigenous Peoples Act*, retrieved from the Department of Justice – Government of Canada website: https://www.justice.gc.ca/eng/declaration/about-apropos.html, January 23, 2025.

Application of the UNDRIP and the UNDA to CNSC staff's Consultation Approach

380. The Commission heard the Michi Saagiig Nations' view that the CNSC's consultation activities had not upheld the principles of the UNDRIP, the UNDA, and the *UNDA Action Plan*, including FPIC.

381. The Commission also acknowledged CNSC staff's assertion that CNSC staff had considered and incorporated the principles of the UNDRIP in its consultation process for OPG's LTC application by striving to achieve consensus on key issues and by encouraging Indigenous Nations and communities to express their views directly to the Commission regarding their process and position on their FPIC, as it related to the DNNP. [269] CNSC staff's efforts to achieve this consensus with the rights-holding WTFN are detailed in sections 4.1-4.4, Appendices A.1-A.3, and Appendix B of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application,* and in section 4, Appendices A.1-A.4, and Appendices C.1-C.5 of CMD 24-H3.F.

382. The Commission notes that, based on feedback from the Michi Saagiig Nations, CNSC staff proposed the following accommodations regarding the application of the UNDRIP and the UNDA:

> "CNSC staff are committed to having policy discussions with the Michi Saagiig Nations to solicit their feedback regarding the CNSC's approach to Consultation, engagement, regulatory framework, UNDA/UNDRIP implementation and phased licensing approach."[270]
>
> and
>
> "CNSC staff are committed to supporting Indigenous Nations and communities by either providing information about the appropriate contacts and channels for addressing broader concerns or coordinating meetings between the CNSC, the First Nations with other federal departments, as appropriate. For example, this could include discussions with Natural Resources Canada on UNDA policy and approach to addressing legacy issues"

383. The Commission further notes that, in section 1.2 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application*, CNSC staff proposed the following accommodation:

> "The CNSC is committed to continuing to evolve [its] approaches to align with best practices and guidance that emerge through whole-of-government implementation of UNDA, and the *UNDA Action Plan*, including those that relate to FPIC. This includes initiating formal consultation on proposed updates and amendments in 2024-2025 to the CNSC's REGDOC-3.2.2: *Indigenous Engagement* to provide nuclear proponents and licensees with further guidance

[269] Section 4.1.1 of CMD 24-H3.F.
[270] Section 4.1.1 of CMD 24-H3.F.

and clarity with regards to how their approach to engagement and partnership with Indigenous Nations can align with UNDA"

384. The Commission recognizes that the UNDA means that the Commission's consideration of what the section 35 duty to consult and potentially accommodate may entail is to be done through the interpretive lens of the UNDRIP, including the standard of FPIC where applicable.[271] This is a case where Article 32(2) of the UNDRIP applies, meaning the goal of FPIC is the standard of consultation that is triggered.[272]

385. With consideration of the UNDRIP as an important contextual factor for consultation and for the evaluation of its sufficiency, the Commission notes that, over the course of the DNNP, there has been development in the law and adjustments to processes reflecting new understandings of rights. In this matter, the Commission finds the accommodations proposed by CNSC staff to be appropriate and to be sufficient. The Commission hears the clear intention of CNSC staff to continue to work with the Michi Saagiig Nations and Natural Resources Canada on the CNSC's implementation of UNDA policy. In addition, the steps forward toward mutual agreement will continue.

386. The Commission finds that accommodations were also made throughout the hearing process to foster an environment that encourages working together in partnership and respect, and to more fully incorporate the Michi Saagiig Nations' cultural traditions in line with the standard of FPIC consultation. Prior to Part 2 of the hearing, the Commission Registry met with a number of the rights-holding Michi Saagiig Nations, in their community, to receive feedback on how the hearing process could better incorporate their perspectives and be a more welcoming environment to share their views. Accommodations made in response to this feedback included:

- the hearing room was arranged so that hearing participants and the Commission could face each other and be seated on the same level, as closely to a circle-style as possible
- an Elder representing CLFN gave remarks to both open and close the hearing, including a welcoming and a closing song, an acknowledgement of the three orders of creation, and a reminder "to be mindful, to be present, to hold that level of respect, [and] to come with honesty and transparency in your communication styles"[273]
- ceremony including smudging and tobacco offerings were included in the opening of the hearing
- a box of earth from the DNNP site was present for the duration of the hearing, as explained by the Elder representing CLFN, "we believe it is a living being, Aki, the body of Earth Mother... and so we want her to hear our words. We

[271] As explained in *Kebaowek First Nation,* supra note 12, "FPIC is a right to a robust process... it is not a veto or a right to a particular outcome. Nor is FPIC absolute, as States may infringe UNDRIP rights in certain limited circumstances". The UNDRIP concept of FPIC requires an enhanced and more robust process to ensure consultation processes are tailored to consider Indigenous laws, knowledge and practices, and that the process is directed towards finding mutual agreement.

[272] Article 32(2) of the UNDRIP says, "States shall consult and cooperate in good faith the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources."

[273] Transcript, January 8, 2025, page 12.

want her to hear those good words"[274]
- additional time was provided for the presentation by the Michi Saagiig Nations
- the rights-holding Nations presented on the first day of part 2 of the hearing, before intervenors and non-rights holding Nations

The Commission heard positive feedback from the Michi Saagiig Nations and other hearing participants regarding the changes made to the hearing.

387. The Commission directs CNSC staff to implement the accommodations detailed in paragraphs 382 and 383 with respect to CNSC staff's consultation with the Michi Saagiig Nations on the implementation of the UNDA and the *UNDA Action Plan* to ensure that consultation proceeds at the FPIC standard.

Holding OPG Accountable to its Indigenous Engagement Commitments

388. The Commission heard the Michi Saagiig Nations' request for a regulatory mechanism that would require OPG to fulfill its engagement commitments. The Commission is of the view that proposed licence condition 15.4 would provide such a regulatory mechanism. Licence condition 15.4 was proposed by CNSC staff to accommodate the Michi Saagiig Nations' request and would require OPG to conduct ongoing Indigenous engagement specific to the DNNP throughout the licence period. The Commission acknowledges that the Michi Saagiig Nations have proposed revisions to the compliance verification criteria under this licence condition. The Commission's view on licence condition 15.4 and the accompanying compliance verification criteria is further detailed in section 3.8.2 of this *Record of Decision*.

389. The Commission notes that, in section 4.3.6 of CMD 24-H3.F, CNSC staff proposed the following accommodations related to the implementation of OPG's commitments:

> "CNSC staff are committed to collaboratively monitoring OPG's implementation of its proposed mitigation measures and commitments with the Michi Saagiig Nations. CNSC staff are committed to working with the Michi Saagiig Nations to verify the commitments and measures specific to them and report the results and relevant updates to the Commission as appropriate. CNSC staff propose that this is done through a formal working group between OPG, CNSC staff and the 4 Michi Saagiig Nations. CNSC staff propose having quarterly meetings to discuss progress being made on the commitments, any issues or concerns and whether the mitigation measures are working as expected or if adjustments need to be made to ensure that the Nations rights and interests continue to be protected, and the commitments are upheld. The details of the working group and its implementation and structure will be collaboratively developed with the Nations and OPG should the project proceed."

390. The Commission further notes that, in CMD 24-H3.G, CNSC staff proposed the following updated compliance verification criteria for licence condition 15.4 in response to the revisions requested by the Michi Saagiig Nations:

[274] Transcript, January 8, 2025, page 9.

"OPG shall:

- Participate in the proposed oversight and monitoring working group with CNSC staff and the Michi Saagiig Nations to collaborate on progress being made on CNSC and OPG's commitments to Michi Saagiig Nations. This may include discussions and engagement on issues or concerns raised by the Michi Saagiig Nations in relation to the implementation of OPG's and CNSC's commitments to ensure that the Nations' rights and interests continue to be protected, and the commitments are upheld. The details of the working group and its structure will be developed collaboratively between CNSC staff, the Michi Saagiig Nations and OPG. The working group would include collaboration between CNSC staff, the Michi Saagiig Nations and OPG on the contents of the annual reports to the Commission which would include an update on the implementation of CNSC and OPG commitments and engagement through the working group, in relation to the DNNP."

The Commission expects CNSC staff to verify OPG's participation and collaboration in the above noted working group as part of CNSC staff's compliance verification activities under licence condition 15.4.

391. The Commission is of the view that the working group proposed by CNSC staff would provide an additional mechanism for CNSC staff and the Michi Saagiig Nations to collaboratively monitor and share information on OPG's progress on its commitments.

392. The Commission directs CNSC staff to implement the accommodations detailed in paragraphs 389 and 390 with respect to the establishment of a working group to collaboratively monitor OPG's implementation of its commitments.

Completion of an Indigenous Knowledge Study and a Cumulative Effects Study

393. The Commission heard the Michi Saagiig Nations' request for an Indigenous Knowledge study and a cumulative effects study to gather more information on impacts to their rights and interests as it relates to the DNNP and other nuclear facilities in their territory.

394. The Commission heard a strong commitment from CNSC staff and OPG to support the Michi Saagiig Nations in the completion of an Indigenous Knowledge study and a cumulative effects study, including the provision of financial support. The Commission is of the view that licence condition 15.4 would provide a regulatory tool for CNSC staff to hold OPG accountable to its commitments on this matter.

395. OPG and CNSC staff are also required to abide by the Commission's existing directions regarding the Indigenous Knowledge and cumulative effects studies as outlined in the Commission's April 2024 determination on the applicability of the DNNP EA to the BWRX-300 reactor technology.

396. The Commission understands that the Michi Saagiig Nations have hired a consultant to

work on the governance structure for the Indigenous Knowledge study, and that this governance structure must be completed prior to commencement of the study.

397. The Commission notes that, in section 4.3.6 of CMD 24-H3.F, CNSC staff proposed the following accommodations related to the completion of the Indigenous Knowledge and cumulative effectives studies:

> "CNSC staff are committed to the ongoing collaboration with the Michi Saagiig Nations and OPG on supporting an Indigenous Knowledge study to gather more information and data regarding the Michi Saagiig Nations rights and interests as it relates to the DNNP and surrounding territory. This includes providing funding, informational, and other support to complete these studies as appropriate. CNSC staff have been informed that the Michi Saagiig Nations are working on a governance framework for the studies and that the work on the studies will not begin until after a framework is in place. CNSC staff are able to provide funding and support for the study when requested by the Michi Saagiig Nations."
>
> and
>
> "CNSC staff commit to supporting and ongoing collaboration with the Michi Saagiig Nations on completing a cumulative effects study, which could include a cumulative effect on rights analysis as it relates to the nuclear sector in their traditional and treaty territories."

398. The Commission further notes that, in CMD 24-H3.G, CNSC staff proposed updated compliance verification criteria for licence condition 15.4 in response to the revisions requested by the Michi Saagiig Nations, including:

> "The DNNP is located within the Williams Treaties territory. In order to support fulfilling the Duty to Consult, and where appropriate, accommodate, the licensee shall continue to collaborate and engage with 4 the Michi Saagiig Nations of the Williams Treaties First Nations on the specific commitments and accommodations made throughout the regulatory review process. This includes, but is not limited to:
>
> - Scoping the extent, timing and content of an Indigenous Knowledge Study.
> - Scoping the extent, timing and content of a Cumulative Effects Study."

399. The Commission directs CNSC staff and OPG to implement the accommodations detailed in paragraph 397 with respect to CNSC staff's support and collaboration on Indigenous Knowledge and cumulative effects studies with the Michi Saagiig Nations. The Commission also expects CNSC staff to verify OPG's completion of the measures detailed in paragraph 398 as part of CNSC staff's compliance verification activities under licence condition 15.4.

Rights Impact Assessments

400. The Commission heard the Michi Saagiig Nations' view that the scope, timelines, baseline, and process used by CNSC staff to develop the RIAs for OPG's LTC application were inadequate, and, specifically, "to ensure that the RIA is effective and the Crown properly fulfills its duty, CNSC staff should have collaborated with the Treaty Nations to co-develop the RIA framework, including time with the comprehensive needs of the RIA process itself. Instead, CNSC staff imposed their own reporting timelines, which are disconnected from the time that is required to conduct a genuine and thorough rights impact assessment."[275]

401. The Commission is of the view that CNSC staff made a good faith effort to collaborate with the Michi Saagiig Nations on the RIAs. The Commission notes that, in section 4.3.1.1 of CMD 24-H3.F, CNSC staff submitted that it had offered to conduct collaborative RIAs with the Michi Saagiig Nations regarding OPG's DNNP LTC application. CNSC staff had multiple discussions with CLFN, HFN, and MSIFN regarding the RIA approach between 2023 and 2024, as detailed in section 4 of *CNSC staff's Indigenous Consultation Report for the Darlington New Nuclear Project Licence to Construct Application* and in sections 4.2.1-4.2.3 and Appendix A of CMD 24-H3. CNSC staff proceeded with a narrative-based approach for the DNNP LTC RIA after it did not receive feedback from the Michi Saagiig Nations regarding their preferred approach to conducting the RIA assessment in advance of Part 2 of the Hearing.

402. The Commission acknowledges that CNSC staff asked the Michi Saagiig Nations whether they would prefer to explore the option of delaying the regulatory review process to provide more time for the Indigenous Knowledge and cumulative effects studies to be started, and to conduct the DNNP LTC application RIA collaboratively. CNSC staff reported that the Michi Saagiig Nations either indicated that they were not asking to delay the project at this time or that they were comfortable with the regulatory process proceeding in parallel with the studies.[276]

403. The Commission notes that, in section 4.3.6 of CMD 24-H3.F, CNSC staff proposed the following accommodation related to updating the DNNP LTC RIA for future phases of the DNNP:

> "CNSC staff are committed to collaborating with the Michi Saagiig Nations to update RIAs as new information is gathered and provided by both the Michi Saagiig Nations and OPG and to providing updates to the Commission at future phases of the regulatory review and licensing process for the DNNP, such as a potential Licence to Operate, should the project proceed"

404. The Commission further notes that, in section 4.1.1 of CMD 24-H3.F, CNSC staff proposed the following accommodation regarding a broader, territory-wide RIA:

> "CNSC staff are committed to supporting interested Michi Saagiig Nations in conducting a longer-term broader RIA covering all CNSC-regulated facilities in their territory, driven by the Nations and based on, but not limited to the Indigenous Knowledge study and cumulative effects assessment. CNSC staff view is that this would not be a project specific RIA and would take the form of

[275] Transcript, January 8, 2025, page 163.
[276] Section 4.3.5.6 of CMD 24-H3.F.

> a study and assessment of cumulative effects on the rights and interests of the Michi Saagiig Nations as it relates to the nuclear sector. The results of this study could inform future regulatory processes for nuclear projects and activities in their territory, should the First Nations wish to share and incorporate the information into project specific assessments in the future."

405. The Commission has heard a strong commitment from CNSC staff to collaborate with the Michi Saagiig Nations to both update the DNNP LTC RIA for future DNNP licensing phases, as new information becomes available, and to support the Michi Saagiig Nations in conducting a longer-term broader RIA covering all CNSC-regulated facilities in their territory. The Commission is satisfied that CNSC staff are committed to working with the Michi Saagiig Nations to develop a collaborative RIA process.

406. The Commission directs CNSC staff to implement the accommodations detailed in paragraphs 403 and 404 with respect to CNSC staff's support and collaboration with the Michi Saagiig Nations on the RIAs for future DNNP licensing stages, and on a territory-wide RIA.

Phased Approach to Licensing the DNNP

407. The Commission heard the Michi Saagiig Nations' view that the phased approach to licensing the DNNP prevented the Michi Saagiig Nations from obtaining a holistic view of the Project and its potential impact on their rights.

408. During the hearing, the Commission considered the Michi Saagiig Nations' submissions, as well as those of other intervenors that raised similar concerns regarding the phased approach to the DNNP and sought clarifications and further information from OPG and CNSC staff on this issue. The phased approach to licensing the DNNP is discussed in further detail in sections 3.1.1 and 3.4 of this *Record of Decision*.

409. The Commission is of the view that the phased approach to licensing the DNNP is appropriate and in line with the requirements of the NSCA, CINFR, and international best practices. The Commission notes that the impacts of the DNNP over its entire lifecycle were considered in the DNNP EA.

410. In spite of this, the Commission understands that the Michi Saagiig Nations disagree with the phased approach to licensing and are of the view that they do not have the information required to understand the holistic impacts of the Project on their rights and that this can impact the issue of their consent.

411. As discussed in section 3.6.5.1 of this *Record of Decision*, CNSC staff proposed the following accommodation in section 4.1.1 of CMD 24-H3.F which relates to the phased licensing approach:

> "CNSC staff are committed to having policy discussions with the Michi Saagiig Nations to solicit their feedback regarding the CNSC's approach to Consultation, engagement, regulatory framework, UNDA/UNDRIP implementation and phased licensing approach."

The Commission directed CNSC staff to implement this accommodation measure in section 3.6.5.1 of this *Record of Decision*. The Commission is also of the view that the completion of the Indigenous knowledge and cumulative effects studies, also described in section 3.6.5.1 of this *Record of Decision*, will allow the Michi Saagiig Nations to gather more information on impacts to their rights and interests as it relates to the DNNP. The Commission anticipates ongoing consultation as these studies are completed and anticipates the potential for more opportunities to incorporate Indigenous knowledge into the DNNP.

Permitting, Offsetting, and Jurisdiction of the Lakebed

412. The Commission heard the issue raised by the Michi Saagiig Nations regarding their unceded rights to the lakebed where OPG is proposing in-water construction activities for the DNNP. The Commission also heard requests from the Michi Saagiig Nations for OPG to engage with them regarding federal and provincial permits, and for OPG to establish a plan to offset the environmental impacts of the DNNP.

413. The Commission notes that, as described in section 4.3.5.6 of CMD 24-H3.F, CNSC staff contacted Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), regarding whether the Williams Treaties Settlement Agreement addressed specific claims to the lakebed. CIRNAC confirmed that the Williams Treaties Settlement Agreement did not address any potential claim of the Williams Treaties First Nations to lakebeds or water and any lakebed assertions. The Commission also understands that OPG is continuing discussions with the Michi Saagiig Nations and the Provincial Ministry of Natural Resources and Forestry to discuss different options to work to address the concerns regarding the potential purchase or use of an easement of the lakebed.

414. The Commission acknowledges the commitment from OPG to continue engagement with the Michi Saagiig Nations regarding federal and provincial permits for the DNNP. In section 5.1 of CMD 24-H3.1C, OPG reported that 18 permits were approved by federal and provincial regulators in 2024 and that each of those permits was discussed with the rights-holding Michi Saagiig Nations and adjusted based on their feedback. OPG has established a monthly meeting with the Michi Saagiig Nations regarding DNNP permitting requirements and has committed to continue to engage with the Michi Saagiig Nations on permitting at the Project progresses.[277]

415. The Commission recognizes that OPG has committed to ongoing discussions and planning regarding aquatic offsetting and terrestrial restoration in collaboration with the Michi Saagiig Nations and that OPG is working with the WTFN's on their recommendation for an instrument to protect the beneficial actions areas. OPG proposed that implementation of WTFN's recommendation may be achievable through a project agreement between OPG and the Michi Saagiig Nations.[278]

416. The Commission further notes that, in CMD 24-H3.G, CNSC staff proposed the following updated compliance verification criteria for licence condition 15.4:

[277] Section 2.0 of CMD 24-H3.1A.
[278] Section 2.0 of CMD 24-H3.1A.

> "The licensee shall file with the CNSC annually a report on the engagement activities specific to the DNNP it has undertaken with potentially impacted or interested Indigenous Nations and communities...
>
> Each report shall include, at a minimum, and for each Indigenous Nation and community engaged:
>
> - An update on the status of and engagement conducted related to the aquatic offsetting, terrestrial restoration, beneficial action areas and provincial authorizations related to the potential issuance of a land use easement for the Lake Ontario lake bed."

and

> "In addition, OPG shall:
>
> - Provide an update on the following in the above-described report to the CNSC:
>   - The status of mitigations contemplated, and progress made on a project agreement between OPG and the Michi Saagiig Nations in relation to the DNNP"

The Commission expects CNSC staff to verify OPG's completion of these accommodation measures as part of CNSC staff's compliance verification activities under licence condition 15.4.

417. The Commission does not have the authority to confirm, establish or deny the existence of Aboriginal and/or treaty rights as claimed or asserted by Indigenous Nations and communities. The Commission expects OPG to continue to work with the William Treaties First Nations to engage on the issue of the jurisdiction of the Lake Ontario lakebed and the potential issuance of a land use easement.

418. The Commission is satisfied that OPG and CNSC staff have proposed adequate accommodations to mitigate the Michi Saagiig Nations' concerns regarding DNNP permitting and offsetting. The Commission directs OPG to implement its commitments regarding its continued engagement with the Michi Saagiig Nations on permitting, aquatic offsetting, and terrestrial restoration measures.

Radioactive Waste Management

419. The Commission acknowledged the view of the Michi Saagiig Nations that OPG's plans for radioactive waste management had not been adequately considered in OPG's LTC application. The Commission also acknowledged the Michi Saagiig Nations' request for OPG to provide them with a comparison of international best practices for the management and storage of used nuclear fuel with the current practices at the Darlington Nuclear site.

420. The Commission notes that no radioactive waste would be generated or stored on the

DNNP site during the licence to construct phase and, as discussed in section 3.5.10 of this *Record of Decision*, the Commission is of the view that OPG has met the requirements for waste management for the LTC application. OPG has not applied for a waste management facility related to the DNNP. If such an application is received in the future, it would be subject to the CNSC's licensing process and consultation with Indigenous Nations and communities. The Commission further notes that the DNNP EA assessed the full life cycle of the DNNP, including radioactive waste management.

421. The Commission is of the view that OPG has sufficiently responded to the Michi Saagiig Nations' request for a comparison of international best practices regarding waste management. As discussed in section 3.6.3.1 of this *Record of Decision*, an OPG-funded international peer review of best practices for waste management was conducted in September 2024 by a third-party selected by MSIFN. The review found that OPG's current and planned practices meet or exceed industry best practices.

422. In CMD 24-H3.G, CNSC staff proposed updated compliance verification criteria for licence condition 15.4 in response to the request from the Michi Saagiig Nations, including:

> "The DNNP is located within the Williams Treaties territory. In order to support fulfilling the Duty to Consult, and where appropriate, accommodate, the licensee shall continue to collaborate and engage with the Michi Saagiig Nations of the Williams Treaties First Nations on the specific commitments and accommodations made throughout the regulatory review process. This includes, but is not limited to:
>
> - Ongoing review of international best practices for the management and storage of used nuclear fuel, in relation to the current practices at the Darlington site."

The Commission also expects CNSC staff to verify OPG's completion of the accommodation measure detailed above as part of CNSC staff's compliance verification activities under licence condition 15.4.

423. The Michi Saagiig Nations also asserted that the consent of the WTFN is required regarding the management of future radioactive waste and the DNNP site. The Commission expects CNSC staff to consult with the WTFN on future licensing phases of the DNNP to strive towards FPIC, in line with the requirements of the UNDA, regarding radioactive waste management.

Capacity Constraints and Participant Funding Timelines

424. The Commission acknowledged that the Michi Saagiig Nations have raised concerns regarding the timelines to apply for and receive participant funding for this hearing process, as well as the administrative burden that funding applications place on the Nations.

425. The Commission recognizes that participant funding was made available for this proceeding, as described in section 1 of this *Record of Decision*, and that additional

funding was provided through the CNSC's Indigenous and Stakeholder Capacity Fund for MSIFN and AFN to hire internal support staff. The Commission finds that CNSC staff showed flexibility in working with AFN to submit a funding application outside of the initial participant funding opportunity and that the Commission Registry showed flexibility by granting MSIFN an extension to submit their intervention following a delayed decision on MSIFN's additional funding request. The Commission also notes that OPG has entered into DNNP project capacity agreements with CLFN, HFN, and MSIFN.

426. The Commission acknowledges the challenges that the Michi Saagiig Nations face regarding limited capacity. The Commission is of the view that CNSC staff and OPG have made significant efforts to alleviate capacity constraints throughout the hearing process.

Involvement in Regulatory Oversight

427. The Commission heard the Michi Saagiig Nations' request to have the perspectives of the Michi Saagiig Nations integrated into the consultation, review, and decision-making processes for the DNNP and future nuclear projects. The Commission also heard the Michi Saagiig Nations' request that the CNSC form an Indigenous Advisory Committee and Monitor Program similar to the one established by the Canada Energy Regulator (CER).

428. Regarding future nuclear projects, the Commission notes that CNSC staff proposed the following accommodation in section 4.1.1 of CMD 24-H3.F:

> "CNSC staff are committed to continuing long-term engagement and collaboration with the Michi Saagiig Nations, through the existing terms of reference for long-term engagement, which could include creating a plan with the Michi Saagiig Nations to outline how they want to engage, collaborate and consult with the CNSC on future projects, policy discussions and work plans."

429. Regarding the DNNP specifically, the Commission notes that CNSC staff proposed the following accommodations in section 4.3.6 of CMD 24-H3.F:

> "CNSC staff are committed to continuing to work with the Michi Saagiig Nations to determine how they want the results of these studies [the Indigenous Knowledge and cumulative effects studies], when provided to CNSC and OPG, to be incorporated, considered and reflected in the CNSC's regulatory processes and ongoing oversight of the DNNP, should the project proceed. CNSC staff commit to adjusting the approach to oversight of the DNNP as new information is shared with regards to the Michi Saagiig Nations knowledge, land use, rights and interests. As outlined in the draft LCH this could include but is not limited to OPG incorporating the outcomes of these studies into its Environmental Monitoring and Environmental Assessment Follow-Up Plan. The knowledge and information could also help inform the CNSC's Independent Environmental Monitoring Program (IEMP) as well as help inform CNSC compliance and oversight activities for the DNNP. However, CNSC staff have not specified the exact timing, mechanisms or approach as this process needs to be driven by the

Michi Saagiig Nations and in collaboration with OPG."

and

"CNSC staff commit to collaborating with the Michi Saagiig Nations on the CNSC's Independent Environmental Monitoring Program in relation to the Darlington site, which would include the DNNP, should it proceed. This includes providing opportunities for the Michi Saagiig Nations to review and provide input into the sampling plans, participate in sampling and conduct ceremony and walk the land prior to conducting sampling. CNSC staff will work with the Michi Saagiig Nations to ensure that their land use, values and knowledge systems are reflected and considered in the CNSC's environmental sampling, as appropriate and where possible."

430. The Commission further notes that, in CMD 24-H3.G, CNSC staff proposed the following updated compliance verification criteria for licence condition 15.4:

> "The DNNP is located within the Williams Treaties territory. In order to support fulfilling the Duty to Consult, and where appropriate, accommodate, the licensee shall continue to collaborate and engage with the Michi Saagiig Nations of the Williams Treaties First Nations on the specific commitments and accommodations made throughout the regulatory review process. This includes, but is not limited to:
>
> - Scoping the extent, timing and content of an Environmental Monitoring Augmentation Program and participation in OPG's environmental monitoring."

431. The Commission is satisfied with the accommodations proposed by CNSC staff to involve the Michi Saagiig Nations in CNSC staff's regulatory review process and OPG's environmental monitoring. The Commission notes that CNSC staff have committed to adjusting its approach to oversight of the DNNP as new information is shared with regards to the Michi Saagiig Nations' knowledge, land use, rights and interests. The Commission is also of the view that the working group proposed by CNSC staff would provide an additional avenue for the Michi Saagiig Nations to participate in CNSC staff's regulatory oversight activities.

432. Regarding the Michi Saagiig Nations' request for an Indigenous Advisory Committee similar to that of the CER, the Commission notes that the *Canada Energy Regulator Act*[279] mandates the creation of such a committee and the same mandate does not apply to the NSCA. While the NSCA does authorize the Commission to "establish, and fix the terms of reference of, advisory, standing and other committees", the Commission is satisfied that the working group proposed by CNSC staff, along with the accommodations described above in paragraphs 428 to 430, would enhance the Michi Saagiig Nations' involvement in CNSC staff's oversight activities in a reasonable and responsive way.

[279] S.C. 2019, c. 28, s. 10.

433. The Commission directs CNSC staff to implement the accommodations detailed in paragraphs 428 and 429 with respect to the inclusion of the Michi Saagiig Nations, and their perspectives, in the CNSC's regulatory processes and oversight of OPG's activities. The Commission also expects CNSC staff to verify OPG's completion of the accommodation measure detailed in paragraph 430 as part of CNSC staff's compliance verification activities under licence condition 15.4.

3.6.5.2 Mississaugas of Scugog Island First Nation

434. The Commission acknowledges the issues raised by MSIFN regarding impacts of the DNNP on its treaty rights, the adequacy of the RIA process, MSIFN's lack of decision-making power, and MSIFN's involvement in future regulatory oversight activities. The Commission finds that these concerns have been addressed in section 3.6.5.1 of this *Record of Decision*, as they apply to the four Michi Saagiig Nations. The Commission notes that MSIFN's concern regarding the gap analysis and applicability of the IAA is addressed in section 3.2 of this *Record of Decision*. The additional issue raised by MSIFN is discussed below.

3.6.5.3 Curve Lake First Nation

435. The Commission acknowledges the issues raised by CLFN regarding impacts of the DNNP on its treaty rights, CNSC staff's approach to consultation, and the integration of Indigenous Knowledge into regulatory oversight and decision-making. The Commission finds that these concerns have been sufficiently addressed in section 3.6.5.1 of this *Record of Decision*, as they apply to the four Michi Saagiig Nations. The additional issue raised by CLFN is discussed below.

<u>Completion of Commitments made in Commission's 2024 Determination on the Applicability of the DNNP EA</u>

436. The Commission heard CLFN's request for there to be continued focus on the requests, obligations, and commitments that came out of the Commission's April 2024 determination on the applicability of the DNNP EA to the BWRX-300 reactor technology.

437. The Commission reiterates that the directions outlined in its April 2024 determination remain valid. The Commission expects CNSC staff and OPG to continue to fulfill the expectations and directions detailed in the Commission's April 2024 determination and to continue to engage with CLFN and the other Williams Treaties First Nations on those matters.

3.6.5.4 Hiawatha First Nation

438. The Commission acknowledges the issues raised by HFN regarding impacts of the DNNP on its treaty rights and CNSC staff's approach to consultation. The Commission finds that these concerns have been sufficiently addressed in section 3.6.5.1 of this

Record of Decision, as they apply to the four Michi Saagiig Nations.

3.6.5.5 Alderville First Nation

439. The Commission acknowledges the issues raised by AFN regarding the baseline used by CNSC staff to determine impact to treaty rights and the environment, CNSC staff's approach to consultation and CNSC staff's application of the UNDRIP, including FPIC. The Commission finds that these concerns have been sufficiently addressed in section 3.6.5.1 of this *Record of Decision*, as they apply to the four Michi Saagiig Nations.

3.6.5.6 Saugeen Ojibway Nation

440. The Commission heard the issues raised by SON regarding the sufficiency of OPG's radioactive waste management plans at the licence to construct phase, the phased approach to licensing the DNNP, and the application of the UNDRIP and FPIC to the CNSC's licensing process. The Commission is of the view that these concerns have been addressed in sections 3.5.10, 3.6.5.1, and 3.6.4 of this *Record of Decision*, respectively. The additional issues raised by SON are discussed below.

Storage of Radioactive Waste on SON Territory

441. The Commission recognizes that SON does not want radioactive waste from the DNNP to be transported to, or stored on, SON territory without their consent. The Commission understands that OPG is not actively pursuing the option of interim storage of low and intermediate level radioactive waste generated by the DNNP at OPG's WWMF in SON's traditional territory. The Commission expects OPG to continue to share information with SON regarding the DNNP and waste management.

442. As discussed further in section 3.8.2 of this *Record of Decision*, the Commission recognizes that, in CMD 24-H3.H, CNSC staff committed to add the following compliance verification criteria under licence condition 11.1 in the LCH:

> "Licensee shall honour the commitments made to CNSC and SON in the letter to the Commission Registry of November 13, 2024"

The Commission appreciates CNSC staff's planned modification to the compliance verification criteria under licence condition 11.1 and expects CNSC staff to continue engagement with the SON regarding the compliance verification criteria, as appropriate.

443. The Commission recognizes that OPG's strategy for waste minimization and volume reduction will not be finalized until the licence to operate phase. The Commission notes that any volume reduction activities that would take place at the WWMF would be subject to a separate licensing process and are outside of the scope for the Commission's decision for the current matter. Should the Commission receive a future application from OPG regarding waste management activities on SON territory, the

SON will be owed consultation on that application. The Commission expects OPG to continue to engage with SON on its waste strategy for the DNNP.

Implementation of JRP Recommendations #52 and #53

444. The Commission heard the issue raised by SON regarding the implementation of JRP recommendations #52 and #53 which require OPG to make provisions for on-site storage of all radioactive waste for the duration of the DNNP in the event that a suitable off-site solution for the long-term management for used fuel waste is not found. The Commission understands that SON is of the view that recommendations #52 and #53 should be implemented immediately, and not as part of a future licensing stage.

445. The Commission notes that proposed licence condition 15.1 would require OPG to continue to implement the mitigation measures and commitments made during the JRP process, including the applicable recommendations of the JRP report. The Commission also notes that completion of these actions is tracked in the *DNNP Commitments Report*.

446. Regarding recommendations #52 and #53 specifically, the Government of Canada accepted the intent of the recommendations to the extent that it is the responsibility of the waste owners to manage and fund the safe and secure operation of their own wastes, in accordance with the CNSC's regulatory requirements. These recommendations remain open and, should the Project proceed to the operations phase, OPG would be required to provide a robust plan for the storage of radioactive waste as part of its application for a licence to operate.

3.6.5.7 Métis Nation of Ontario, Region 8

447. The Commission has heard OPG's commitment to continued engagement with interested Indigenous Nations and communities throughout the lifecycle of the DNNP. The Commission expects OPG to continue its engagement with MNO to keep MNO informed on the DNNP and to provide clarity on MNOs outstanding questions regarding emergency preparedness, environmental monitoring data, and the proximity of the DNNP site to the Darlington NGS. The Commission notes that these topics are discussed throughout section 3.5 of this *Record of Decision*.

3.6.5.8 Reporting on Commitments and Accommodations

448. The completion of the commitments and accommodations proposed by OPG and CNSC staff is vital to the Crown's discharge of the duty to consult and, where appropriate, accommodate. As such, the Commission requires a mechanism to receive updates on progress being made on the commitments, ongoing engagement, and accommodation measures.

449. The Commission notes that, in CMD 24-H3, CNSC staff proposed the following compliance verification criteria for licence condition 15.4:

> "The licensee shall file with the CNSC annually a report on the engagement activities specific to the DNNP it has undertaken with potentially impacted or interested Indigenous Nations and communities… The licensee should also provide a copy of the report to each Indigenous Nation or community engaged in advance or at the same time it is filed with the CNSC."

450. The Commission directs CNSC staff to include an update on CNSC staff's commitments, ongoing engagement and accommodation measures, annually, either through an existing regulatory oversight report or through another reporting mechanism. Noting the following commitment made by CNSC staff in section 4.3.6 of CMD 24-H3.F,

> "CNSC staff commit to providing the most current information available related to the progress being made on CNSC staff's commitments and accommodation measures to the Michi Saagiig Nations for the DNNP in the annual update report to the Commission."

the Commission expects CNSC staff to provide the most current information available in its annual update.

451. The Commission acknowledges that challenges may arise with regards to the implementation of the commitments made by OPG and CNSC staff. To provide a pathway to resolve such issues, the Commission expects CNSC staff to implement an escalation pathway as part of the proposed working group, as proposed by CNSC staff in section 4.3.6 of CMD 24-H3.F:

> "CNSC staff propose that an escalation procedure is collaboratively developed with the Michi Saagiig Nations, as part of the DNNP engagement and oversight working group. This could include steps to resolve the issues, such as efforts at the working level, CNSC Director/ Executive and Nation Leadership level and/ or direct notification to the Commission."

3.6.6 Conclusions on Indigenous Engagement and Consultation

452. Based on the evidence on the record for this hearing, and described throughout section 3.6.5 of this *Record of Decision*, the Commission concludes that its responsibility to uphold the honour of the Crown and its constitutional obligations with regard to engagement and the duty to consult respecting Indigenous interests has been satisfied to date. The Commission finds that, OPG's LTC application has the potential to impact Aboriginal and/or treaty rights. It also finds that those potential impacts have been appropriately assessed, considered, and mitigated based on the commitments and accommodation measures proposed by OPG and CNSC staff.

453. The Commission recognizes that the DNNP site is located on Michi Saagiig Anishinaabeg lands and waters, within the Williams Treaties territory. Considering the 2018 Williams Treaties First Nations Settlement Agreement and the potential for construction of the DNNP to impact those rights, the Commission finds that the Crown's duty to consult and, where appropriate, accommodate falls at the higher end of

the spectrum with respect to the Williams Treaties First Nations.

454. In light of the UNDA, the Commission's appreciation of the scope of the duty is informed by the UNDRIP and its principles. Following recent jurisprudence, the Commission has considered its duty in light of the FPIC standard of consultation with respect to the Michi Saagiig Nations. It is in this regard that the Commission has directed extensive accommodation measures that will further enable the incorporation of Indigenous knowledge and practices into the conduct of the licensed activities and into the CNSC oversight thereof, including but not limited to cultural practices built into the hearing process, reformatting of the hearing space and seating format to better reflect and include Indigenous perspectives, and increasing time for oral interventions at the hearing. The evidence supports that the CNSC staff, Michi Saagiig Nations and OPG continue to work together with the aim of achieving consensus. The Commission is satisfied that the adjustments that have been made to the hearing process, to respond to Michi Saagiig Nations' input, are valuable ones that contribute to the discharge of the duty by ensuring a responsive and robust process.

455. The Commission acknowledges CNSC staff's efforts in this regard on behalf of the Commission, including its efforts to ensure that Indigenous Nations and communities were properly informed of the licence to construct application, and that participant funding was made available to assist Indigenous Nations and communities in participating in the hearing process. The efforts made by CNSC staff in this regard are key to the important work of the Commission toward reconciliation and relationship-building with Canada's Indigenous Nations and communities. The Commission expects CNSC staff to continue to build meaningful long-term relationships with Indigenous Nations and communities as part of the CNSC's reconciliation efforts. The Commission also recognizes OPG's commitment to continue engagement with and inclusion of Indigenous peoples in this matter.

3.7 Other Matters of Regulatory Importance

3.7.1 Public Engagement

456. A public information and disclosure program (PIDP) is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities. Paragraph 3(j) of the CINFR states that an application for a licence in respect of a Class I nuclear facility shall contain "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."

457. Section 5.2 of REGDOC-1.1.2 provides that an applicant shall describe how its proposed public information and disclosure program meets the requirements in REGDOC-3.2.1, *Public Information and Disclosure*,[280] which sets out requirements and guidance for public information and disclosure for licensees and applicants of Class I and Class II nuclear facilities.

[280] REGDOC-3.2.1, *Public Information and Disclosure*, CNSC, May 2018.

458. In section 5.2 of CMD 24-H3.1 and section 5.3 of its application, OPG reported that it has conducted comprehensive public outreach on all phases of the DNNP since the outset of the Project in 2006. OPG reported that its public engagement tools have included OPG's public website, public newsletter, annual public open houses, site tours, presentations to community groups, and responding to public inquiries.

459. In section 5.2 of CMD 24-H3.1 and section 5.3 of its application, OPG reported that it has a *Nuclear Public Information Disclosure and Transparency Protocol* (OPG's PIDP) in place, which provides the expectations and requirements for OPG's activities with stakeholders, public response requirements for issues or significant events, and communications with the public. OPG's PIDP is publicly available on OPG's website.

460. In section 4.1 of CMD 24-H3, CNSC staff reported that OPG conducted early and ongoing engagement activities with members of the public regarding the DNNP, and that OPG's ongoing engagement activities had been thorough and flexible. In section 4.2 of CMD 24-H3, CNSC staff noted that OPG has implemented a PDP in compliance with REGDOC-3.2.1. Noting that REGDOC-3.2.1 does not require licensees to have unique PIDPs for separate licenced facilities co-located on a common site, CNSC staff recommended that OPG consider adding details to its existing PIDP regarding its plans to communicate DNNP-specific information with the public.

461. The Commission asked CNSC staff for additional information on how it had communicated with the public regarding OPG's application for a licence to construct. CNSC staff informed the Commission that it informed the public of OPG's application through the CNSC website, through an email to subscribers of the CNSC's mailing list, and through social media. In September 2024, CNSC staff also mailed a physical information card to households and businesses within a 10-km radius of the Darlington Nuclear site to inform them of OPG's application and the related hearing.[281]

462. Regarding the request from the Municipality of Clarington (CMD 24-H3.54) to be formally notified of hearings for facilities in their jurisdiction, CNSC staff committed to putting in place a more formal process to inform host communities of upcoming hearings.[282]

463. The intervention from Christine Drimmie (CMD 24-H3.11, CMD 24-H3.11A) raised the view that the public had not been adequately informed regarding the DNNP. Asked how it could improve public outreach, CNSC staff noted that it would conduct a lessons learned activity following the hearing to identify areas for improvement, including regarding public engagement. An OPG representative explained that OPG tracks the feedback that it receives from the public and uses that feedback to update its public outreach approach. The OPG representative noted that, since 2023 OPG has engaged with 50,000 people annually including through community events, public information sessions, and technical workshops.[283]

464. The Commission is satisfied that OPG will continue to communicate to the public information about the health, safety and security of persons and the environment and

[281] Transcript, January 9, 2025, pages 17-21.
[282] Transcript, January 9, 2025, page 19.
[283] Transcript, January 9, 2025, pages 266-274.

other issues related to the DNNP, under the licence to construct. The Commission comes to this conclusion on the following basis:

- OPG's PIDP meets the requirements of REGDOC-3.2.1
- OPG conducted sufficient public engagement activities regarding the DNNP leading up to the hearing on OPG's licence to construct application

3.7.2 Decommissioning Plans and Financial Guarantee

465. The NSCA and associated Regulations require licensees to adequately provide for the safe decommissioning of their facilities and long-term management of waste produced during the facilities' lifespan. In order to ensure that adequate resources are available for the safe and secure future decommissioning of the DNNP site, the Commission requires that an adequate financial guarantee for the realization of planned activities be implemented and maintained in a form acceptable to the Commission throughout the licence period.

466. REGDOC-3.3.1 – *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*[284] sets out requirements and guidance for applicants regarding the establishment and maintenance of funding for the decommissioning of facilities and termination of activities licensed by the CNSC.

467. As discussed in section 3.5.10 of this *Record of Decision*, OPG submitted both an 'as-built' PDP and an "end of life" PDP alongside its application for a licence to construct. Only the 'as-built' PDP is required for the construction phase of the Project. In section 2.10 of CMD 24-H3, CNSC staff submitted that OPG had adequately described the proposed activities for decommissioning the 'as-built' facility and had provided a credible cost estimate for those activities.

468. In section 5.5 of CMD 24-H3.1, OPG provided information on its financial guarantee. OPG also provided the Commission with specific documentation on its financial guarantee and associated cost estimate in a confidential information package submitted alongside its application. OPG proposed a Letter of Credit, of which the CNSC is the beneficiary, as the legal instrument for the financial guarantee. OPG reported that the Letter of Credit would replace the current financial guarantee for OPG's licence to prepare site and satisfy the CNSC requirement for a five-year financial guarantee period from 2025 to 2029. For the period post-2029, OPG reported that it would provide the CNSC with an updated assessment of the financial guarantee in 2029, or before, in support of OPG's application for a licence to operate, whichever is earlier.

469. In section 5.2 of CMD 24-H3, CNSC staff clarified that OPG's proposed financial guarantee states the amount to bring the DNNP site from an 'as-built' pre-fuelled state to a Brownfield site is $167,180,000.[285] CNSC staff submitted that OPG's proposed financial guarantee is sufficient to cover the activities that would be authorized during the license to construct phase and is compliant with REGDOC-3.3.1.

[284] REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, CNSC, January 2021.
[285] Cost given in 2022 Canadian dollars.

470. The intervention from Christine Drimmie (CMD 24-H3.11, CMD 24-H3.11A) raised a concern regarding OPG's readiness for decommissioning. Regarding this intervention, the Commission asked for clarity on how uncertainty in the PDP is managed. CNSC staff clarified that there are two aspects of uncertainty regarding decommissioning; the cost estimate and planning. Uncertainties in the cost estimate are managed using contingencies and, per REGDOC-2.11.2, an applicant should describe uncertainties in decommissioning planning in its PDP. CNSC staff noted that OPG included key uncertainties in its "as-built" PDP. An OPG representative added that the "as-built" PDP is generic enough that, as the design progresses, the PDP will still be reflective of what is being built. Per REGDOC-2.11.2, OPG is required to update its PDP at least every 5 years.[286]

471. The intervention from the Ontario Clean Air Alliance (CMD 24-H3.6) raised questions regarding OPG's planned decommissioning timeline. Asked to provide clarity on this matter, an OPG representative explained that its "as-built" PDP employs a prompt decommissioning strategy which estimates that decommissioning activities would take 6 years. OPG's "end-of-life" PDP estimates that decommissioning following operation of the BWRX-300 would take 10 years. CNSC staff noted that it had accepted OPG's prompt decommissioning strategy and concurred with the timelines provided by OPG.[287]

472. The Commission asked OPG to detail its approach if decommissioning were to occur at the "as-built" stage of the project. An OPG representative explained that, per its "as-built" PDP, OPG would remove material from the site up to a metre below ground, backfill, and then reseed the soil to restore the site to a Brownfield site. CNSC staff clarified that OPG would be required submit a detailed decommissioning plan, submit an updated cost estimate, and apply for a licence to decommission before any decommissioning activities would be authorized.[288]

473. Noting that the intervention from Dr. Ole Hendrickson (CMD 24-H3.36) questioned the adequacy of OPG's PDPs, the Commission asked OPG how it had considered industry experience in developing its PDPs. An OPG representative explained that OPG had considered decommissioning experience from first generation BWRs in its PDPs. OPG also considered its own previous experience from decommissioning the Bruce Heavy Water Plant and OPG's conventional (coal-fired) Nanticoke and Lambton Generating Stations.[289]

474. The Commission asked whether OPG had considered the environmental impact of future decommissioning activities. An OPG representative clarified that, prior to applying for a licence to decommission, OPG would be required to prepare a detailed decommissioning plan which would include a safety analysis to confirm that environmental releases during the decommissioning phase would meet regulatory requirements.[290]

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[286] Transcript, January 9, 2025, pages 274-278.
[287] Transcript, January 10, 2025, pages 80-82 and 87-88.
[288] Transcript, January 10, 2025, pages 103-106.
[289] Transcript, January 10, 2025, pages 97-99.
[290] Transcript, January 13, 2025, page 5.

475. The intervention from Dr. Ole Hendrickson (CMD 24-H3.36) questioned how OPG ensured the adequacy of its decommissioning cost estimate. Asked to comment on this matter, an OPG representative stated that OPG used a bottom-up estimating methodology, as described in REGDOC-3.3.1, along with industry experience to develop an accurate cost estimate. CNSC staff informed the Commission that it assessed the accuracy of OPG's estimate by reviewing OPG's decommissioning work breakdown structure, including the cost factors and contingencies applied to each decommissioning activity.[291]

476. The Commission accepts OPG's proposed financial guarantee of $167,180,000 in the form of a Letter of Credit. The Commission is satisfied that the financial guarantee satisfies regulatory requirements and is sufficient to account for the activities under the licence to construct. The Commission notes that this financial guarantee is distinct from OPG's consolidated financial guarantee, which covers the existing Darlington NGS and Waste Management Facilities.

3.7.3 Cost Recovery

477. Paragraph 24(2)(c) of the NSCA requires that a licence application be accompanied by the prescribed fee, as set out by the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*[292] (CRFR), and based on the activities to be licensed. An applicant for a Class I facility licence is subject to Part 2 of CRFR, which is based on Regulatory Activity Plan fees.

478. In section 5.1 of CMD 24-H3, CNSC staff reported that OPG is in good standing with respect to the CRFR requirements for the DNNP. CNSC staff added that OPG has paid its cost recovery fees in full. The Commission is satisfied that OPG is in good standing with respect to CRFR requirements for the DNNP.

3.7.4 Nuclear Liability Insurance

479. Licensees are required to maintain nuclear liability insurance for designated nuclear installations, in accordance with the *Nuclear Liability and Compensation Act*[293] (NLCA). The Commission notes that the DNNP is not covered under the NLCA during the construction phase as there is no nuclear fuel on site. The Commission would consider the applicability of the NLCA to the operation of the DNNP should OPG submit an application for a licence to operate.

3.8 Licence Length and Conditions

480. The Commission considered OPG's application for a licence to construct one BWRX-300 for the DNNP at its Darlington Nuclear site. OPG requested a 10-year licence

[291] Transcript, January 8, 2025, pages 96-99.
[292] SOR/2003-212.
[293] S.C. 2015, c. 4, s. 120.

period for the licence to construct. OPG currently holds a licence to prepare site for the Darlington Nuclear site, PRSL 18.00/2031, which is valid until October 11, 2031.

481. In section 1.3 of CMD 24-H3.1, OPG submitted that it is seeking a 10-year power reactor construction licence in order to complete any remaining site preparation activities, to construct supporting infrastructure for up to four BWRX-300 units, to construct a single BWRX-300 powerblock, and to complete fuel-out commissioning activities for the single BWRX-300 unit.

3.8.1 Licence Length

482. OPG applied for a 10-year licence to construct. In its application, OPG submitted that it is qualified to safely carry out the licensed activities for the proposed 10-year licence term and that, in carrying on those activities, OPG will 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.

483. In section 1.8 of CMD 24-H3, CNSC staff submitted its view that OPG's request for a 10-year licence to construct period was adequately substantiated.

484. The Commission concludes that a 10-year licence term is appropriate. The Commission's decision is based on the following, discussed in further detail throughout section 3.5 of this *Record of Decision*:

- OPG has characterized and mitigated hazards associated with the construction of the DNNP to ensure the protection of the health and safety of persons and the environment
- OPG has an effective management system in place that meets the requirements of CSA N286-12
- CNSC staff has effective compliance verification programs in place to ensure that activities under the licence to construct remain in compliance with the licensing basis

The Commission notes that OPG intends to apply for a licence to operate prior to the end of the licence to construct period.

3.8.2 Licence Conditions

485. In Part 2 of CMD 24-H3, CNSC staff provided a proposed power reactor construction licence. CNSC staff provided an update to that proposed licence in Appendix A of CMD 24-H3.B. The proposed licence contains standardized CNSC licence conditions along with the following 4 site-specific licence conditions:

> "15.1. The licensee shall implement the mitigation measures proposed and commitments made during the Darlington Joint Review Panel process,

including the applicable recommendations of the Darlington Joint Review Panel Report, in accordance with the Government of Canada response.

15.2. The licensee shall implement and maintain an environmental assessment follow-up program.

15.3. The licensee shall obtain the approval of the Commission, or consent of a person authorized by the Commission, prior to the removal of established regulatory hold points.

15.4. The licensee shall conduct Indigenous engagement activities, specific to the DNNP, throughout the period of this licence."

486. Licence conditions 15.1 and 15.2 would require OPG to complete its commitments from the EA process for the DNNP. Licence condition 15.1 would require OPG to implement the mitigation measures and commitments made during the EA process, including the applicable recommendations of the JRP report, as well as additional mitigation measures identified and described in CNSC staff's CMD 24-H2. Licence condition 15.2 would require OPG to implement the provisions of the DNNP Environmental Monitoring and Environmental Assessment Follow-Up.

487. Licence condition 15.3 would require the approval of the Commission, or person authorized by the Commission, to remove regulatory hold points. The regulatory hold points proposed by CNSC staff are discussed further in section 3.8.3 of this *Record of Decision*.

488. During their joint oral intervention, and in a January 8, 2025 letter,[294] the Michi Saagiig Nations requested a revision to the compliance verification criteria for licence condition 15.4 in the proposed LCH. CNSC staff reviewed the Michi Saagiig Nations' request and updated the proposed compliance verification criteria, as described in CMD 24-H3.G, in an effort to address the concerns raised. CNSC staff submitted that it would be sharing the updated compliance verification criteria with the Michi Saagiig Nations for their review, comment, and feedback. CNSC staff committed to continued engagement with the Michi Saagiig Nations on the compliance verification criteria for licence condition 15.4, with the goal of reaching consensus on the proposed language.

489. In its written intervention, SON requested that licence condition 11.1 in the proposed licence to construct be revised from the language proposed by staff in Part 2 of CMD 24-H3:

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

[294] *Supplementary Information in consideration of Ontario Power Generation's Licence to Construct application for one BWRX-300 reactor at the Darlington New Nuclear Project Site*, Chief T. Simpson, Chief K. Knott, Chief L. Carr, and Chief K. LaRocca, January 8, 2025.

to the following language proposed by SON:

> "11.1 The licensee shall implement and maintain a waste management program to store all the radioactive waste on site throughout the life cycle of the nuclear facility and permanently if no disposal solution is found. This requirement applies with respect to the sorting, processing, recycling, and reducing of radioactive wastes."

490. In CMD 24-H3.H, CNSC staff provided its response to SON's request. CNSC staff expressed the view that the language proposed by CNSC staff for licence condition 11.1 adequately encompasses the regulatory requirements for the waste management SCA for the licence to construct phase of the DNNP. The activities that the licence to construct would authorize do not allow for the handling of radioactive materials and will not generate any radioactive wastes at the DNNP. CNSC staff further submitted that it would add the following compliance verification criteria under licence condition 11.1 in the LCH, should a licence to construct be issued by the Commission:

> "Licensee shall honour the commitments made to CNSC and SON in the letter to the Commission Registry of November 13, 2024"

491. The Commission appreciates CNSC staff's planned modification to the compliance verification criteria under licence conditions 11.1 and 15.4, as detailed in CMD 24-H3.G and CMD 24-H3.H. The Commission expects CNSC staff to continue engagement with the Michi Saagiig Nations and SON regarding the compliance verification criteria in the LCH, as appropriate. The Commission directs CNSC staff to provide the updated LCH to the Commission for its information once the compliance verification criteria for these two conditions are finalized, and to notify the Commission of any changes made to the LCH annually, either through the regulatory oversight report addressing nuclear power reactors or by other reporting means.

3.8.3 Regulatory Hold Points

492. CNSC staff proposed a power reactor construction licence with conditions including regulatory hold points (RHP) as part of the compliance oversight strategy. In section 1.6 of CMD 24-H3 and in the proposed LCH, CNSC staff proposed the following 3 RHPs at key project milestones during the licence to construct phase:

- RHP-1: Installation of the Reactor Building Foundation
  - The removal of this RHP would authorize OPG to place the foundation for the reactor building and commence civil construction of the reactor building structure, internal civil structures, and internal reactor building systems and components.
- RHP-2: Installation of the Reactor Pressure Vessel
  - The removal of this RHP would authorize OPG to install the reactor pressure vessel and associated structures and components, as well as complete the appropriate installations of critical components, and conduct limited component testing.

- RHP-3: Fuel-Out Commissioning
    - The removal of this RHP would authorize OPG to conduct full-scale testing and commissioning of installed structures, systems, and components.

493. As described in licence condition 15.3 in the proposed LCH, the removal of a RHP requires the licensee to submit evidence that all commitments related to the RHP have been completed. The criteria for removal of a RHP should be clear and objective. In Appendix D.2 of CMD 24-H3, CNSC staff outlined which commitments OPG must complete before OPG can apply for the removal of each RHP. The commitments tied to each RHP would be tracked by CNSC staff in the *BWRX-300 Licensing Regulatory Actions* document under licence condition 15.3.

494. In section 3 of CMD 24-H3.F, CNSC staff committed to implement the following communications to ensure that the Commission, Indigenous Nations and communities and interested parties remain informed on the status of the RHPs:

- annual reporting in the regulatory oversight report addressing nuclear power reactors.
- maintaining the CNSC website to include status updates of the project and the status of the RHPs
- informing the Commission and Indigenous Nations and communities when an RHP is removed, should the Commission delegate its authority for the removal of RHPs
- messaging CNSC subscribers and using social media posts informing when a RHP has been removed
- providing updates through the regular *Status Report on Power Reactors* to the Commission as required

495. The Commission asked CNSC staff to provided additional information on how it would assess OPG's completion of the commitments for each RHP. CNSC staff explained that each commitment listed in Appendix D.2 of CMD 24-H3 has specific deliverables that must be accepted by CNSC staff before removal of a RHP can be considered. The required deliverables are clearly communicated to OPG. Upon receipt of the necessary deliverables from OPG, CNSC staff would assess whether the deliverables meet regulatory expectations. If all expectations are met, CNSC staff would make the recommendation for removal of the RHP to the Commission, or person authorized by the Commission, per licence condition 15.3. If expectations are not met, CNSC staff would request additional information from OPG. CNSC staff noted that it has experience successfully implementing RHPs for large projects such as the Darlington NGS Refurbishment Project.[295]

496. Asked to provide additional information on its management of RHP commitments, an OPG representative explained that, if the Commission were to accept the RHPs proposed by CNSC staff, each RHP commitment would be built into the DNNP project plan to ensure completion. The OPG representative noted that OPG took a similar

[295] Transcript, January 13, 2025, pages 184-189.

approach to RHP commitments in its project plan for the Darlington NGS Refurbishment Project.[296]

497. The Commission asked CNSC staff if documentation related the removal of RHPs would be available to the public. CNSC staff also stated that it has a communication plan associated with the removal of each RHP which includes a public announcement and links to relevant supporting documentation. Documents detailing the interactions between OPG and CNSC staff relevant to the RHPs would be available upon request, apart from any confidential information.[297]

498. The Commission is satisfied with the three RHPs proposed by CNSC staff. The Commission finds that the use of RHPs will allow for the progression of the detailed design and phased construction whilst ensuring that the conditions set out in the licence have been satisfied and that safety is maintained. The Commission also notes that CNSC staff has experience successfully implementing RHPs for large projects such as the Darlington NGS Refurbishment Project.

3.8.4 Delegation of Authority

499. In section 5.4 of CMD 24-H3, CNSC staff recommended that the Commission delegate authority for licence condition 15.3 ("The licensee shall obtain the approval of the Commission, or consent of a person authorized by the Commission, prior to the removal of established regulatory hold points.") to the following CNSC staff:

- Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch

By delegating its authority for the purposes of licence condition 15.3, the Commission would be delegating the authority to remove the established regulatory hold points to the above CNSC staff member.

500. In section 5.4 of CMD 24-H3, CNSC staff clarified that, prior to releasing a regulatory hold point, CNSC staff will verify compliance and provide a report to the Executive Vice President and Chief Regulatory Operations Officer, who will review the report and, if satisfied, lift the regulatory hold point. CNSC staff would also provide notice of the removal of the hold point to the licensee, the public, and Indigenous Nations and communities.

501. For the purpose of the administration of licence condition 15.3, the Commission authorizes the CNSC Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch, as recommended by CNSC staff. This is for the purpose of the removal of regulatory hold points. The Commission is satisfied that this approach is reasonable.

502. The Commission directs CNSC staff to provide updates to the Commission on the status of OPG's progress toward each regulatory hold point in the regular *Status Report*

[296] Transcript, January 13, 2025, pages 189-191.
[297] Transcript, January 13, 2025, pages 194-196.

on Power Reactors at each public meeting of the Commission and annually, either through the regulatory oversight report addressing nuclear power reactors or by other reporting means.

3.8.5 Conclusion on Licence Length and Conditions

503. The Commission is satisfied that a 10-year licence term is appropriate and that the licence conditions proposed by CNSC staff are adequate. The Commission appreciates CNSC staff's planned modification to the compliance verification criteria under licence conditions 11.1 and 15.4, and expects CNSC staff to continue engagement with the Michi Saagiig Nations and SON regarding the compliance verification criteria in the LCH, as appropriate.

504. The Commission is satisfied with the three RHPs proposed by CNSC staff. The Commission authorizes the CNSC Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch to administer licence condition 15.3, as recommended by CNSC staff. This is for the purpose of the removal of the RHPs.

505. The Commission directs CNSC staff to provide updates to the Commission on the status of OPG's progress toward each regulatory hold point in the regular *Status Report on Power Reactors* at each public meeting of the Commission and annually, either through the regulatory oversight report addressing nuclear power reactors or by other reporting means. The Commission also directs CNSC staff to notify it of any changes made to the LCH through the regular regulatory oversight report addressing nuclear power reactors.

4 CONCLUSION

506. The Commission has considered the information and submissions of OPG, CNSC staff, and all participants, as set out in the material available for reference on the record, including all oral submissions made during the public hearing.

507. The Commission has considered whether the duty to consult has been triggered by the determinations before it in this matter, and whether that duty has been satisfied. As described in detail in this decision, the Commission is satisfied that the honour of the Crown has been upheld and that the legal obligation to consult and, where appropriate, accommodate Indigenous interests has been satisfied, relative to the Commission's considerations related OPG's application for a licence to construct one BWRX-300 reactor at for its DNNP at the Darlington Nuclear site.

508. The Commission acknowledges that, as the DNNP continues to be pursued, there will be future licensing decisions to which the duty to consult will also apply. The Commission expects CNSC staff and OPG to continue their respective consultation and engagement efforts over the lifecycle of the DNNP Project, and any subsequent applications to the Commission, with Indigenous Nations and communities and their representatives, as well as with the public.

509. Based in its consideration of the record before it, the Commission concludes the

following:

- OPG is qualified to carry on the activities that the licence will authorize
- OPG, in carrying on these activities, will 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
- the financial guarantee proposed by OPG in the form of a Letter of Credit is acceptable

510. The Commission therefore issues, pursuant to section 24(4) of the *Nuclear Safety and Control Act*, a Nuclear Power Reactor Construction Licence to OPG to construct one BWRX-300 reactor for its Darlington New Nuclear Project at its Darlington Nuclear site, located in the Municipality of Clarington, Ontario. The licence, PRCL 32.00/2035, is valid from April 4, 2025, to March 31, 2035, unless suspended, amended, revoked or replaced.

511. In issuing PRCL 32.00/2035, the Commission also delegates it authority for the purpose of the administration of licence condition 15.3 to CNSC staff's Executive Vice-President and Chief Regulatory Operations Officer, Regulatory Operations Branch.

Tremblay, Pierre

Digitally signed by Tremblay, Pierre
DN: C=CA, O=GC, OU=CNSC-CCSN, CN="Tremblay, Pierre"
Reason: I am approving this document
Location:
Date: 2025.04.04 08:36:59-04'00'
Foxit PDF Editor Version: 13.0.1

April 4, 2025

Pierre F. Tremblay
President

Date

APPENDIX A – INTERVENORS

Intervenors – Oral Presentations	**Document Number**
Ontario Clean Air Alliance, represented by J. Gibbons	24-H3.6
CANDU Owners Group, represented by R. Clavero	24-H3.7
North American Young Generation in Nuclear, represented by M. Mairinger	24-H3.8
Christine Drimmie	24-H3.11 24-H3.11A
Darlington Nuclear Community Advisory Council, represented by D. Hardy and H. Reid	24-H3.12 24-H3.12A 24-H3.12B
Regional Municipality of Durham, represented by E. Baxter-Trahair, J. Eng, C. Closs, A. Di Pietro, and C. Goodchild	24-H3.15 24-H3.15A
Canadian Nuclear Association, represented by J. Baker	24-H3.18
RESD Inc., represented by P. Sedran	24-H3.20 24-H3.20A
Bruce Power, represented by M. Rinker	24-H3.21
Society of United Professionals, represented by R. Caron and R. Chatoor	24-H3.25 24-H3.25A
Dr. Ole Hendrickson	24-H3.36
Dr. Sunil Nijhawan	24-H3.39 24-H3.39A
Kinectrics, represented by Y. Hoang and S. Donelly	24-H3.40 24-H3.40A
North American Young Generation in Nuclear Durham, represented by J. Jeyyarajah, A. Sindhar, and S. Fu	24-H3.46
Clarington Board of Trade, represented by B. Wrightman	24-H3.47
Organization of Canadian Nuclear Industries, represented by B. Fehrenbach	24-H3.51
The Society of High Prairie Regional Environmental Action Committee, represented by J. Asterisk	24-H3.52
Municipality of Clarington, represented by Mayor A. Foster	24-H3.54
Northwatch, represented by B. Lloyd	24-H3.58
Promation, represented by D. Spector	24-H3.60
Alderville First Nation, represented by Chief T. Simpson	24-H3.62
Nuclear Waste Management Organization, represented by C. Boyle	24-H3.65 24-H3.65A
Judith Fox Lee	24-H3.66
Canadian Coalition for Nuclear Responsibility and Prolet Inc., represented by G. Edwards	24-H3.67 24-H3.67A
Canadian Nuclear Workers' Council, represented by B. Walker	24-H3.76 24-H3.76A
Hatch Ltd., represented by M. Pieries and M. Wilde	24-H3.77 24-H3.77A

Kenneth C. Johnson	24-H3.79 24-H3.79A
Mississaugas of Scugog Island First Nation, represented by Chief K. LaRocca	24-H3.81
Saugeen Ojibway Nation, represented by Chief C. Ritchie, K. Tucker, J. K. Martin, and A. Monem	24-H3.82
Curve Lake First Nation, represented by F. Chua, P. Williams, and K. Wright	24-H3.83
Durham Nuclear Awareness, Slovenian Home Association, and Canadian Environmental Law Association, represented by S. Libman and M.V. Remana	24-H3.84 24-H3.84A
Hiawatha First Nation, represented by Chief L. Carr	24-H3.85
Intervenors – Written Submissions	**Document Number**
Labourers' International Union of North America	24-H3.3
AtkinsRéalis	24-H3.4
Durham College	24-H3.5
Lakeside Process Controls Ltd	24-H3.9
Orano Canada Inc.	24-H3.10
BWX Technologies Inc.	24-H3.13
CEDAR Project Environment & Society Program	24-H3.14
Power Workers' Union	24-H3.16
Cheryl Casbourn	24-H3.17
CALIAN	24-H3.19
CAMECO Corporation	24-H3.22
Black & McDonald	24-H3.23
Scientists in School	24-H3.24
Celeros Flow Technology	24-H3.26
E.S. Fox Limited	24-H3.27
Chris Corey	24-H3.28
Paul Filteau	24-H3.29
Mark M. Giese	24-H3.30
Adam Pasmanik	24-H3.31
Andrew Stout	24-H3.32
Barbara Schumacher	24-H3.33
Marilyn Hay	24-H3.34
Shawn Kettner	24-H3.35
Jennifer Tett	24-H3.37
Ecojustice Working Group	24-H3.38
Kerstin Muth	24-H3.41
Durham Business Alliance	24-H3.42
Bird Construction	24-H3.43
Mary Ludwig	24-H3.44
Pauline Richardson	24-H3.45
Ingrid Alesich	24-H3.48
NB Power	24-H3.49

SaskPower	24-H3.50
Brilliant Energy Institute at Ontario Tech	24-H3.53
Janine Carter	24-H3.55
GEH SMR Technologies Canada	24-H3.56
Metis Nation of Ontario	24-H3.57
Stephen Lawrence	24-H3.59
Fermi Energia AS	24-H3.61
AECOM	24-H3.63
Jamil Jivani	24-H3.64
Nuclear Transparency Project	24-H3.68
Aecon Group INC.	24-H3.69
Ontario Chamber of Commerce	24-H3.70
Johanna Aucoin-Slaunwhite	24-H3.71
Mary Veltri	24-H3.72
Catherine Vakil	24-H3.73
Women in Nuclear (WiN) Canada	24-H3.74
Victor Lau	24-H3.75
Wendy O'Connor	24-H3.78
Jeremy Whitmore	24-H3.80
Piotr Ciompa	24-H3.86
Prodigy Clean Energy Ltd.	24-H3.87

Hautfenne-Jewer, Celia

From: Eaton, Sarah
Sent: May 28, 2024 6:01 AM
To: CNSC.F ExecutiveTeamMembersandExecutiveAdministrativeOfficers-MembresdelÉquipedeDirectionetAgentsadministratifsExécutifs F.CCSN
Cc: Moroz, David; Cropley, Julia; Boudrias, Geneviève; Cattrysse, Clare; Levine, Adam; Engagement / Engagement (CNSC/CCSN); Howlett, Catherine
Subject: For your Information - Notes from DART participation in "NORAD Modernization and the North"

Event – DG DART participation in a panel on "SMRs in the North: A Research and Partnership Opportunity" (full agenda below)

Key Points

- Approximately 80 people in attendance, including many Inuit economic development leaders, ADM, DG and staff from DND, Canadian Air Force, NORAD, PSPC and Defense Research and Development
- While the workshop was mostly out of scope for the mandate of the CNSC, presenters covered threats from a security perspective that was fascinating (and frightening) highlighting the advancements in weapons technology including nuclear weapons.
- Power sources needed for new detection systems in the North (i.e.: NORAD modernization & replacement) is a clear challenge, with power estimates of 2MWe to 20MWe. Diesel generation is the current approach, but it takes 7L of diesel to get 1L of diesel to ALERT, there is a consideration of SMRs. From those in the room I spoke to, there is a lack of understanding of SMRs, their "provenness" and a concern on Inuit acceptance.
- Reconciliation was a theme throughout the day and a need for Inuit to be part of decision making on siting and for these installations to be multi-use (allowing both military and civilian use)
- In my panel my remarks focussed on the CNSC's leadership in SMRs, our expertise in SMRs and nuclear in Canada, the current landscape in Canada, challenges with obtaining HALEU and the need for robust engagement and consultation. I touched on the military vs civilian aspects of the NSCA (a big thanks to Catherine for those points) and the fact that nuclear safety must be the top priority for safe SMR deployment.
- Adam Levine participated in some of the workshop to hear the Inuit perspectives.

Takeaway

- Was a worthwhile event and the Macdonald-Laurier Institute created a strong program with leaders in each area.
- Difficult to assess how serious DND is about SMRs, but in my view, there is merit in following this space to see how that progresses.

Happy to discuss further if there are any questions or comments.

Thanks!
Sarah

From: Macdonald-Laurier Institute <noreply@event.eventbrite.com>
Sent: Friday, May 24, 2024 3:40 PM
To: Eaton, Sarah <Sarah.Eaton@cnsc-ccsn.gc.ca>
Subject: Event Reminder! NORAD Modernization and the North on May 27th, 2024

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE



This was sent to you by Macdonald-Laurier Institute

Good afternoon,

Thank you for registering for an exclusive, one-day forum at the National Arts Centre, jointly hosted by the **Inuit Development Corporation Association (IDCA)** and the **Macdonald-Laurier Institute (MLI)**, taking place on Monday, 27th.

As a reminder, please find the event details below:

- **When:** Monday, May 27th from 8:30 am - 5:30 pm ET
- **Doors open:** 8:30 am ET
- **Where:** National Arts Centre, Salon Room, 1 Elgin St, Ottawa, ON, K1P 5W1

Registration includes breakfast, lunch, and cocktail reception. The full program is presented below.

Parking:

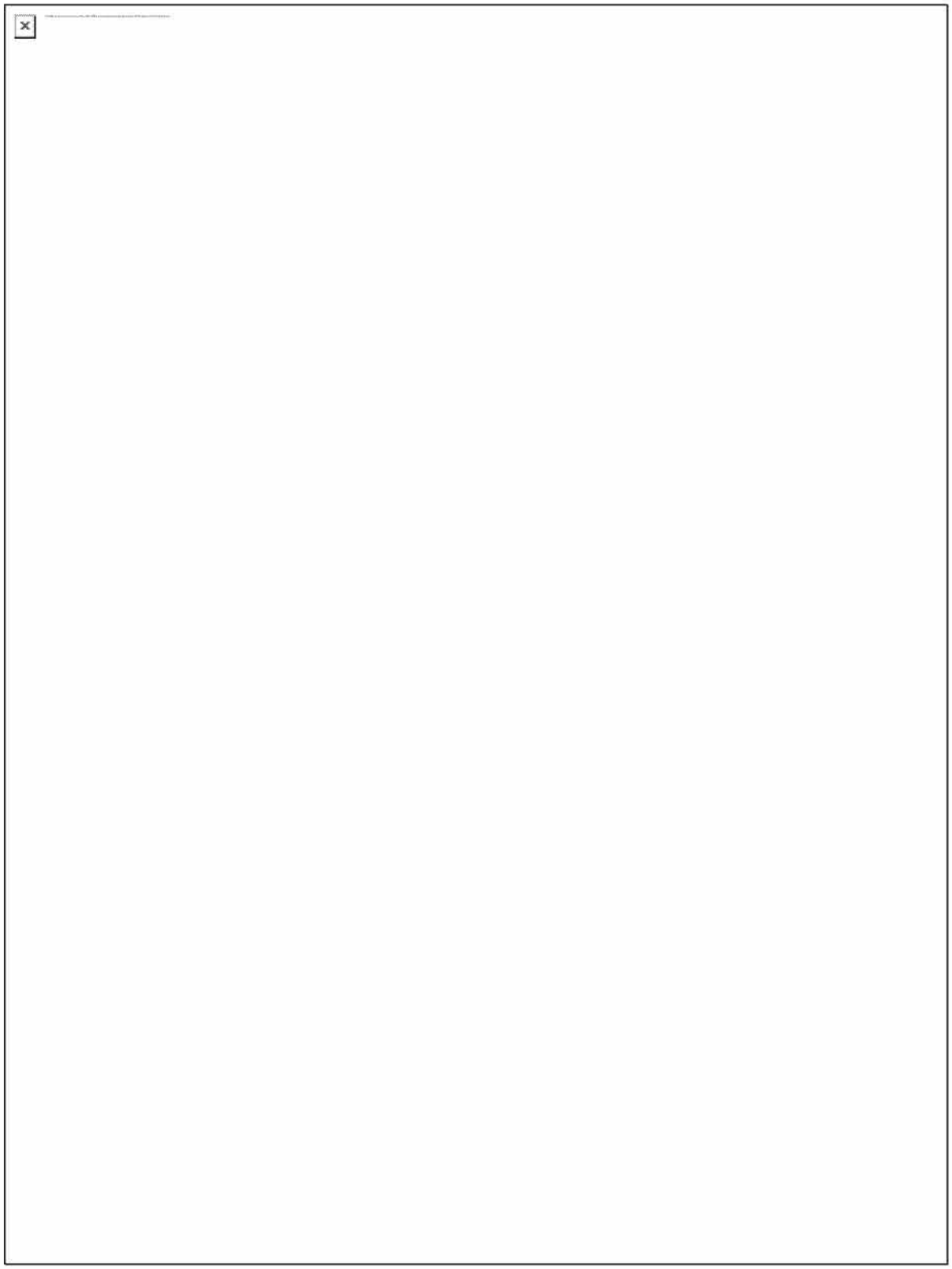
We recommend using public transportation or Uber, taxi, etc. If parking is needed, accessible parking is available in the NAC parking garage on a first-come, first-served basis. These parking spaces are located near the elevators on Level P2 (blue signage) and Level P3 (red signage).The NAC garage parking rate is $3 per half hour, up to a $22 maximum.

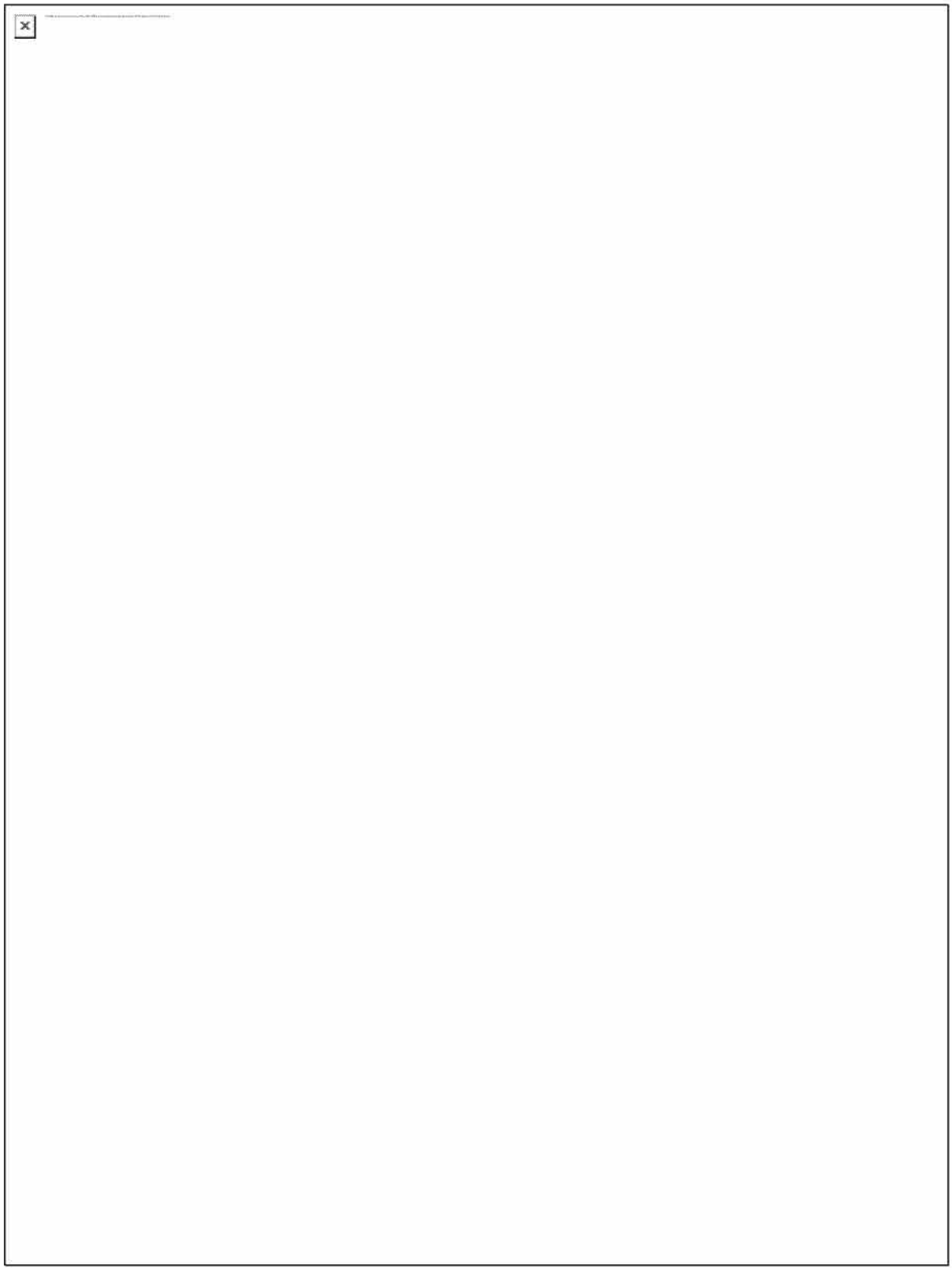
Please bring business cards if available.

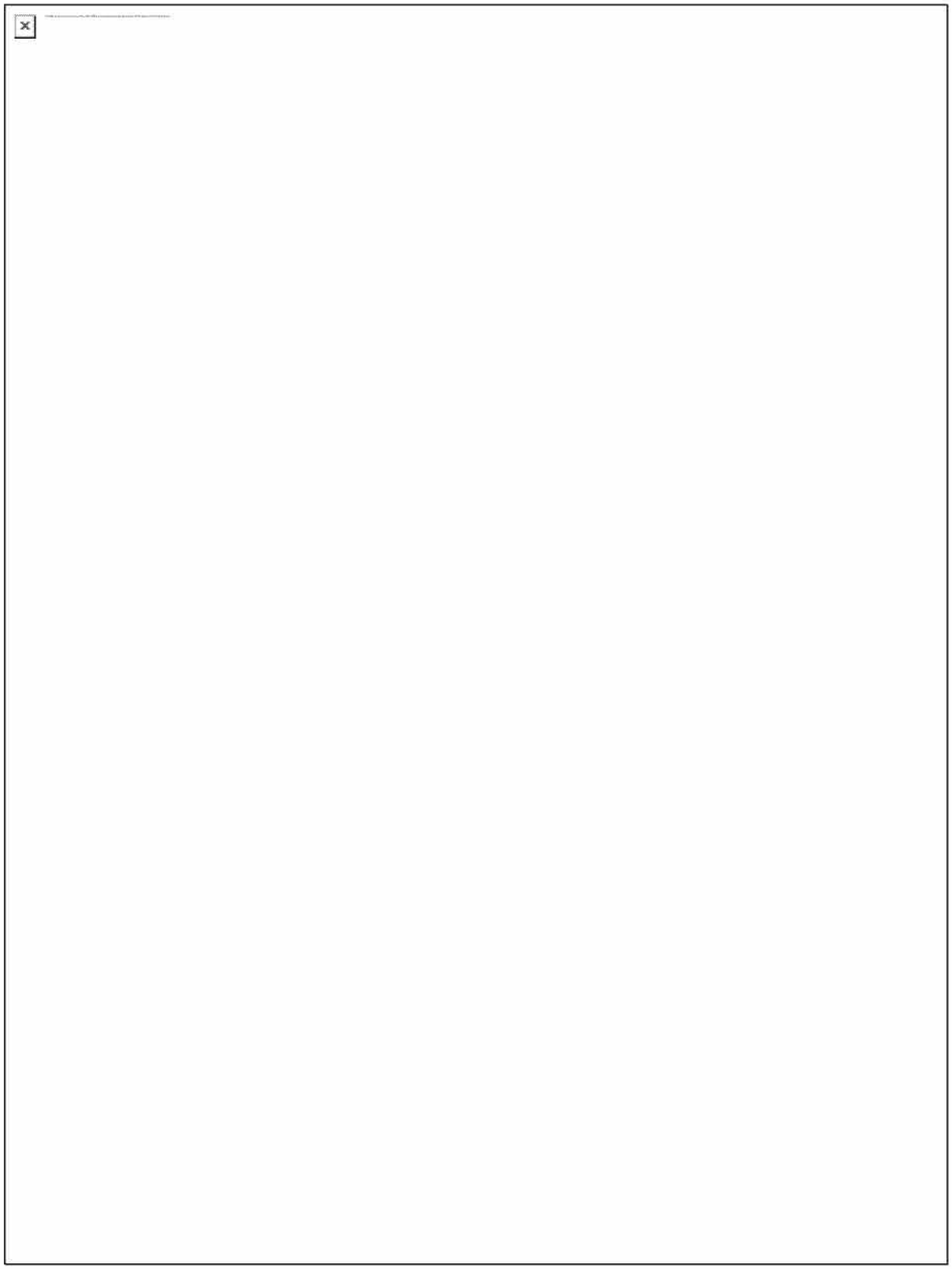
Lastly, if you have a moment, please check out our **Primer**, recently released by **Dr. Heather Exner-Pirot** and **Lee Carson**, for insights into the key topics we will be discussing at the event: **NORAD Modernization and the North – A Primer: Heather Exner-Pirot and Lee Carson**

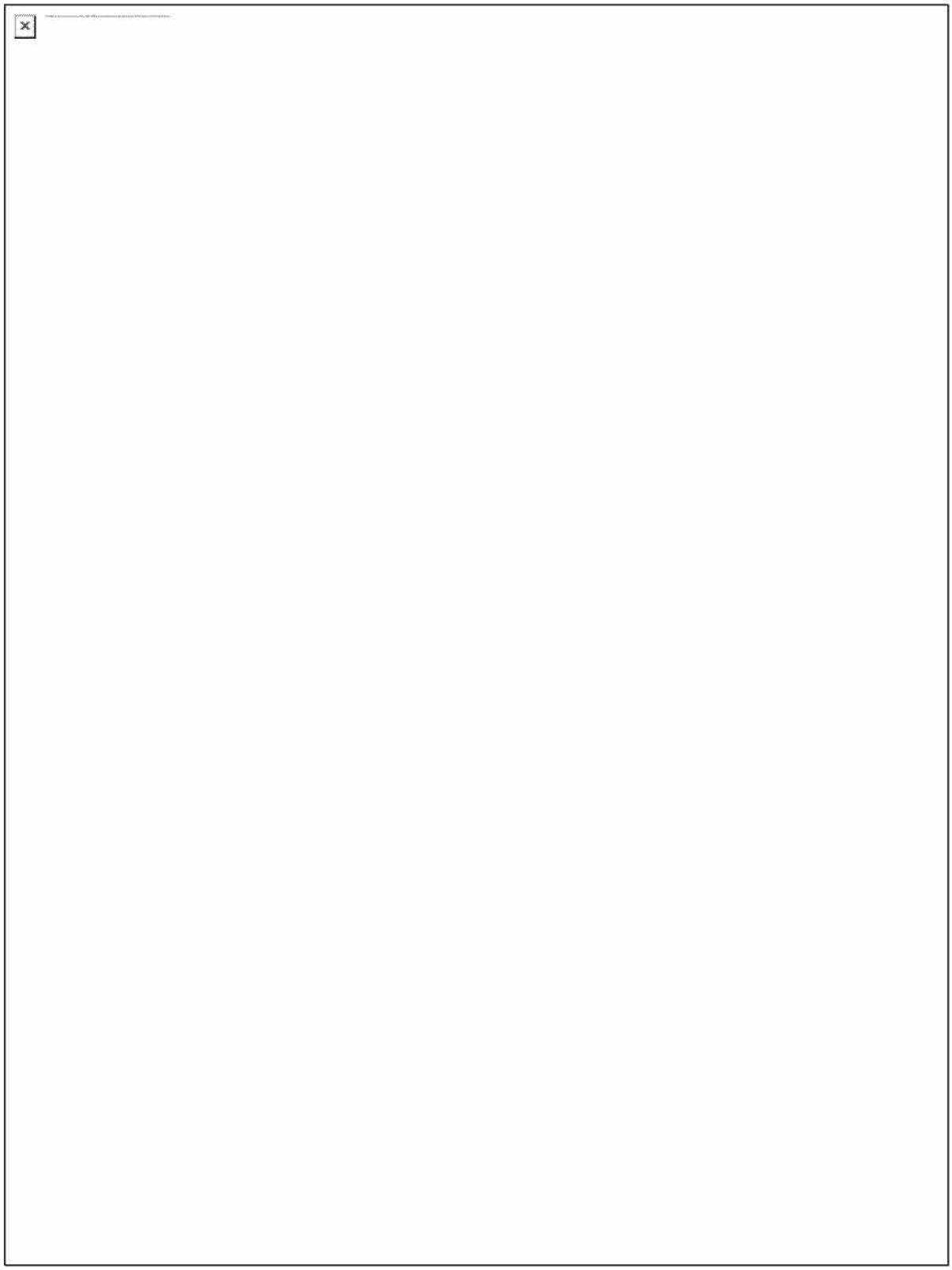
We look forward to seeing you there!

- The Macdonald-Laurier Institute









NORAD Modernization and the North

Monday, 27 May 2024 from 8:30 AM to 5:30 PM (EDT)

National Arts Centre
1 Elgin Street
Ottawa, ON K1P 5W1
Canada

Organized by Macdonald-Laurier Institute

Questions about the event?

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Ontario Power Generation: SMR leadership

Short overview

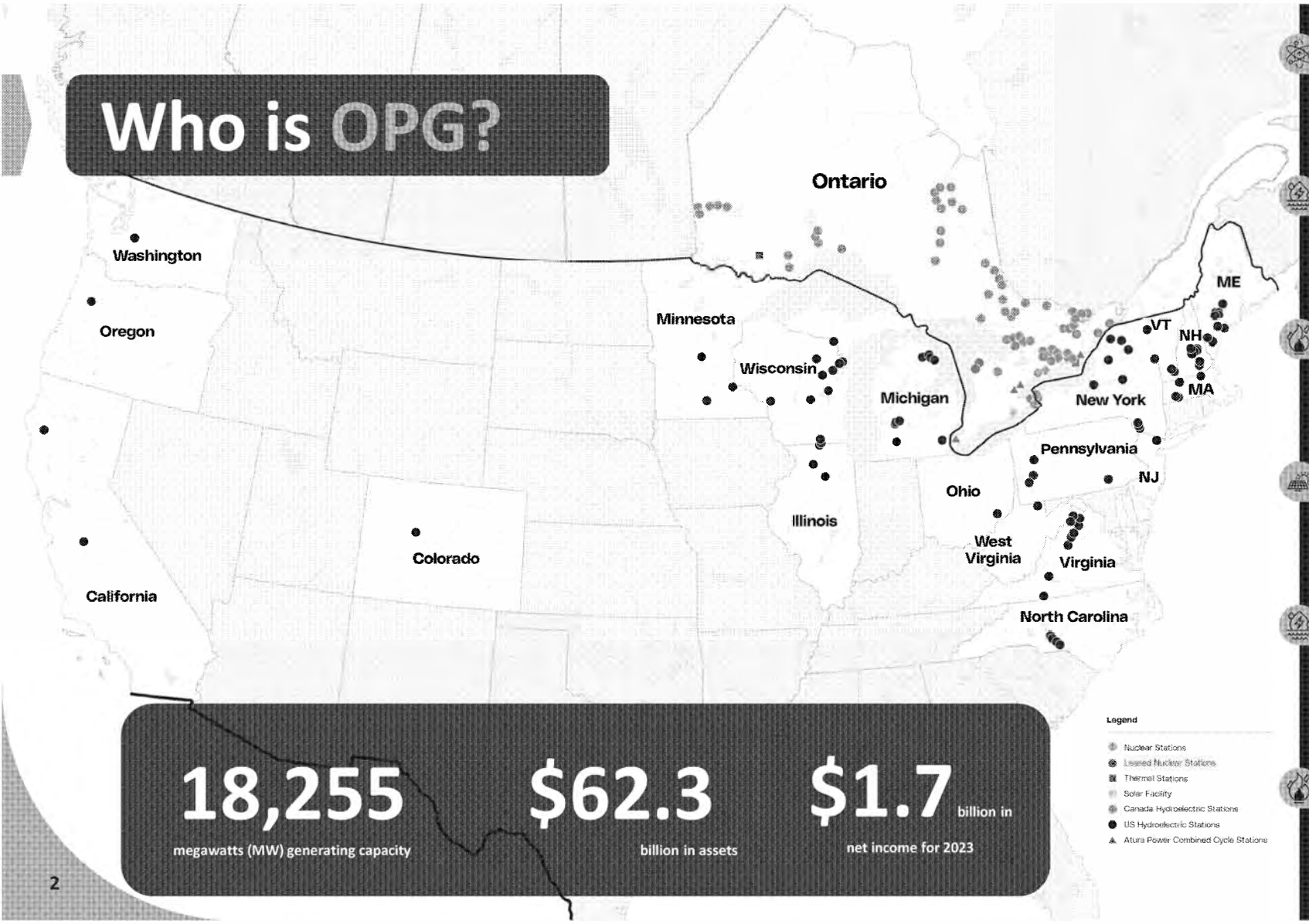
New Nuclear Development | February 2025

ONTARIO POWER GENERATION

Where a brighter tomorrow begins.

A0120229_1-002823

Who is OPG?



18,255 megawatts (MW) generating capacity

$62.3 billion in assets

$1.7 billion in net income for 2023

2 **Nuclear** Generating Stations



66 **Hydroelectric** Generating Stations in Canada



2 **Thermal** Stations



1 **Solar** Facility



85 **Hydroelectric** Generating Stations in the U.S.



4 **Atura Power Combined-Cycle** Generating Stations

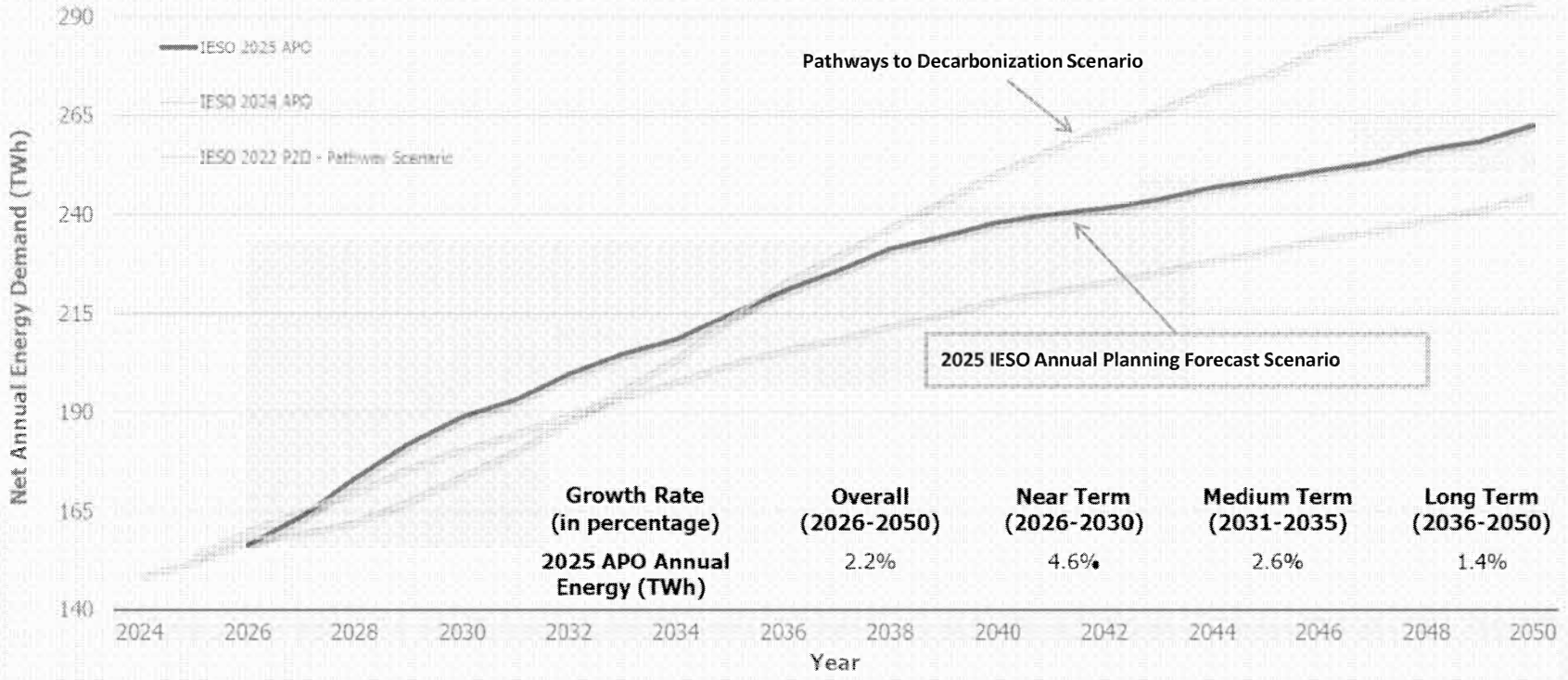


OPG

A0120229_2-002824

Ontario's Energy Growth

IESO 2025 Annual Planning Outlook now forecasting a 75% increase in energy demand by 2050 in Ontario.



Growth Rate (in percentage)	Overall (2026-2050)	Near Term (2026-2030)	Medium Term (2031-2035)	Long Term (2036-2050)
2025 APO Annual Energy (TWh)	2.2%	4.6%	2.6%	1.4%

Source: Annual Planning Outlook (October 2024)

OPG's Nuclear Growth

Walk before we run

2023+

Large Nuclear Development

- Leverage operating & regulatory experience
- Utilize new nuclear project experience





Pickering Refurbishment Project

Leverage Darlington experience:

- Project Planning
- Project Execution
- Vendor Partners

2024+



2019-2036

Darlington New Nuclear Project (SMRs)

- Gen-III+ technology development
- Leverage lessons learned on project delivery from DRP
- Develop new-build nuclear project expertise

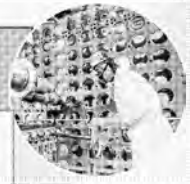
Ontario, pan-Canadian, and international SMRs



- Further SMR development
- Deployment partnerships
- Grow SMR supply chain

Darlington Refurbish-ment Project (DRP)

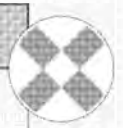
- Build capacity & expertise
- Gather lessons learned
- Increase vendor capacity



2007-2026

Gen-IV SMR Development

- Decarbonize industry & remote communities



OPG

Dates reflect start of internal planning and engineering through to completion of construction/commissioning

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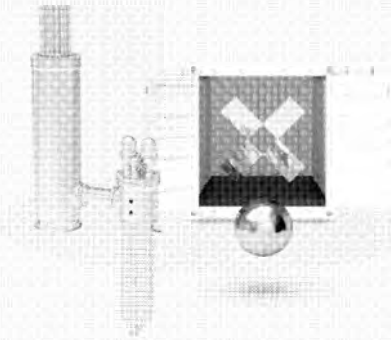
Small Modular Reactors

On-grid SMRs



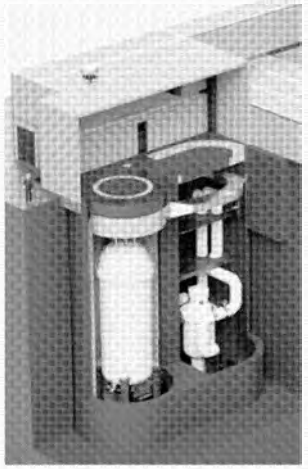
- 150 to 300 Mwe
- Baseload power
- Displace carbon emitting generation
- Deployment in 2020s

Advanced Reactors



- 10 to 150 Mwe
- Heavy industrial applications (e.g., mining, oilsands)
- Deployment mid-2030s

Off-grid SMRs



- 1 to 10 MWe
- Remote industrial and off-grid communities
- Demonstration in the 2020s



Darlington New Nuclear Project

January 2025

BIG things start small.



OPG's SMR technology selection - December 2021
Site Preparation Activities Begun – October 2022
Submitted a License to Construct to CNSC – October 2022
(License to Construct hearings – October 2024 and January 2025)

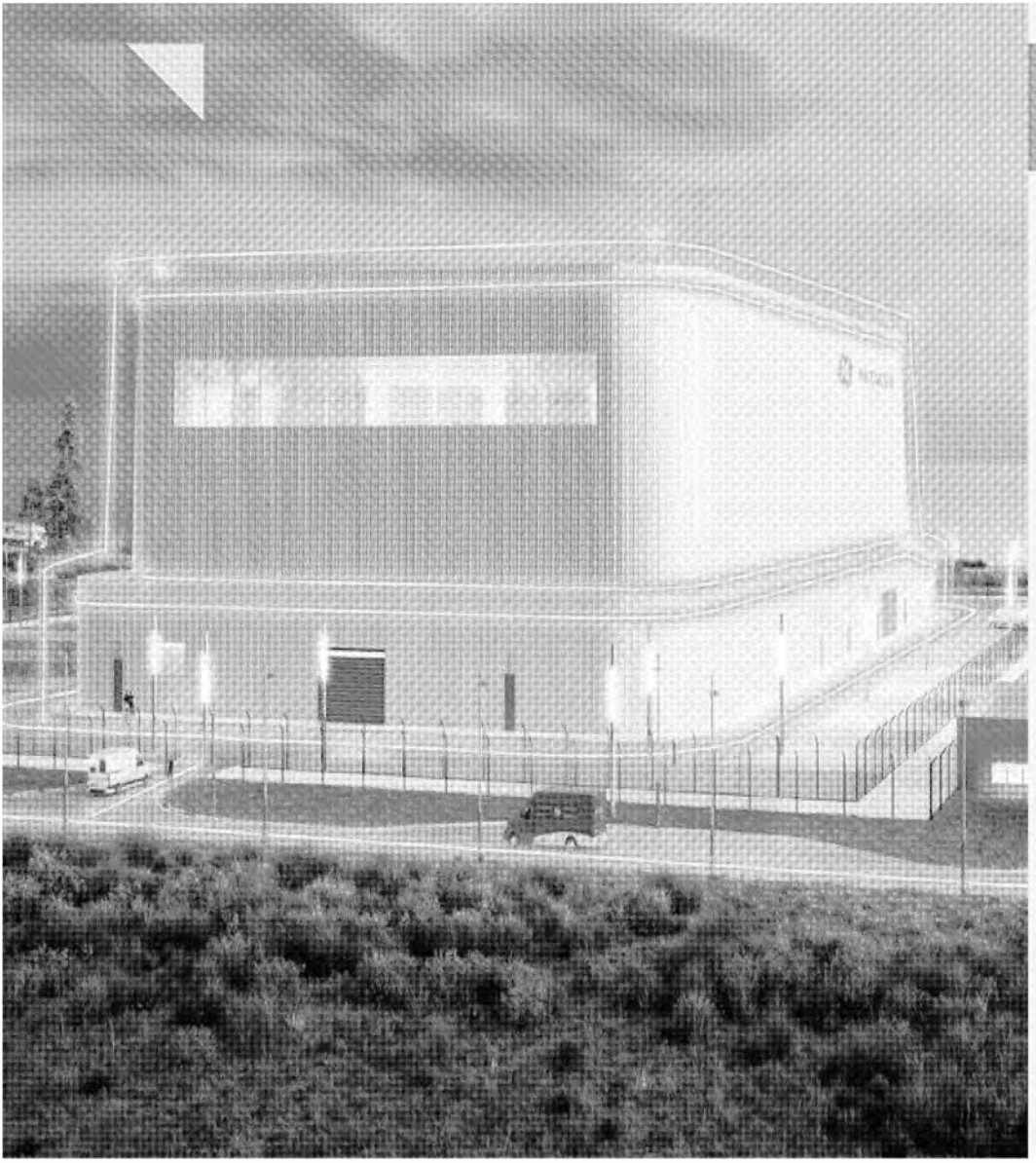
Darlington is the only site in Canada **licensed** for new nuclear build with an **accepted environmental assessment**.

Project partners: OPG, GE-Hitachi, AtkinsRéalis and Aecon.

Allows **low-carbon** nuclear energy to continue playing an important role in **Ontario's future** energy mix.

OPG

A0120229_6-002828



A Fleet Approach

OPG is planning and licencing for three additional SMRs at the Darlington site.

Four units would produce a total 1,200 MW, equivalent to **powering 1.2 million homes**.

Multiple units will allow common infrastructure to be shared across units, further **reducing cost**.

Pending regulatory approvals by CNSC, additional SMRs could come **online between 2034 and 2036**.

Ontario's **robust nuclear supply chain** is uniquely positioned to support SMR development and deployment in Ontario, Canada and globally.

OPG


OPG
Electrifying
life

Integrated Project Delivery Model

Darlington New Nuclear Project

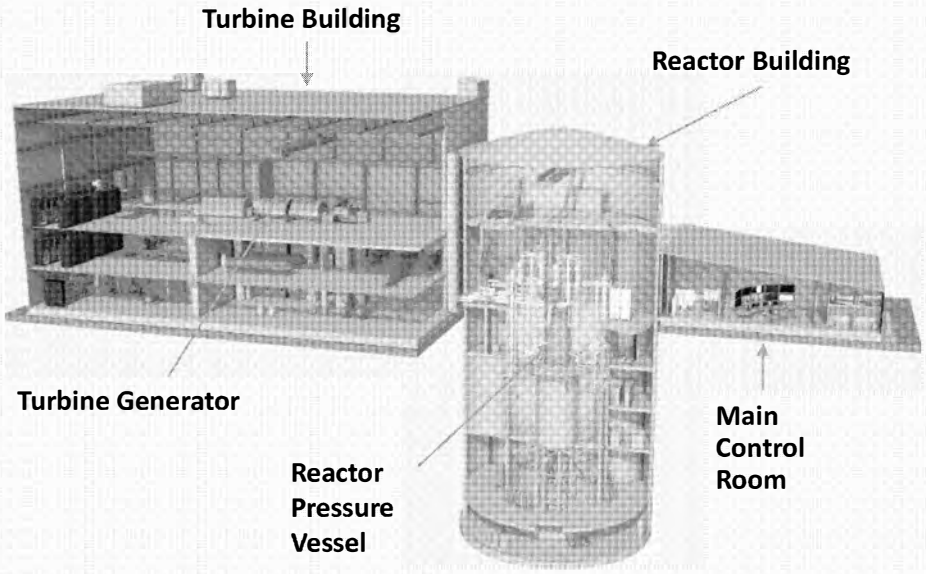
Owner and Licence Holder	Architect Engineer	Technology Developer	Constructor
ONTARIO POWER GENERATION	AtkinsRéalis	GE HITACHI	AECON

Why the Integrated Project Delivery (IPD) model?

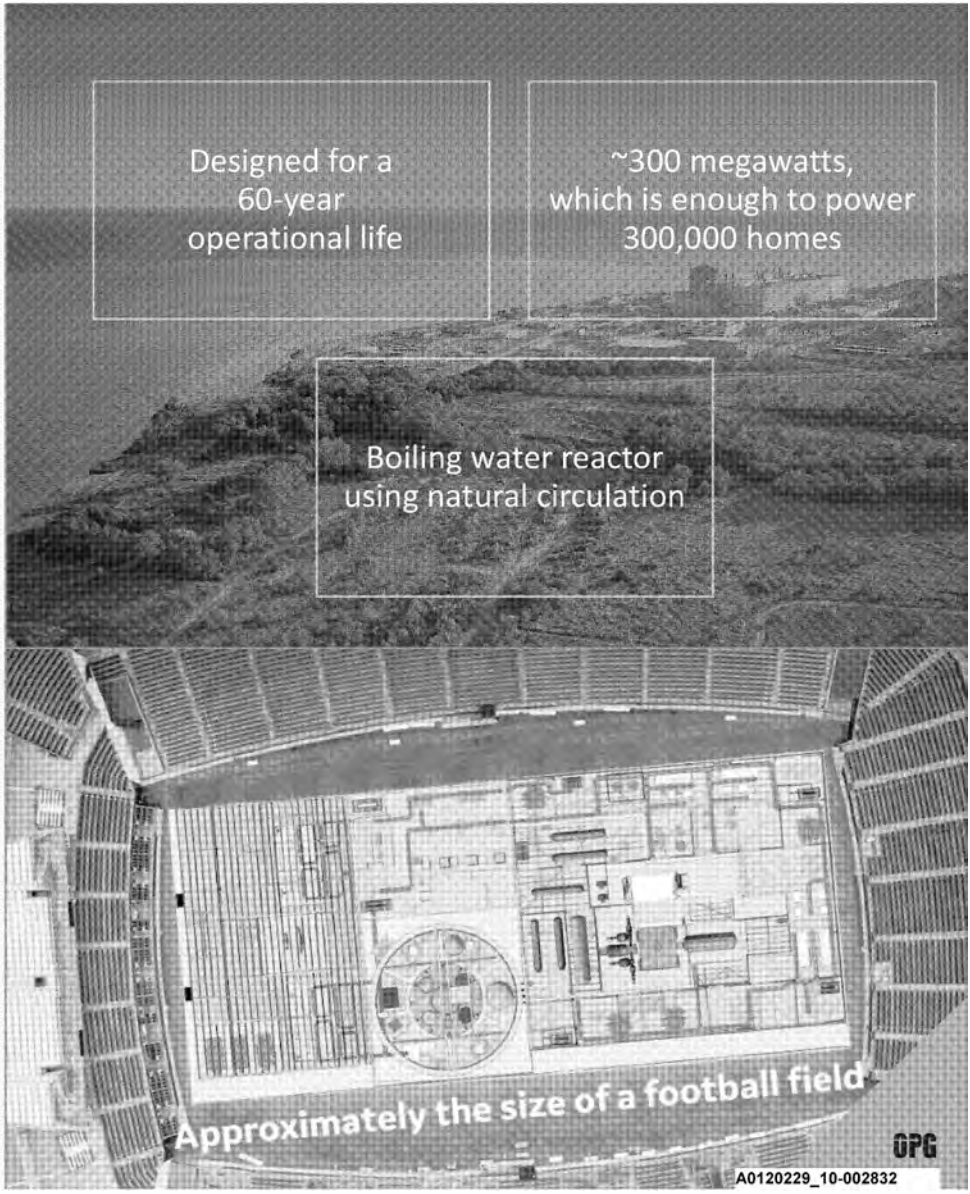
One team approach was a success on Darlington Refurbishment project	Integrates people, systems, business structures and practices	Joint management and collaborative decision making to achieve goals	Unique cost and profit structures to promote teamwork

Technology Overview

GE Hitachi: *BWRX-300*

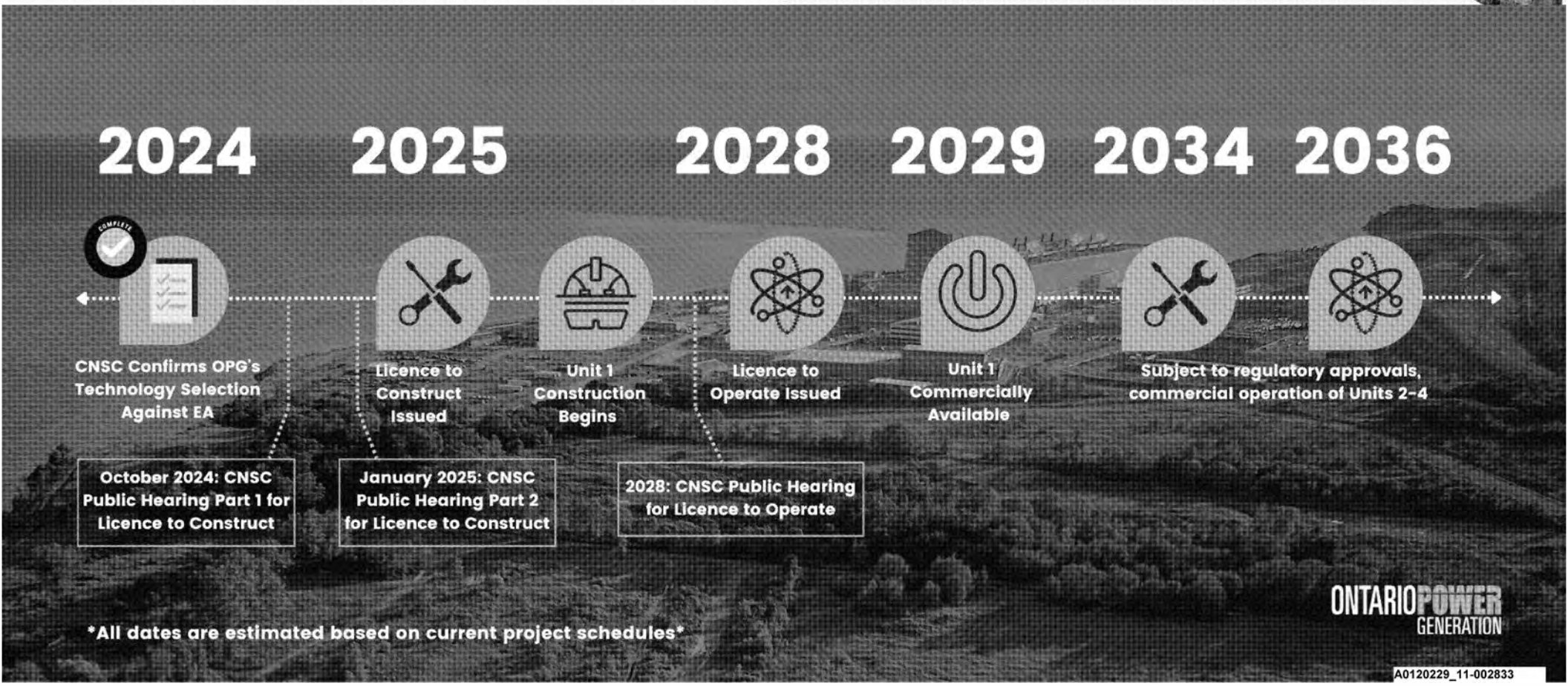


GEH SMR Technologies Canada is the Canadian division of the world-leading provider of reactor technology and nuclear services.



Darlington New Nuclear Roadmap

BIG things start **small**.



A0120229_11-002833

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Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Canada

CNSC Approach to SMR Licensing

Regulatory approach to OPG's Licence to Construct Application for BWRX-300 reactor at the Darlington site

Bartek Rzentkowski
Senior Project Officer in the Advanced Reactors Licensing Division

OUTLINE

- CNSC Mandate
- CNSC Licensing Process
- Approach for SMR Readiness
- Regulatory Approach and Review of OPG's Licence to Construct (LTC) Application for BWRX-300 Reactor



A0120231_2-002847

CNSC Mandate

CANADA'S NUCLEAR REGULATOR – OUR MANDATE



REGULATE
the use of nuclear energy and materials to protect health, safety, security and the environment



IMPLEMENT
Canada's international commitments on the peaceful use of nuclear energy

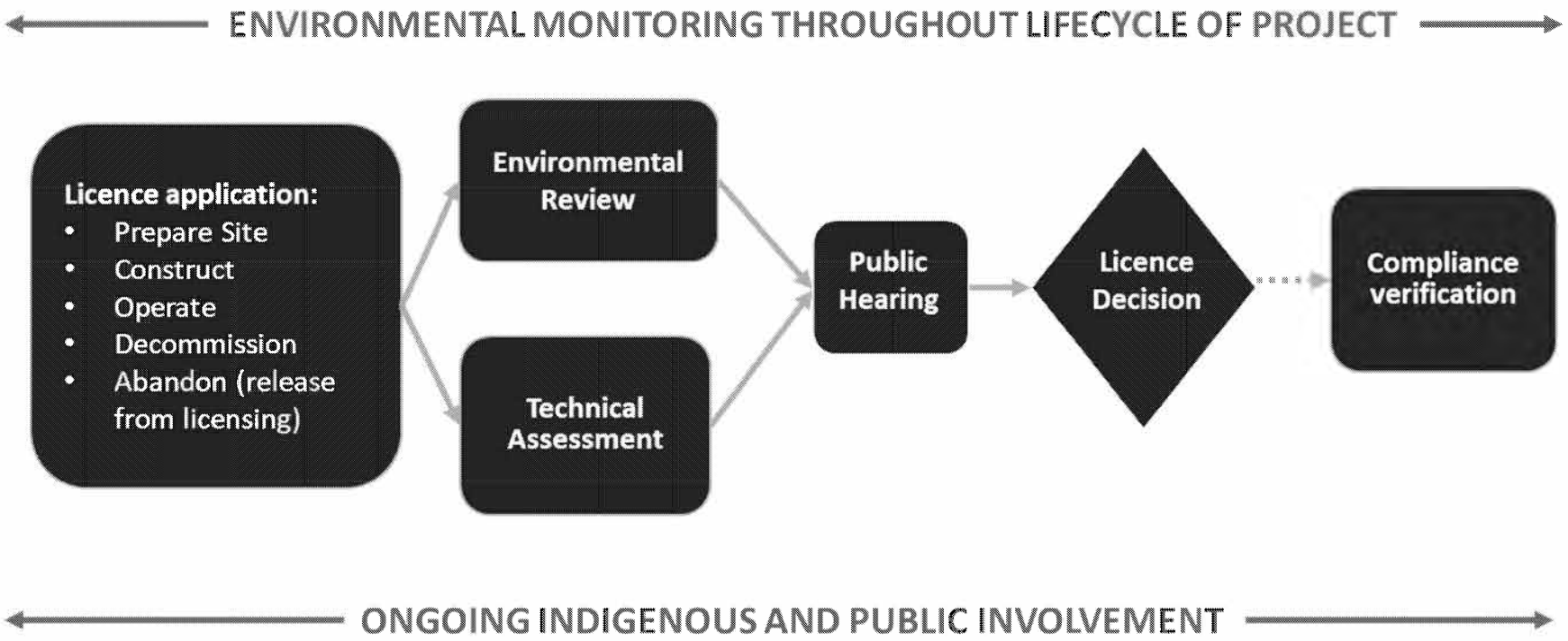


DISSEMINATE
objective scientific, technical and regulatory information to the public

OVER 75 YEARS OF REGULATORY EXPERIENCE

CNSC A0120231_4-002849

CNSC Licensing Process



Approach for SMR Readiness

- The CNSC is a performance-based regulator
- CNSC Directorate of Advanced Reactor Technologies (DART)
  - Dedicated directorate for SMR
- Dedicated project and resources addressing SMR Readiness
- International Collaboration
- Vendor Design Review
  - An optional pre-licensing process for CNSC to provide early feedback to the technology developer (vendor)

CNSC's performance-based regulatory framework is well-suited for the evaluation of novel reactor technologies

CNSC A0120231_6-002851

Regulatory Approach to OPG's LTC Application for BWRX-300 Reactor

- The CNSC applies a risk-informed approach, focusing on evaluating the construction safety case
- Compliance Oversight
  - Use of site-specific conditions
  - Use of regulatory hold points
- International Collaboration and Leveraging of Information
  - Memoranda of Cooperation (MOC) with other national nuclear regulators

CNSC A0120231_7-002852

Regulatory Review of OPG's LTC Application for BWRX-300 Reactor

- CNSC staff reviewed OPG's LTC application using the *Nuclear Safety and Control Act* and associated regulations
  - CNSC staff leveraged regulatory experience and technical information from other national nuclear regulators
- Use of CNSC Safety and Control Areas framework
  - CNSC staff identified regulatory focused areas for the construction stage
- CNSC staff recommended that the Commission authorize OPG to construct a single BWRX-300 reactor at the Darlington site
  - Subject to the conditions outlined in the proposed licence
- Two-Part Commission Hearing recently completed
  - Awaiting Licensing Decision from the Independent Commission

A0120231_8-002853

Thank you

Stay connected!

Bartek.Rzentkowski@cnsc-ccsc.gc.ca

nuclearsafety.gc.ca

Powering the Future: Regulatory & Technological Advancements in SMRs Across the United States

February 26, 2025



NUCLEAR ENERGY INSTITUTE

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NEI
THE NUCLEAR ENERGY INSTITUTE
is the policy and membership organization of the nuclear technologies industry, based in Washington, D.C. On behalf of its members, NEI is the unified voice of the nuclear energy industry on various policy and technical issues.
350+ MEMBERS IN 17 COUNTRIES

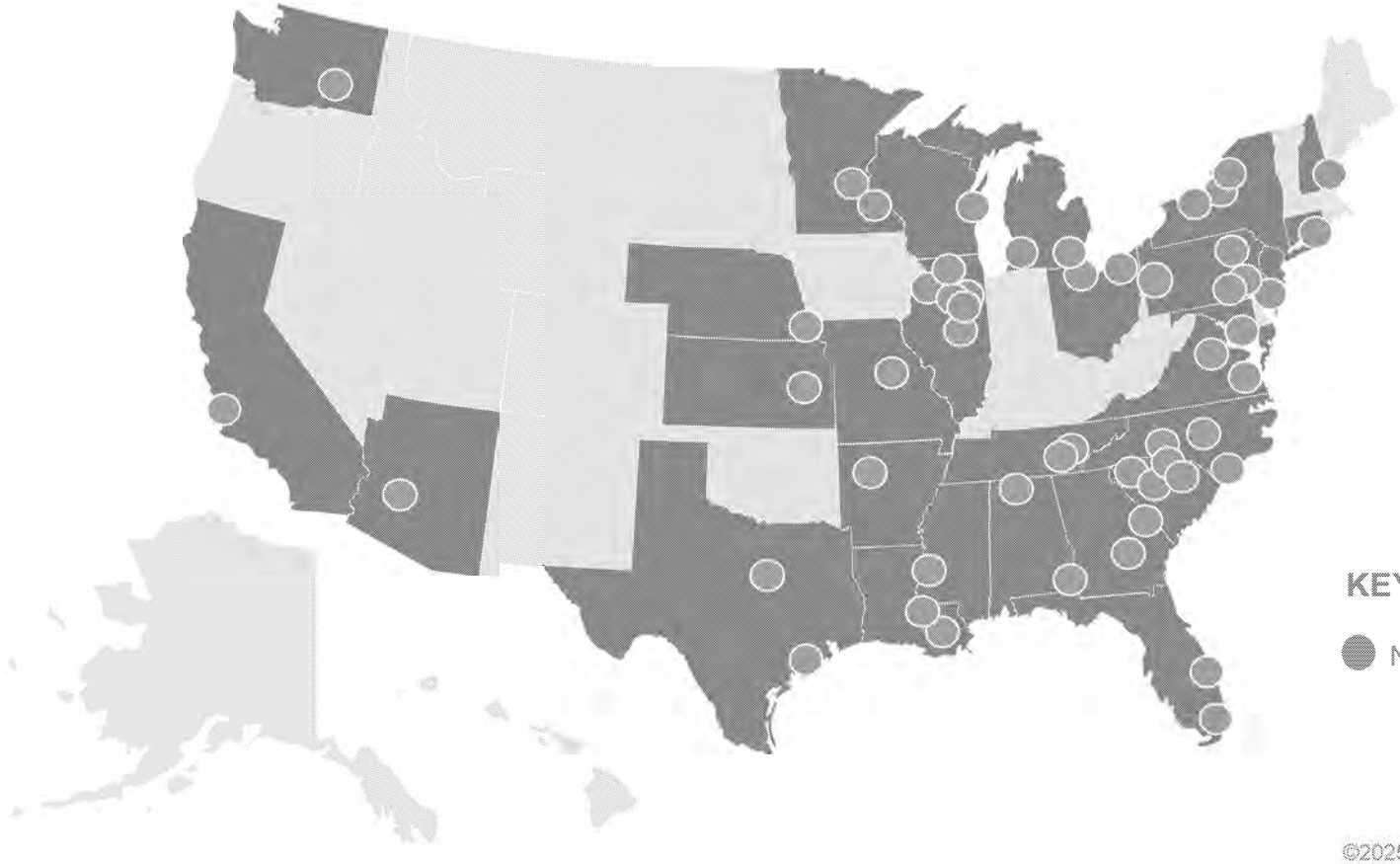

VISION
A world powered by clean and reliable energy

MISSION

Promote the use and growth of nuclear energy through efficient operations and effective policy



Nuclear Provides Majority of Emissions-Free Electricity



Nuclear generated 19% of electricity in the U.S.

From 94 reactors at 53 plant sites across the country

KEY

Nuclear power plant site

Updated: July 2024

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Nuclear Power Contributions

437 million
Carbon emission avoided per year in metric tons

169,000
Short tons of NOx prevented

165,000
Short tons of SO_2 prevented

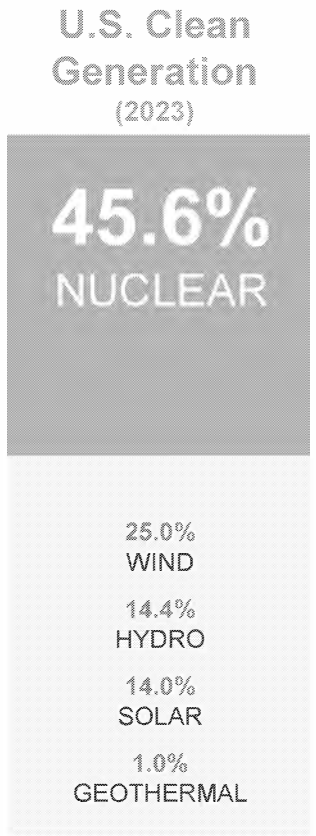
>90%
The average capacity factor since 1999

$6.9 billion
Contributions in federal taxes each year

$9.0 billion
Contributions in state and local taxes each year

250,000
Jobs supported

$64 billion
in contributions to the country's GDP



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U.S. nuclear energy market poised for massive expansion

Electric utilities are planning for more nuclear

License Renewal

- **93%*** of fleet expects to operate to at least **80 years**
- **21*** additional LR/ SLR applications expected 2025-2030
- **3*** units pursuing/ considering restart of shutdown

Investments

- **24*** power uprate applications expected by 2030 (>3 GWe)
- **26*** Extended Fuel Cycle applications being considered or planned
- **>$8B*** in other capital investments by the end of the decade

Applications

Action or Interest

	Sites	GWe
Hydrogen	12	>0.9
Data Center	25*	>6
Other	2	1.6

New Nuclear

- **~50%** of companies increased interest in new nuclear
- **>100*** GWe of new nuclear by 2050s
- Applications in next 10 Years:

ESP	**25***
CP	**19***
COL	**8***

* - Increase from prior survey

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Types of Advanced Reactors

Range of sizes and features to meet diverse market needs

Water Cooled



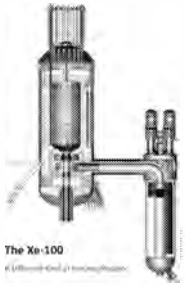
Westinghouse AP1000® (shown)
GE ABWR
GE ESBWR



GEH BWRX-300(shown)
NuScale
Holtec SMR-300
Westinghouse AP300

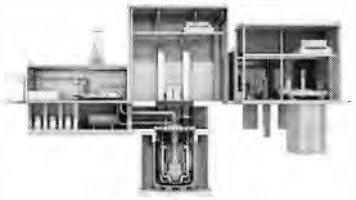
Non-Water Cooled

High Temp Gas Reactors



X-energy (shown)

Liquid Metal Reactors



TerraPower Natrium™ (shown)

Molten Salt Reactors



Kairos Hermes (shown)

Both



Oklo (shown)
Last Energy
Radiant
Westinghouse eVinci™

Large ~1000 MWe — Small Modular Reactors < 300 MWe — Micro < 50 MWe

Learn more about innovative technologies with the Nuclear Innovation Alliance.

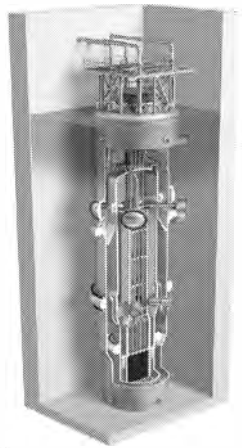
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NuScale VOYGR™ Reactor

Light-Water SMR

- Design
  - Module = 77 MWe
  - Plant (4 to 12 modules) = 308 MWe to 924 MWe
  - Individual modules adjust output rapidly
  - Existing Fuel Design (Framatome)
  - Ability to safely shut down and self-cool, indefinitely
  - Air cooling for condensers is an option
- Licensing
  - Design Certification (50 MWe version) approved in 2020
  - NRC approval of 77 MWe expected in 2025
  - DOE support for design and licensing
- Project Development
  - Standard Power plans for Ohio and Pennsylvania
  - Romania
  - Others: Dairyland, AECI, Nucor, Romania (DOE FEED), Poland, Bulgaria, Czech, Prodigy Marine (Canada), Jordan, others





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X-energy – Xe-100

- Design
  - 80 MWe or 200 MWth
  - Standard Plant = 4 reactors @ 80 MWe each
  - Requires HALEU for TRISO fuel
  - Online Refueling (220,000 pebbles)
  - High temperatures for expanded non-electricity applications
- Licensing
  - 11 Topical Reports, 11 White Papers with NRC
  - Construction Permit expected in 2025
- Project Development
  - ARDP (DOE Award of $1.2B for first plant and fuel facility)
  - DOW's Seadrift, TX site for cogeneration around 2030
  - Energy Northwest plans for future plant
  - ENEC, Jordan, Alberta, UK

High Temperature Gas-cooled Reactor (HTGR) SMR





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TerraPower/GEH – Natrium™ Reactor

Liquid Sodium Fast Reactor (SFR) SMR

- Design
  - 345 MWe; 500 MWe with storage
  - Requires HALEU for metallic fuel
  - High temperatures for expanded non-electricity applications
- Licensing
  - Construction permit application submitted to NRC March 2024
- Project Development
  - ARDP (DOE Award of $2B for first plant and fuel facility)
  - PacifiCorp project broke ground, Kemmerer, WY June 2024
  - PacifiCorp IRP for four more Natrium reactors in early 2030s



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Advanced Nuclear Deployment Plans

Projects that may be in operation by early 2030s

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Updated 01/17/2025



Legend

- Considered project
- Planned project
- Under construction
- Operating
- Large (1,000 MWe)
- Small (<300 MWe)
- Micro-reactor (<50 MWe)
- University / Research / Test

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QUESTIONS?
Way, GENSLER

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Proposed Guiding Principles for Recycling/Reprocessing Used Fuel in Canada

Presented at the 42nd Annual CNS Conference / 47th Annual CNS/CNA Student Conference

Saint John New Brunswick Canada
2023 June 4-7

P.D. Thompson
NB Power
pthompson@nbpower.com

Abstract

The commercial nuclear power industry in Canada currently utilizes a once through fuel cycle strategy of the natural uranium dioxide fuel in CANDU reactors. This fuel cycle is well known, safe, cost effective, and the end of cycle disposal pathway is by the waste owners funded and managed through the Nuclear Waste Management Organization's establishment of a Deep Geological Repository. Reprocessing of used nuclear fuel to extract the fission products and reuse the fissile and fissionable transuranic isotopes to produce energy in a commercial power reactor, is not currently performed in Canada. This paper outlines the potential benefits to recycling/reprocessing of used nuclear fuel in Canada and proposes guiding principles that would need to be followed. The paper also discusses how the existing regulatory framework in Canada would ensure these guiding principles would be adhered to.

1. Background

Reprocessing of used nuclear fuel to extract the fission products and reuse the fissile and fissionable transuranic isotopes to produce energy in a commercial power reactor, is not currently performed in Canada, although chemical extraction of fuel targets at Canadian National Laboratories (CNL) to extract medical isotopes has been routinely performed. A number of other countries however either have, or continue to, reprocess used fuel. Most but not all of these countries happen to be nuclear weapons states.

The reprocessing and recycling of used nuclear fuel has some important advantages which, depending on the design and fuel conversion ratio of the reactor, can include:

- Improved efficiency of the fuel cycle by extracting more energy from what would otherwise be treated as waste,

A0120236_1-002906

- Significantly reduced amount/volume of long-lived isotopes, thereby improving the public acceptability of nuclear power and the disposal of radioactive waste,
- The establishment of a sustainable fuel cycle and significantly extending the availability of uranium supply, and
- Reduced demand for fuel enrichment, including that for the production of high assay low enriched uranium.

While reprocessing of used CANDU fuel for re-use in CANDU reactors has not been economically attractive to pursue, the above benefits could potentially be realized in a cost-effective manner for advanced Gen IV fast fission reactors, two of which are specifically being developed currently in New Brunswick, Canada.

2. Need for a Policy Statement

Review of the various policies, regulations, international agreements, etc. reveal there appears to be no policy inhibitors to prevent the reprocessing of used nuclear fuel for peaceful purposes in Canada. However, this topic is expected to be of sufficient interest to the Canadian public, Indigenous population, and the international community. In addition, given the sensitivity resulting from the atomic weapons test performed by India in 1974 using reprocessed used fuel from a research reactor supplied by Canada in 1954, it is felt it is essential for Canada to be open, transparent, and beyond reproach with its plans and guiding policy related to the reprocessing of used nuclear fuel.

3. Development of Guiding Principles

The nuclear industry established an SMR recycling/reprocessing task team under the CANDU Owners Group. Following several discussions with senior representatives in NRCan, Global Affairs Canada, and the CNSC departments of security, safeguards, import and export control, high level principles were developed that the task team believes provides the necessary guidance on the key areas of interest. These principles could form the basis of a national policy.

4. Proposed High Level Guiding Principles

I. Recycling/reprocessing in Canada would only be done for peaceful uses

II. Adequate provisions must be in place to respect Canada's international obligations related to nuclear non-proliferation of controlled nuclear substances, equipment, and information

III. Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment

A0120236_2-002907

IV. Waste owners shall arrange for long-term management of radioactive wastes generated by recycling/reprocessing activities

V. Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment related to the secure transportation of reprocessed fuel

VI. Import/export of controlled nuclear substances, equipment and information, would be governed through Nuclear Co-operation Agreements with supporting Administrative Arrangements, as well as the Additional Protocol to Canada's comprehensive safeguards agreement with the IAEA.

Canada already has the necessary legislative and regulatory framework in place that would ensure that these principles would be adhered to, thereby ensuring reprocessing would be done safely with regards to impact on workers, the public and environment, and that Canada's international obligations (*to non-proliferation*) would be met.

5. Legislative and Regulatory Framework that already exists in Canada

Canada has an extensive legislative and regulatory framework that appears to address all of these principles. The key elements of the framework involve:

- Canada being a signatory to the Treaty on Non-Proliferation of Nuclear Weapons (NPT) and a Canadian comprehensive safeguard agreement with the IAEA
- Canada being a signatory to an additional Protocol to Canada's comprehensive safeguards agreement with the IAEA
- Nuclear Cooperation Agreements that Canada has with other countries
- Administrative Arrangements with CNSC
- The Canadian Nuclear Regulatory Framework starting with the Nuclear Safety and Control Act, the associated regulations and CNSC regulatory documents
- The Transport of Dangerous Good Regulations
- The Government of Canada's Policy Framework for Radioactive Waste (currently under review)
- The Nuclear Fuel Waste Act
- Impact Assessment Act

Appendix I provides a mapping of the principles to the elements of the framework along with providing additional commentary that serves to the extensive rigour that will be undertaken to ensue reprocessing would be done done safely with regards to impact on workers, the public and environment, and that Canada's international obligations (*to non-proliferation*) would be met.

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6. Communication will be a key ingredient in implementing a Policy

A good communication and engagement plan that is well executed is a key ingredient of rolling out a policy such as this. It is important to convey to the general public, Indigenous groups and the international community that these principles address all the key areas and that they are supported by Canada's rigorous and extensive existing legislative and regulatory framework.

7. Summary and Conclusion

Reprocessing and recycling of used nuclear fuel has a number of important advantages that will become important in the future, especially when Generation IV fast reactors are introduced to Canada. While there are no policy inhibitors to prevent the reprocessing of used nuclear fuel for peaceful purposes in Canada, this topic is expected to be of sufficient interest to the Canadian public, Indigenous population, and the international community that a policy would be warranted.

The paper presents high level guiding principles that could form the basis for a policy to ensure that if reprocessing were to take place in Canada, that it would be done safely with regards to impact on workers, the public and environment, and that Canada's international obligations (*to non-proliferation*) would be met.

Canada already has an extensive and rigorous legislative and regulatory framework to ensure that these principles would be adhered to.

A well executed communication and engagement plan is viewed as a key ingredient of success in introducing the policy.

With such a policy in place, a proponent would be in a position to decide, based on their assessment of the technological and economic feasibility of a given reprocessing process, if and when, they were going to proceed with a specific reprocessing project. Control to ensure the guidelines/policy is met would be through the regulatory process to licence such a facility and its associated required impact/environmental assessment.

8. Acknowledgements

The author acknowledges the contributions of the COG SMR Recycling/Reprocessing Task Team and the excellent discussions with senior level representatives of NRCan, Global Affairs Canada, and the CNSC departments of security, safeguards, import and export control.

A0120236_4-002909

APPENDIX I

Canada's Framework to ensure that the Guiding Principles are met

The existing framework already exists in Canada to ensure the guiding principles are met. This is discussed below.

Non-proliferation and Security
Principles 1,2 and 6.

- ***Recycling/reprocessing in Canada would only be done for peaceful uses,***
- ***Adequate provisions must be in place to respect Canada's international obligations related to nuclear non-proliferation of controlled nuclear substances, equipment and information,***
- ***Import/export of technology, material and equipment would be governed through Nuclear Co-operation agreements with supporting Administrative Arrangements***

Existing framework and discussion:

Canada was the first country with substantial nuclear capability to reject nuclear weapons. Canada continues to be actively involved in the international promotion of the peaceful use of nuclear energy.

The Canadian Nuclear Safety Commission (CNSC) is responsible for implementing Canada's nuclear non-proliferation policy.

In addition, the CNSC participates in several international nuclear organizations in order to strengthen nuclear safety and non-proliferation at home and abroad.

- IAEA Emergency Preparedness Review (EPREV) mission to Canada
- IAEA Integrated Regulatory Review Service mission to Canada
- International agreements
- Nuclear non-proliferation
- Nuclear materials verification (IAEA safeguards)

The CNSC is responsible for implementing Canada's nuclear non-proliferation policy, which contains two broad, long-standing objectives:

1. to assure Canadians and the international community that Canada's nuclear exports do not contribute to the development of nuclear weapons or other nuclear explosive devices
2. to promote a more effective and comprehensive international nuclear non-proliferation regime

The cornerstone of the international nuclear non-proliferation regime is the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT).

The NPT establishes commitments to prevent the spread of nuclear weapons, promote cooperation on the peaceful uses of nuclear energy and achieve nuclear disarmament.

Canada is an original signatory to the NPT and has centered on the treaty's provisions.

The CNSC, through the *Nuclear Safety and Control Act* (NSCA) and corresponding regulations, implements Canada's NPT commitments:

- not to receive, manufacture or acquire nuclear weapons or other nuclear explosive devices
- to accept International Atomic Energy Agency (IAEA) safeguards on all nuclear material in peaceful uses in Canada
- to ensure that Canada's nuclear exports to non-nuclear-weapon states are subject to IAEA safeguards

Under the NSCA and its regulations, Canadian importers and exporters are required to obtain and comply with CNSC licences controlling the international transfer of nuclear and nuclear-related items. Licensees must respect Canada's nuclear non-proliferation commitments.

Through the licensing process, the CNSC takes steps to ensure that nuclear imports and exports are consistent with Canada's nuclear non-proliferation policy.

The policy requires major nuclear exports to be subject to a nuclear cooperation agreement between Canada and the importing country.

These agreements establish reciprocal obligations that are designed to minimize the risk of proliferation associated with the international transfer of major nuclear items.

The CNSC participates with Foreign Affairs, Trade and Development Canada (DFATD) in the negotiation of bilateral nuclear cooperation agreements and implements administrative arrangements with its foreign counterparts to effectively fulfill the terms and conditions of these agreements.

The approaches and measures utilized by the IAEA to verify that nuclear material is not diverted from peaceful uses to nuclear weapons or other nuclear explosive devices in accordance with NPT commitments are commonly referred to as "safeguards".

In 1972, Canada was the first country to bring into force a comprehensive safeguards agreement with the IAEA pursuant to the NPT. The safeguards agreement gives the IAEA the right and obligation to monitor Canada's nuclear-related activities and verify nuclear material inventories and flows in Canada.

In 2000, as part of worldwide efforts to strengthen IAEA safeguards, Canada brought into force the Additional Protocol to its comprehensive safeguards agreement with the IAEA.

The Additional Protocol gives the IAEA enhanced rights of access to nuclear sites and other locations and provides it with access to information about nuclear-related activities in Canada above and beyond its rights under the original safeguards agreement.

The CNSC is responsible for implementing the Canada/IAEA safeguards agreement and the Additional Protocol. Through the *NSCA*, regulations and licences, the CNSC implements regulatory controls for the production, use, storage and movement of nuclear material in Canada.

Conditions for the application of IAEA safeguards are contained in nuclear facility operating licences.

Through its regulatory process, the CNSC ensures that all relevant licensees have in place safeguards policies and procedures that include:

- the reporting and monitoring of nuclear material and activities
- the provision of IAEA safeguards inspector access to nuclear facilities

The CNSC performs compliance and auditing activities to ensure licensees' safeguards policies and procedures remain sufficient to meet the safeguards requirements of the agreement and Additional Protocol.

The CNSC maintains a national system that accounts for and controls nuclear materials in Canada, and supplies reports to the IAEA that serve as a basis for IAEA inspection and monitoring activities.

The CNSC also cooperates with the IAEA in developing new safeguards approaches for Canadian facilities and contributes to efforts to strengthen safeguards internationally.

As part of this effort, the CNSC, through its Safeguards Support Program, assists the IAEA in developing advanced safeguards equipment or techniques aimed at strengthening the effectiveness and efficiency of safeguards implementation.

The program also supports domestic needs in resolving specific safeguards issues related to Canadian nuclear facilities and the use of nuclear material.

The CNSC participates in a number of international committees and groups as well as international meetings and research projects committed to ensuring the safe, secure and peaceful use of nuclear materials and technology.

Membership and participation in these international activities ensure that the CNSC's regulatory activities are consistent, as appropriate, with internationally agreed upon best practices and principles.

Membership and participation also ensure that CNSC guidance, policies and technical standards are current. Through the CNSC's participation in various international nuclear fora, Canada's position on nuclear regulatory matters is heard.

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In particular, the CNSC participates in various committees and activities of the IAEA and Nuclear Energy Agency. As part of its work with these organizations, the CNSC represents Canada, or participates in broader Canadian delegations in a wide variety of relevant multilateral discussions, symposia and conferences that address such issues as:

- the physical protection of nuclear materials and facilities
- international transport of nuclear and other radioactive material
- nuclear safety
- radiation protection
- radioactive waste management
- nuclear safeguards
- nuclear regulation

In 2015, the CNSC gained observer status in the Western European Nuclear Regulators Association (WENRA). The CNSC made the request to become an observer, to promote the exchange of experiences with fellow regulators and learn from international best practices. As an observer, the CNSC will have the opportunity to participate in WENRA's working groups on reactor harmonization and on waste and decommissioning.

The CNSC also participates with Global Affairs Canada in two multilateral nuclear export control mechanisms: the Nuclear Suppliers Group and the Zangger Committee. Canada was a founding member of both these bodies.

The CNSC contributes technical and policy expertise in meetings and working groups of these committees to:

- ensure that the guidelines established by these bodies relating to conditions of nuclear supply effectively address proliferation threats
- ensure that the lists of controlled items take into account advances in nuclear and nuclear-related technology

The implementation of the CNSC's statutory responsibilities for the regulation of Canadian nuclear exports is consistent with the guidelines of these bodies.

The IAEA implements State-level safeguards in Canada, whereby the frequency and intensity of verification activities, facilitated by the CNSC, are dependent, *inter alia*, upon the IAEA's independent assessment of the technical pathways available to Canada for the acquisition of weapons-usable material. The potential impact on these activities of a new domestic reprocessing capability within the Canadian nuclear industry will be assessed by CNSC in discussion with the IAEA, through a best-practice process known as Safeguards by Design.

Security

Nuclear security is a major consideration for all CNSC activities. The CNSC is responsible for enforcing Canada's Nuclear Security Regulations, as enabled by the Nuclear Safety and Control Act. Nuclear security in Canada is aided by federal regulations, which set out detailed security requirements for licensed nuclear facilities. The CNSC's approach follows international physical protection best practices and standards recommended by the International Atomic Energy Agency.

CNSC staff assess if licensees meet the requirements of the Nuclear Security Regulations and the conditions of their licences through ongoing compliance verification activities. The specific areas of security include: facilities and equipment, security practices, response arrangements, and drills and exercises. The CNSC has worked closely with nuclear facility operators, law enforcement and intelligence agencies, international organizations and other governmental departments to ensure that nuclear materials and facilities are adequately protected.

Safety
Principle 3
Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment.

The Canadian Nuclear Safety Commission regulates the full life cycle of a facility. The mandate of the CNSC as defined in the Nuclear Safety and Control act is to:

> **(a)** to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to
>
> > **(i)** prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use,
> >
> > **(ii)** prevent unreasonable risk to national security associated with that development, production, possession or use, and
> >
> > **(iii)** achieve conformity with measures of control and international obligations to which Canada has agreed; and
>
> **(b)** to disseminate objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use referred to in paragraph (a).

The CNSC carriers out this mandate through a comprehensive framework of regulations supported by regulatory documents, and Licences covering the entire life cycle of a facility. Facility licences are required for; the Licence to prepare site, Licence to

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construct, Licence to operate, and Licence to decommission. The CNSC conducts the licensing process in an open and transparent manner, holding public hearings that allow for public and indigenous interventions.
The licence application process ensures the following safety and control areas are addressed in a systematic and comprehensive manner.

- management system
- human performance management
- operating performance
- safety analysis
- physical design
- fitness for service
- radiation protection
- conventional health and safety
- environmental protection
- emergency management and fire protection
- waste management
- security
- safeguards and non-proliferation
- packaging and transport

Waste
Principle 4
Waste owners shall arrange for long-term management of radioactive wastes generated by recycling/reprocessing activities

The Regulatory framework including any Environmental Assessment or Impact Assessment under the Impact Assessment Act, ensures the full life cycle of a facility, including waste management is considered upfront in the licensing of a facility. Thus, an EA or IA can not be granted, or a licence to prepare a site issued, unless there is a credible pathway for the management and disposal of radioactive wastes. The licensing process also ensures there are adequate plans and financial guarantees for the decommissioning of the facility and long term disposal of used nuclear fuel.

The Nuclear Waste Management Organization (NWMO) was established as an outcome of the Nuclear Fuel Waste Act. The NWMO is responsible to take used nuclear fuel from waste owners, or in the case of reprocessing, high level radioactive waste. NWMO follows and adaptive phase management approach that utilizes the concept of a Deep Geological Repository (DGR).

Transportation
Principle 5
Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment related to the secure transportation of reprocessed fuel

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In Canada such shipments fall under Class 7 of Transport Canada's Transportation of Dangerous Goods Regulations. They also fall under CNSC's Nuclear Safety and Control Act and are regulated under the Packaging and Transport of Nuclear Substances Regulations, which in turn is in alignment with IAEA Safety Standards Series No. SSR-6, Regulations for the Safe Transport of Radioactive Material. Transport Canada and the CNSC cooperate in regulating the transport of nuclear substances through a Memorandum of Understanding (MOU)

Packaging and transport of nuclear substances

All nuclear substances are transported in packages that are selected based on the nature, form, and quantity or activity of the substance. There are general design requirements that apply to all package types to ensure that they can be handled safely and easily, secured properly, and are able to withstand routine transport conditions.

The CNSC issues licences and certificates in certain cases for the packaging and transport of nuclear substances as stipulated in the *Packaging and Transport of Nuclear Substances Regulations, 2015* (PTNSR 2015). These regulations are based on the International Atomic Energy Agency's (IAEA's) SSR-6, *Regulations for the Safe Transport of Radioactive Material, 2018 Edition*.

The PTNSR 2015 introduced an ambulatory reference to the IAEA Regulations and no longer explicitly identify and list relevant paragraphs from them. This change ensures that Canadian regulations will continue to align with international regulations if international regulations are modified.

The CNSC published REGDOC-2.14.1, Volume I: *Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substances Regulations, 2015*, to help the regulated community comply with the PTNSR 2015. REGDOC-2.14.1 links provisions in the regulations to relevant content in the IAEA Regulations, the *Nuclear Safety and Control Act*, other CNSC regulations, and other related information.

Certification of transport packages and special form radioactive material

The CNSC regulates all aspects of the packaging and transport of nuclear substances, including the design, production, use, inspection, maintenance and repair of packages. In addition, the PTNSR 2015 require that certain types of package design be certified by the CNSC prior to being used in Canada. They also include provisions for the certification of special form radioactive material, which specify that the sealed source containing the radioactive material must be designed to be strong enough to maintain leak tightness under the conditions of use and wear for which it was designed.

Learn more about the certification process for transport packages.

See the list of CNSC certified transport packages and special form radioactive material.

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Transport licences

The transport of nuclear substances is a regulated activity in Canada, with CNSC licensees involved in the majority of shipments. In general, the transport of nuclear substances does not require a CNSC transport-specific licence. The PTNSR 2015 require that specific transport licences be issued only in the following circumstances:

- transport of Category I, II or III nuclear material
- transport of nuclear substances while in transit
- transport of nuclear substances contained in large objects
- transport of nuclear substances when the transport cannot meet all of the regulatory requirements
- transport of nuclear substances that require a multilateral approval of shipments
- transport of nuclear substances that require a special use vessel

The majority of these licences are issued for the transport of in-transit shipments (i.e., nuclear substances transiting Canada while being transported from one country to another) and for the transport of Category I, II and III nuclear material.
Details on the specific information requirements for each type of transport licence application can be found in section 6 and section 7 of the PTNSR 2015.

Category I, II and III nuclear material

A CNSC licence to transport Category I, II or III nuclear material is required to transport material that is defined in section 1 of the *Nuclear Security Regulations*, such as plutonium, various grades of unirradiated uranium-235, and irradiated fuels consisting of depleted or natural uranium, thorium or low-enriched fuel.

REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material*, offers assistance in preparing a written transportation security plan as required under section 5 of the *Nuclear Security Regulations* when applying for these licences.

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Hautfenne-Jewer, Celia

From: Pat Schroeder <pschroeder@ans.org>
Sent: April 2, 2025 7:41 PM
To: [redacted]
Cc: Vary, Beth; [redacted]
Subject: EPRI/NEI North American Advanced Reactor Roadmap / ARCSC Member Comments Resquested
Attachments: NEI-EPRI_NAARR_March2023.pdf

EXTERNAL EMAIL – USE CAUTION / COURRIEL EXTERNE – FAITES PREUVE DE PRUDENCE

Dear ARCSC Members,

I've attached a copy of the EPRI/NEI North American Advanced Reactor Roadmap. Members were asked to review the codes and standards section (page 43) and provide comments on any updates that need to be made.

Please send any comments to ARCSC Chair Don Eggett at don.eggett@gmail.com with me (pschroeder@ans.org) on Cc.

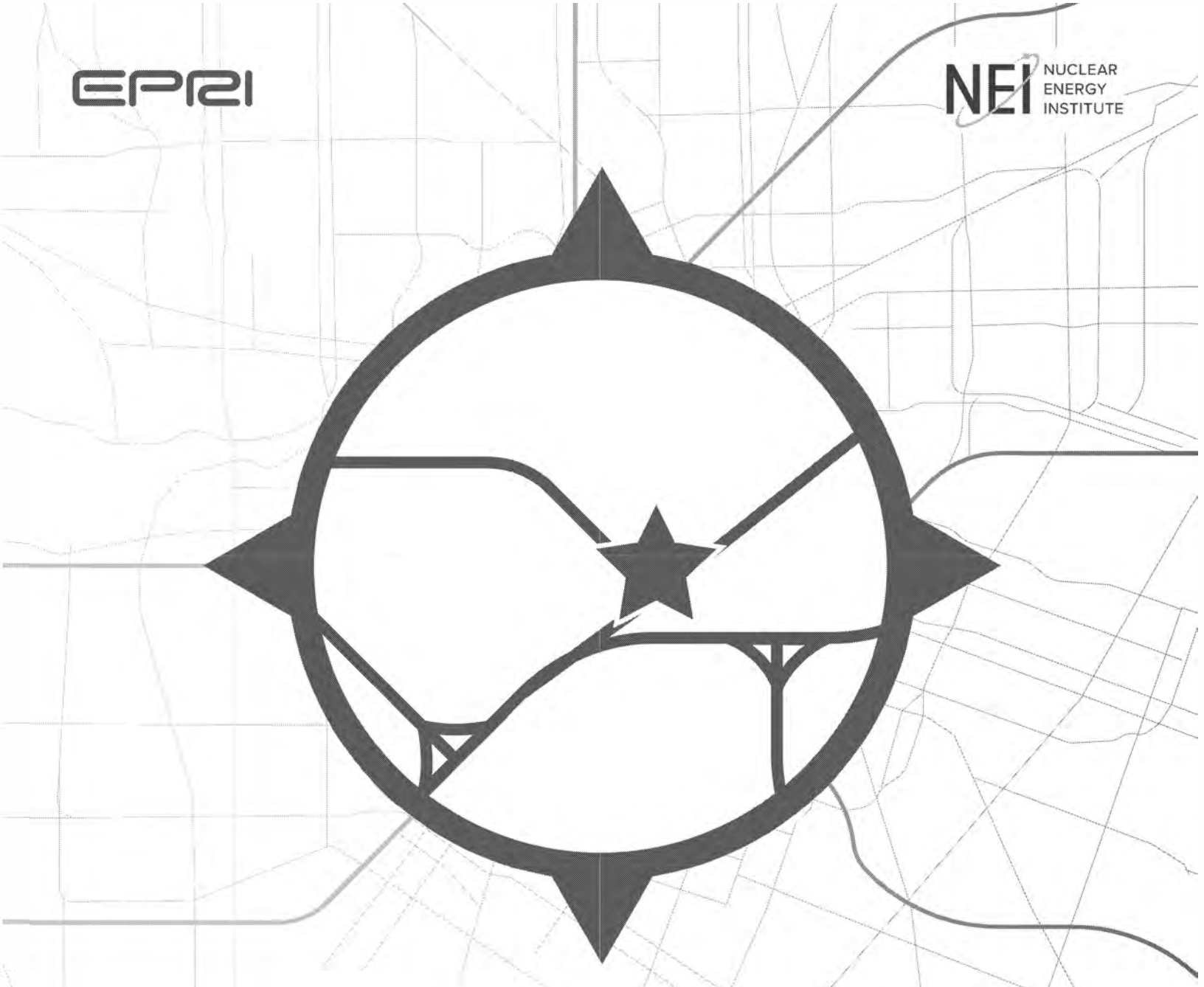
Thanks,
Pat

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EPRI

NEI NUCLEAR ENERGY INSTITUTE



ADVANCED REACTOR ROADMAP

PHASE 1: NORTH AMERICA

EXECUTIVE SUMMARY

Increased capacity for nuclear energy production could be key to helping the United States and Canada meet national energy, economic, climate, environmental, and security goals.

There is a growing consensus that both existing and advanced nuclear could play important roles in the decarbonization of the electricity grid and other parts of the U.S. and Canadian economies. Decarbonization of the electricity, transportation, and industrial heating sectors could come from large amounts of firm, carbon-free energy produced through nuclear technology.

Recent studies, like those by EPRI, DOE, and Vibrant Clean Energy, conclude that there is a large market opportunity for cost-competitive firm, clean energy sources, including nuclear energy. The nuclear energy industry is taking action to enable nuclear energy to meet the market demand through the continued operation of existing reactors and the commercialization of advanced reactors, which could be called upon to provide 60 to 400 GW of generating capacity as a carbon-free option by 2050.

The purpose of this Advanced Reactor Roadmap is to outline the critical strategies and support actions necessary for the successful large-scale deployment of advanced reactors. This will be a living document that evolves and refocuses strategies and actions as the future unfolds.

The Advanced Reactor Roadmap's intended audiences are potential customers (owners and energy off-takers), policymakers, regulators, financial institutions, public stakeholders, and industry stakeholders. The roadmap, developed through a multistakeholder process, including experts from advanced reactor developers, suppliers, utilities, researchers, and industry associations, describes an achievable path to facilitate the successful commercialization of advanced reactors, spur and support the necessary actions, and enable deployment at the levels needed.

The approach that the industry is taking to enable the value of advanced reactors to fulfill critical market needs is focused on three key things:

1. **Commercializing advanced reactor technologies that deliver the desired value**
2. **Establishing a portfolio of advanced reactor technologies to meet a diverse set of market and customer needs**
3. **Ensuring that the commercialization of these technologies is both cost-effective and on track to meet the milestones for decarbonization on time**

The approach relies on disruptive innovations that develop advanced reactors with benefits that deliver value to the market, including easing deployment challenges, accelerating deployments, and increasing cost-competitiveness, all while increasing safety and maintaining reliability. This requires the industry to change how it designs, deploys, and operates advanced reactors. The approach is framed to allow a realistic, phased, and risk-managed approach to deploying advanced nuclear technology. This approach of establishing, advancing, and expanding to scale (EAE) (see Figure 1) is the basis for pursuing industry priorities by setting up early wins, derisking for owners, and creating fast followers.

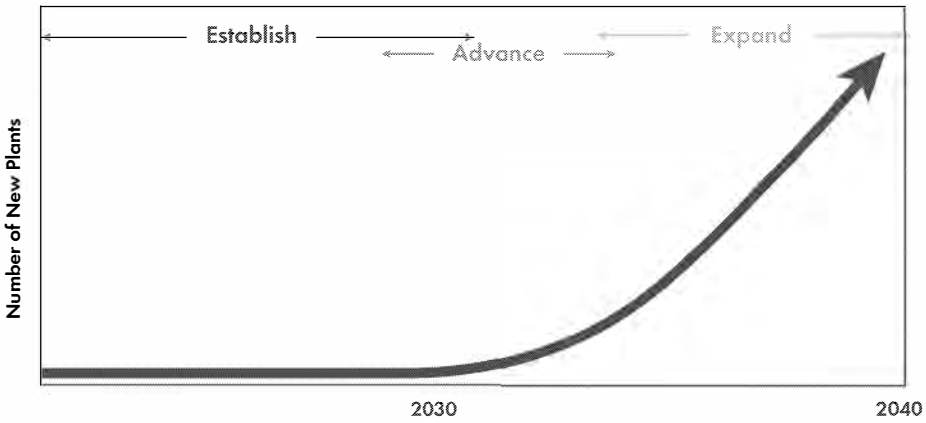
> "The approach is framed to allow a realistic, phased, and risk-managed approach to deploying advanced nuclear technology."

Finally, the active involvement of industry leaders has been a key driver for multistakeholder collaboration in developing this roadmap. Continued industry leadership is essential to execute and drive the strategy, promote collaboration and coordination, and ensure that actions are being completed on the roadmap, which need to be taken now to ensure that the 2050 vision can be achieved. Industry leadership must articulate a vision that builds confidence, attracts capital and investment, inspires the industry to overcome the inevitable challenges, brings technology to the market, and achieves the needed deployments. The 2050 goal is possible only if we start now.

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EXECUTIVE SUMMARY

Figure 1. Establish - Advance - Expand Process



The approach to drive value to meet market demand informs the actions needed to create success in advanced reactor commercialization. These actions are divided into two areas: 1) conditions that would further enable advanced reactors to meet market needs (called enablers) and 2) the actions that the industry plans to take to deliver advanced reactors into the market.

ENABLERS

Enablers are the conditions related to policy, regulatory, and public acceptance surrounding the commercialization of advanced reactors and are key opportunities for stakeholders and the industry to enable and enhance the deployment of advanced reactors.

There are seven enablers, with a total of 15 Key Opportunities:

1. FIRST MOVER SUCCESS
2. FAST FOLLOWERS
3. REGULATORY EFFICIENCY
4. SITING AVAILABILITY AND PERMITTING
5. INDIGENOUS AND PUBLIC ENGAGEMENT
6. SUPPLY CHAIN RAMP-UP
7. WORKFORCE DEVELOPMENT

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EXECUTIVE SUMMARY

ACTIONS

Actions are those the industry plans to take to deliver value in the deployment of advanced reactors. The industry actions focus on what the industry can control in delivering a timely portfolio of products with value that the market desires.

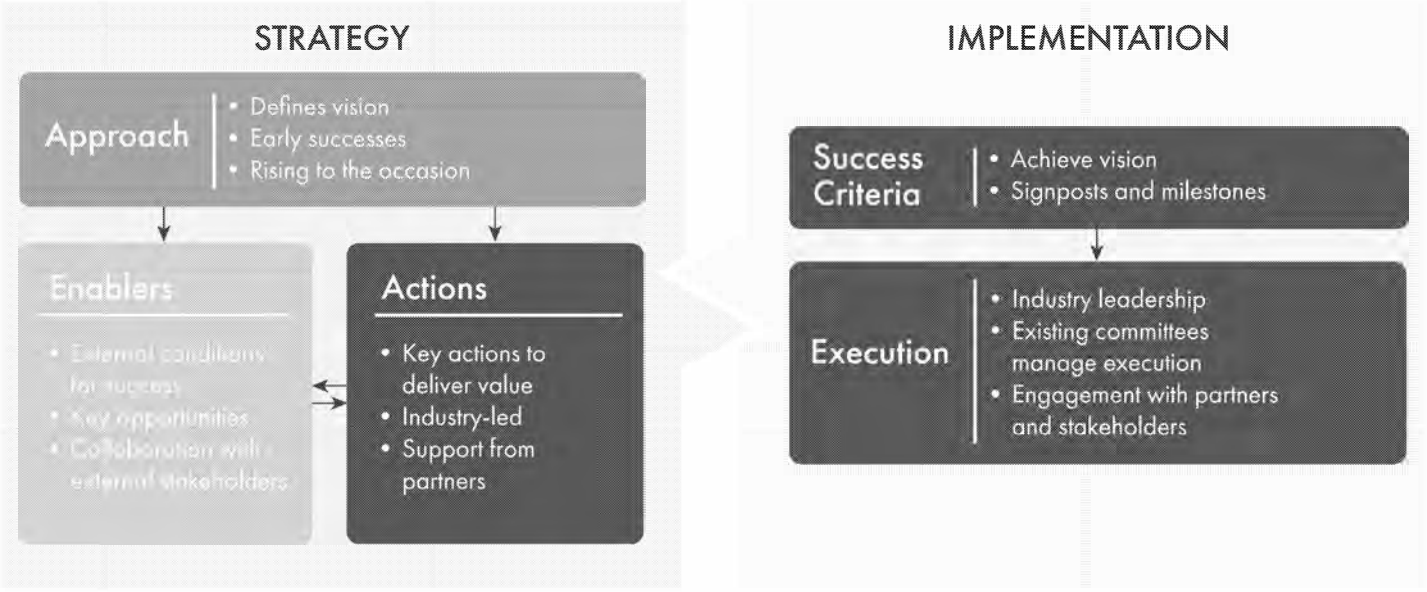
There are a total of 46 actions organized into 13 strategic elements, which are grouped into the following three action pillars:

1. **REGULATORY EFFICIENCY**
2. **TECHNOLOGY READINESS**
3. **PROJECT EXECUTION**

These actions are further prioritized to identify the high-priority actions that make the greatest contribution to delivering value to the market and other actions that could help further improve success.

Successful decarbonization efforts will depend on a host of actions, across many industries and end uses. Nuclear is expected to play a strong role in achieving this success. This roadmap is intended to be a valuable, informative asset in enabling that outcome.

ROADMAP



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VISION

- INTRODUCTION
- THE CASE FOR NUCLEAR ENERGY
- DRIVING VALUE TO MEET THE MARKET NEED

VISION

INTRODUCTION

The Advanced Reactor Roadmap outlines a path forward for advanced reactor technologies to help meet the market need for reliable, affordable, and zero-carbon emissions sources of energy. This early version will focus on North America and has five primary audiences:

1. **For potential owner/operators of advanced reactors –** to understand the industry plan to deliver on owner/operator (e.g., owners and energy off-takers) needs and have more confidence when making decisions to pursue advanced reactors
2. **For policymakers and regulators –** to understand the impacts of federal, state/provincial/territorial, and local policies and the policies necessary to enable deployment of advanced reactors to achieve decarbonization and other objectives
3. **For financial institutions –** to understand how advanced reactors fit in the bigger picture to deliver on society's decarbonization efforts and have more confidence in the value of and return on those investments
4. **For public stakeholders including local communities, Indigenous Nations and communities –** to understand the benefits and key attributes of advanced reactors and to have confidence that deployment and utilization of advanced reactors are done in a way that is protective of the public and the environment
5. **For industry stakeholders –** to understand the integrated path forward to create advanced reactors that deliver value to the market; to understand the opportunities and needs for developing and expanding capability and expertise; to know when those capabilities will be in demand; and to have more confidence in the return on those investments

The purpose of this roadmap is to support the successful commercialization of advanced reactors, spur the needed actions, and achieve the outcomes necessary to enable successful large-scale deployment.

The roadmap includes three sections to:

1. **Describe the approach** that the industry is taking to drive the value of advanced reactors to fulfill critical market needs
2. **Discuss conditions** that would further enable advanced reactors to meet the market needs
3. **Identify actions** that the industry plans to take to deliver advanced reactors into the market

The Advanced Reactor Roadmap is initially focused on North America, with the recognition that efforts to support the industry in the United States and Canada will also support deployment of advanced reactors around the globe.

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VISION

INTRODUCTION (CONT'D)

The roadmap is framed around several key attributes to enhance its value and effectiveness, including being:

1. **Integrated** – The roadmap provides an approach to facilitate the successful commercialization of advanced reactors, taking individual areas needed for success (such as fuel availability) and integrating them into an overall plan to address all areas.

2. **Recognized** – The roadmap must be communicated within and outside the industry and recognized as a common plan for successful deployment of advanced reactors.

3. **Stakeholder Supported** – The roadmap must be driven collaboratively by the industry as a whole to ensure success.

4. **Action Driven** – The roadmap is more than concepts. It includes key targets to recognize success, drive down risk, and ensure timely completion of roadmap actions.

5. **Suitable for Communication to a Wide Variety of Audiences** – The roadmap is presented in a manner that can be understood by key stakeholders internal and external to the industry.

THE CASE FOR NUCLEAR ENERGY

The world depends on vast amounts of energy to run the economy, provide security, enjoy a high standard of living, and provide the basic necessities of food, water, and health. This energy comes in the form of electricity to power homes and businesses, steam and heat for industrial uses, and liquids to fuel ships, airplanes, and cars.

As the negative impacts of carbon emissions have been increasingly recognized by the public and policymakers, there has been a significant focus on decarbonizing the energy sector. As the energy sector is decarbonized and society becomes more dependent on intermittent sources of carbon-free generation, the reliability of supply can be challenged. Nuclear power can play an important role in enhancing the reliability of energy supply while enabling deployment of greater shares of intermittent sources.

Nuclear energy has been a cornerstone of the North American electricity system since the 1970s, producing roughly 20% of the electricity in the United States and about 15% in Canada. In these countries, nuclear has a history as a reliable, resilient and affordable type of energy, available 24/7 year-round and resulting in some of the lowest-cost electricity systems over its lifetime. Nuclear energy has also been environmentally friendly, avoiding emissions of toxins and producing carbon-free energy.

The public and policymakers are beginning to understand more clearly that the transition to a zero-carbon energy system must emphasize clean, reliable, and affordable energy, not just zero-carbon emissions.

Recent passage of clean energy standards in Canada and states like Washington, as well as new federal incentives in both countries to deploy zero-carbon-emitting sources, have provided new incentives for nuclear energy.

Although most attention is on the electricity system, there is growing awareness among policymakers and the public that decarbonization of the other energy-consuming sectors is also important. The carbon emissions of the transportation and industrial heat sectors are, each, nearly the same (in the United States) or greater than (in Canada) as those of the electricity sector, meaning that even if the electric sector's carbon emissions were reduced to zero, only one-third of the carbon emissions from the energy industry will have been addressed. Although some transportation modes might be converted to electricity, many others, such as airplanes and ships, have no viable option to use electricity. Nuclear energy can be used directly for industrial uses or production of liquid fuels, including hydrogen, and can do it more efficiently than electricity to produce the heat.

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THE CASE FOR NUCLEAR ENERGY (CONT'D)

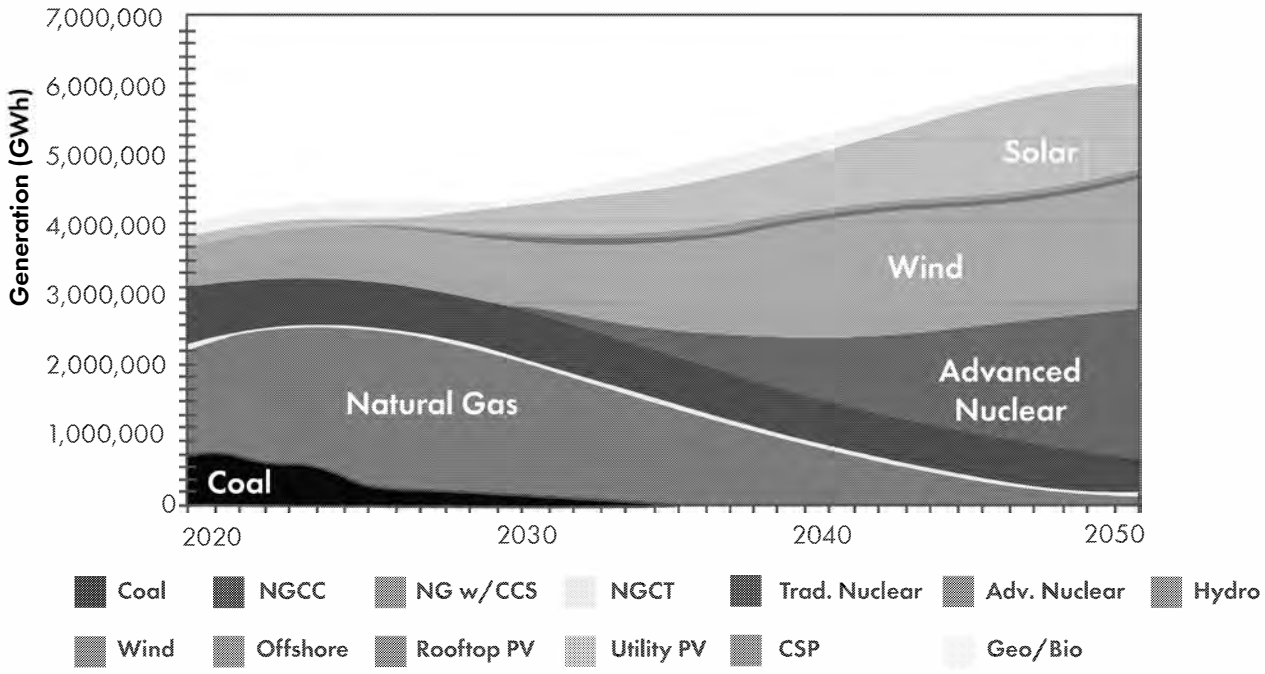
Increased capacity for nuclear energy production could be key to helping the United States and Canada meet national energy, economic, climate, environmental, and security goals. The market also now recognizes the need for more nuclear energy capacity in North America to provide a reliable and affordable path forward to meet goals for reducing carbon emissions.

Recent assessments of the energy system outlook suggest that over the next 10-20 years, the need to deploy advanced reactors in the United States and Canada will rival, and likely exceed, the scale of the entire existing operating nuclear energy capacity in North America. In Canada, Ontario's Independent Electricity System Operator's 2022 "Pathways to Decarbonization" report predicts that a doubling of the nuclear capacity by 2050 is needed to ensure the reliability of a low-carbon electricity system.

A study in the United States by Vibrant Clean Energy (VCE) found that the lowest-cost electricity system for reducing carbon would need to more than triple the nuclear capacity by 2050.[1] In another scenario involving constraints preventing large-scale deployment of new nuclear energy, the report concluded that total system costs increased by nearly a half a trillion dollars.

Figure 2, from the VCE study, shows the cumulative scale of potential advanced reactor electricity generation deployments—on the order of about 300 GWe by 2050. This lowest-cost system to provide reliable electricity and meet carbon reduction goals would need nuclear energy to increase to about 43% of the electricity generation, up from just under 20% today. The system also would need renewable sources to increase to about 50% of the electricity generation, up from roughly 10% today. Further, many energy industry leaders foresee increased demand for advanced reactors in industrial heat applications. Even with the uncertainties in these predictions, the scale of demand for advanced reactors is extremely large.

Figure 2. Potential future electricity generation landscape through 2050[1]



[1]Vibrant Clean Energy LLC. "Role of Advanced Nuclear Technologies in Decarbonizing the U.S. Energy System." NEI Board of Directors presentation. Washington, D.C., May 2022.

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THE CASE FOR NUCLEAR ENERGY (CONT'D)

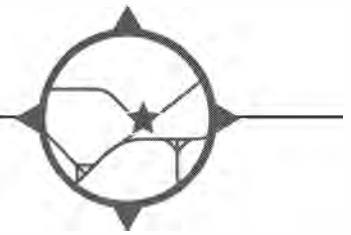
Several important conditions have combined to create an unprecedented market need and opportunity for nuclear energy:

- Continuing, expanding, and accelerating efforts to decarbonize the energy sector, while increasing its reliability, resilience and affordability, create the need for more carbon-free technology options
- A growing understanding that an electricity system must have a diverse set of technologies, including nuclear energy, renewable energy, and storage technologies
- An emerging demand for zero-carbon-emission energy in transportation and industrial uses that will be significantly greater than the demand in the electricity system
- The growing diversity of energy applications that must be decarbonized which necessitates energy solutions tailored to the nature and size of the application

This market need creates an imperative for nuclear energy to be a significant component of a clean, reliable, resilient and affordable energy system.

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VISION



DRIVING VALUE TO MEET THE MARKET NEED

The industry is taking actions to ensure that nuclear energy can meet the market needs for this clean, reliable, affordable technology.

These actions are:

- Continue to operate the existing reactors for 80 years or more
- Commercialize a new set of nuclear energy technologies

The continued operation of existing nuclear energy facilities, which account for roughly 50% of today's carbon-free power generation in the United States and 12% in Canada, is essential not only for the plants' significant benefits
to the energy system, but also because using existing plants mitigate the overwhelming challenges involved in decarbonizing the energy sector.

This roadmap focuses on the commercialization of a new set of nuclear energy technologies called advanced reactors. The industry's approach to driving the value of advanced reactors to fulfill critical market needs is as follows:

PROVIDE DESIRED VALUE

Develop advanced reactors that safely deliver the cost-effective features and benefits that the market needs from zero-carbon emissions energy sources. Most significantly, the market needs firm-clean sources (also known as baseload) that are available 24/7, 365 days a year and can withstand and/or quickly recover from disruptive events, such as extreme weather. This provides a foundation of reliable, resilient, and dispatchable power that is essential to a functional electricity grid and heat users. Furthermore, advanced reactors will ultimately enable greater deployment of renewable energy sources and storage technologies. Additional benefits of advanced reactors are their energy density, resilience, low land use, dispatchability, and contribution to energy security. Advanced reactor features for enabling flexibility to further improve the efficiency of integrating renewable energy sources into the grid will increase the reliability of the electricity system while decreasing the costs.

Advanced reactors must be cost-effective. It is important to note that, when looking at the total system cost or the cost of energy to the customer, the market does not require that advanced reactors have the absolute lowest levelized cost of electricity (LCOE). Because the LCOE does not fully consider the benefits of the energy source, the most accurate method of evaluating the cost impacts of different energy technology choices is a detailed integrated systems cost analysis that accounts for the value of each source's benefits. Analysis of costs at the system level match energy supply and demand geographically and hour-by-hour, and includes costs not included in some LCOE comparisons, such as transmission, grid stability, and intermittency.

PORTFOLIO OF PRODUCTS

Develop a portfolio of products to meet a diverse set of market and customer needs. The existing nuclear energy facilities are essentially one type of product in the market—a large energy facility most suitable to powering a large electrical grid. There will still be value in these products in the future, but the scale and diversity that the market needs to decarbonize the energy sector requires a diverse set of advanced reactor technologies with varying capabilities. There will be a need for large, medium, small, and very small (also called micro) nuclear energy facilities to meet varying sizes of the grid and customer demand. Non-electric markets, such as transportation and industrial heat, will need a wide range of temperatures and sizes. In many cases, the market will need technologies to produce both electricity and heat. Because no one design can meet all of the market need, a portfolio of products is essential.

VISION

DRIVING VALUE TO MEET THE MARKET NEED (CONT'D)

Nuclear energy has historically been used in large, baseload electric generating stations. However, demand for advanced reactors is expected to expand significantly and to include a diversity of attributes and uses, including:

- **Application:** electricity generation, industrial heat, hydrogen production, steam, and other potential energy needs
- **Size:** micro-reactors (under 50 MWe), small modular reactors (50–300 MWe), medium scale (300-600 MWe) and large-scale reactors (>600 MWe)
- **Utilization:** always on, load/demand following, or intermittent
- **Siting:** fixed or mobile
- **Technology:** light water, gas-cooled, liquid sodium cooled, lead-cooled, molten salt and potentially others
- **Energy Products:** electricity, steam, heat, hydrogen

TIMELINESS

The goal is to successfully commercialize advanced nuclear technologies through early deployments, thereby building the foundation for expanding to large-scale deployment before the mid-2030s. The market need for decarbonization, partially driven by policies, is urgent. Some policies have set decarbonization goals for as early as 2035, and nearly all have goals for zero-carbon emissions by 2050. As noted above, the VCE study concludes that if advanced nuclear energy commercialization is delayed by as little as five years (as compared to the timeline shown in Figure 2), it impacts energy system costs.

The approach to drive value to meet market demand informs the discussion on conditions that would further enable advanced reactors to meet the market needs. Planned actions to deliver advanced reactors into the market are identified in the following sections.

Successful commercialization of advanced reactors that enable the United States and Canada to meet their energy, climate, environmental, economic, and national security goals is reasonably achievable through collaborative efforts by the industry and external stakeholders.

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APPROACH

- DISRUPTIVE INNOVATION
- RISING TO THE OCCASION
- ESTABLISH, ADVANCE, EXPAND
- DE-RISKING PROJECTS FOR OWNERS
- EARLY SUCCESS TO BUILD A FOUNDATION & CONFIDENCE

APPROACH

DISRUPTIVE INNOVATION

Capturing the benefits of advanced reactors on the needed timeline requires an emphasis on "disruptive innovation" for deployment and utilization of the technology.

Advanced reactors build on the safety record of existing nuclear power facilities to provide even safer risk profiles. This risk reduction, coupled with modern monitoring and control technology, provides the opportunity to reshape how nuclear technology is developed, regulated, deployed, and operated. Changing how advanced reactors are pursued and viewed is important to achieve leveraged benefits—including easing of deployment challenges, accelerating deployments, and increasing cost-competitiveness, all while increasing safety and reliability.

The opportunities to change the game in advanced reactors are related to the elements listed in the preceding section, but they are also important strategic enablers themselves. Most importantly, changing the game involves shifting industry paradigms and practices in a sustained manner that encourages innovation, further strengthens the industry, and increases the benefits and utilization of advanced reactors.

Important opportunities to change the game and enable the deployment of advanced nuclear technologies include:

IN THE DESIGN AND ENGINEERING OF ADVANCED REACTORS

Increased standardization in designs, achieving the goal of "design and license once, use many;" a limited portfolio of designs each tailored to needed use-cases, reducing the need for use-specific design and licensing, and improving the business case for the application; large and ample design margins that facilitate and enable wide deployment envelopes, both for potential sites and potential uses; a risk-informed approach to quality assurance that avoids undesired bleed over of detailed nuclear quality requirements into the non-nuclear systems and equipment; and importantly, the design, licensing, and operational separation of the nuclear energy portion of a facility supplying energy from the non-nuclear portion using that energy, enabling significant cost savings and increased operational flexibility.

IN THE REGULATORY REVIEWS AND LICENSING OF ADVANCED REACTORS

Increased efficiency of regulator reviews through risk-informed approaches; effective and agile reviews of diverse technologies and use-applications; and NRC review schedules that reliably and predictably support mission objectives. The U.S. goal shall be to license advanced reactors, that have previously been approved, in 12 months or less from submittal to approval (that is, no longer than 12 months for both the safety and environmental reviews), with the understanding that initial applications of a design and early applications may take longer as the regulators streamlines their processes. Canada continues to work on streamlining their regulatory approval process.

IN THE DEPLOYMENT OF ADVANCED NUCLEAR TECHNOLOGY IN THE FIELD

Shift from an approach of "procure and construct" complex facilities to "manufacture and assemble components, then install them in a constructed structure"; implement a risk-informed and graded approach to oversight and quality assurance; and inculcate a culture that embraces the value of project management and risk mitigation rather than simply being activities that are done on the project.

IN THE OPERATIONS AND MAINTENANCE (O&M) OF ADVANCED NUCLEAR TECHNOLOGIES

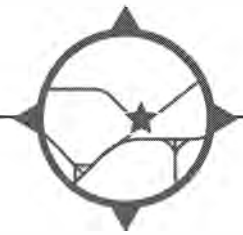
Greatly reduced facility staffing levels and maintenance costs; streamlined qualification requirements for staff through a graded and risk-informed approach; and maintenance philosophies consistent with industrial facilities for comparable systems and components, that still deliver required levels of equipment reliability.

IN THE OWNERSHIP AND BUSINESS MODELS FOR ADVANCED NUCLEAR TECHNOLOGIES

Enabling and delivering to benefit "new to nuclear" owners; reducing the hurdles to ownership of an advanced reactor facility; and creating the opportunity for "energy as a service."

Capturing these disruptive innovations to create opportunities and "change the game" are requisites for success. Without achieving these big picture and cultural shifts as part of the near-term and mid-term deployments, long-term success and large-scale deployments (that is, "expand") are unlikely.

APPROACH



RISING TO THE OCCASION

The success of advanced reactors relies on evolving, strengthening, and sustaining industry culture. The industry's pursuit of operational excellence has served the industry well; excellence is needed across the activities required for successful commercialization and the high levels of safety and reliability, which are hallmarks of the industry, must be maintained. To achieve the vision of success, leverage the benefits of advanced technology, and build confidence and credibility, some elements of the culture must continue to evolve.

Examples of evolution that will enable enhanced effectiveness include:

- Being able to separate the scope of nuclear safety and radiological hazards from normal industrial activities and apply the rigor and levels of quality assurance appropriate to each. Shifting from a model of building large "one-off" plants on site, to assembling factory made plants
- Shifting from an attitude and culture of "constructing nuclear power plants" to "assembling industrial facilities with radiological hazards"
- Being unrelenting in driving the industry to be risk-informed and technology-inclusive with the regulator
- Understanding that external stakeholders can have very different perceptions and views of nuclear technology than industry participants
- From an education and communications perspective, having a proactive posture in engagements with external stakeholders and the public and sharing the contributions and accomplishments of nuclear energy and the industry team, and the larger impacts offered by advanced reactors
- Truly achieving the objective of standardization of nuclear technology designs without continual refinement and modification
- Recognizing the value and importance of government support to accelerate commercialization with policies that are equitable for nuclear and other clean energy sources
- Avoiding overpromising or underperforming. The industry cannot tolerate either, and history suggests that it is vulnerable to both in the deployment of advanced reactors

These culture evolutions are needed to achieve success; enabling and sustaining the changes is a fundamental role of industry leadership.

ESTABLISH, ADVANCE, EXPAND

To enable and ensure the needed timeliness and to build both capability and the needed confidence, the industry's commercialization plans must be framed to allow a realistic, phased, and risk-managed approach to deploying advanced nuclear technology.

More specifically:

- **Establish** wins on early mover and early finisher deployments (both first-of-a-kind [FOAK] and fast followers) to build a firm foundation and increase stakeholder confidence
- **Advance** from the established foundation to include multiple projects, deployments, and uses of advanced nuclear technology
- **Expand** to deliver at needed scale to meet the demands of the future energy landscape

This EAE strategy provides important benefits, including:

- Helping to ensure the most important accomplishments are achieved on the needed timelines
- Prioritizing industry efforts and actions
- Assisting in managing stakeholder expectations of what will be accomplished and when
- Most importantly, avoiding an early "all in" approach of attempting too much, too soon, and at the same time

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APPROACH

ESTABLISH, ADVANCE, EXPAND (CONT'D)

A primary focus is on the industry first establishing a firm foundation, and while establishing it, to pursue a level of simplicity such that wins can be captured and the first deployments will occur as planned. Attempting to take on too many complexities or attempting to expand too widely prior to establishing the foundation of capability and the wins that build confidence threatens delays and costs to the individual projects. These delays jeopardize the overall industry deployment and raise the likelihood of missing the needed time window for deployments. The EAE strategy is intended to provide the framework to enable sustained and large success.

Although the high-level EAE approach has a clear end goal of deployments to meet the demands of 2050, the phased EAE strategy and approach also apply to lower-level accomplishments and workstreams that the industry must advance to achieve those deployments. Examples include:

- **Scale of deployment:** Transitioning from FOAK and early-mover projects with offset intervals, to multiple projects in parallel to widespread deployment of a design
- **NRC and CNSC processes:** In the U.S, using the known Part 50 and Part 52 processes, crafting with the NRC an optimized Part 53, and realizing the expected and needed predictability of NRC reviews. In Canada, applying the CNSC risk-informed, graded-approach, and alternative approaches that are possible within the regulatory framework, but which to date have not been applied to advanced reactors, and addressing timing challenges with the Impact Assessment Act
- **NRC and CNSC throughput:** Increasing the efficiency and throughput of regulatory reviews, advancing from FOAK applications to multiple applications (or fleet application) of previously approved designs, to predictable reviews of many different types of technologies at multiple application volumes
- **Design standardization:** Creating FOAK designs that balance the speed to market and market coverage, and after deployment of a large number of standard, first-series of the designs, then consider enhancing the design
- **Regulatory alignment:** NRC and CNSC collaborating on aligning the regulatory review processes to enable expedited reviews and capacity to accept and utilize each other's work

While moving through the EAE phased approach for these discrete topics, the industry must also be continually strengthening and expanding its capacity—in the spirit of the EAE strategy—in important areas identified in the roadmap, such as project management performance, supply chain robustness, and recruiting and training the needed workforce of the future.

Finally, while executing the roadmap, the industry must always look beyond the current phase and proactively address the needs of subsequent phases. It must also focus on advancing the lower-level workstreams, not simply the high-level achievements.

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APPROACH

DE-RISKING PROJECTS FOR OWNERS

Customers are moving cautiously to make deployment decisions as advanced reactor programs mature. This can create an expected rapid increase in the demand for advanced reactors after success on the initial deployments.

The parallel goals of accelerating initial deployments, flattening the demand peak for new reactors at a sustainable level of new plants coming online each year, and enabling an early foundation for success will require the industry to achieve near-term and mid-term successes that build the confidence of key stakeholders internal and external to the industry and establish a record of success that the industry can deploy advanced reactors to meet customer expectations.

Customers of advanced reactors will remain cautious until a firm foundation is established and early mover and early finisher successes strengthen industry expertise and capability. Prior to the first projects being completed, customers, investors, and other stakeholders will need to gain confidence through the reduction and mitigation of first-mover risks. Developing advanced nuclear project deployment plans that achieve an equitable sharing of risk among customers, suppliers, contractors, financial institutions, and other stakeholders, including financial targets and models that result in cost-competitive products, along with defining the companion project execution and governance models, is a critical need. Extensive numbers of lessons learned from evaluations, reports, and recommendations from previous deployment of nuclear technology are available to owners, technology vendors, constructors, contractors, and other stakeholders. These recommendations were all developed with the mission to derisk future projects. It is imperative in the strategy that industry and owners use these valuable resources.

EARLY SUCCESS TO BUILD A FOUNDATION AND CONFIDENCE

To ensure more opportunities for and delivery on wins, increased confidence in the industry's ability to deliver among stakeholders and customers is critical. To build this confidence, the industry needs to deliver on the work it is doing, which, realistically, will occur only if wins have been achieved (and orders received).

The solution to this chicken-and-egg challenge (need work to build stakeholder confidence, but do not have opportunity to do work without stakeholder confidence) necessitates the strategy to build wins and strengthen the industry in a sequential, incremental manner that also continually derisks projects for owners. This confidence factor and how it is developed are also key in evolving the culture of the industry to succeed and thus in the successful delivery of nuclear technology.

Increasing stakeholder confidence is particularly important from a business case and project definition perspective. By building increased confidence, there will be more orders and investment in advanced reactors, more projects will move through the deployment cycle and provide important lessons, more challenges will be overcome, and the industry will be best positioned and prepared to meet its full potential.

Securing early and frequent "wins" is a fundamental need for establishing a foundation of industry success.

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ENABLERS

- FIRST MOVER SUCCESS
- FAST FOLLOWERS
- REGULATORY EFFICIENCY
- SITING AVAILABILITY AND PERMITTING
- PUBLIC ENGAGEMENT
- SUPPLY CHAIN RAMP UP
- WORKFORCE DEVELOPMENT

ENABLERS

Driving the value of advanced reactors to fulfill critical market needs can be enabled by several conditions related to policy, regulatory, and public acceptance surrounding the commercialization of advanced reactors. The following enablers, with associated key opportunities, provide a valuable framework for focusing the solutions and actions that will enable large-scale deployment success.

Key Stakeholders

FIRST MOVER SUCCESS	FAST FOLLOWERS	LICENSING EFFICIENCY	SITING AVAILABILITY & PERMITTING	INDIGENOUS & PUBLIC ENGAGEMENT	SUPPLY CHAIN RAMP-UP	WORKFORCE DEVELOPMENT
• Industry • Federal • States/ Provinces • Regulators	• Industry • Federal • Regulators	• Industry • Federal • Regulators	• Industry • Federal • States • Regulators	• Industry • Federal • States/ Provinces • Public • Indigenous	• Industry • Federal • States/ Provinces	• Industry • Federal • States/ Provinces • Regulator • Universities • Trade Unions • Trade Schools

FIRST-MOVER SUCCESS

As with any new technology, the deployment of the first advanced reactors will include many new and unfamiliar complexities, and first-customer adoption can be slow for new technologies.

Recognizing these conditions, the U.S. Congress has provided incentives for the deployment of new clean energy technologies, including advanced reactors. These include the U.S. Department of Energy (DOE) providing direct support to first deployments of several advanced reactor designs, the Inflation Reduction Act providing tax incentives to spur market adoption, and loan guarantees. State support for the adoption of nuclear energy is also important to first-mover success, and many states are beginning to pass incentives to spur market adoption. In Canada, the recent Federal Budget announced several tax incentives and other measures that build on previous government support for the adoption of advanced reactors that will help to ensure that these technologies are available in the market and capable of making significant contributions to achieving the decarbonization and energy security goals. The industry is focused on deploying advanced reactors in a manner that minimizes risk and enables rapid learning because future deployments rely on their success.

The key opportunities to enable first-mover success are:

Government Policies

Governments are establishing policies to meet energy and climate goals, and these policies can either enable or discourage advanced reactor adoption in the market. Established policies with stable and reliable funding of programs enable the industry to make and even accelerate business decisions that lead to the timely deployment of the first projects.

Deployment Best Practices

The actions include the development of construction and project best practices, and the implementation of these best practices for advanced reactor projects. These are especially important for the first projects that will encounter new and unfamiliar complexities. Experience has shown that government policies that establish arbitrary deadlines or other unnecessary burdens on industry can also incentivize practices that do not implement all of these best practices. Therefore, government policies that support the industry's implementation of best practices will enable market adoption by enabling the industry to minimize cost, schedule, and risk.

Investments

It has been several decades since a large number of nuclear reactors have been built in the U.S. and Canada, so the investment community is relatively unfamiliar with the financial structuring of new nuclear build projects. The pricing of risk for first-of-a-kind new nuclear build projects, and the uncertainty of whether nuclear energy qualifies in environmental, social and governance financing could be a disincentive to some investors. Building education and comfort in the investment community is needed to enable a healthy supply of investment in new nuclear projects.

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ENABLERS

FAST FOLLOWERS

Customers who are hesitant to be the first to adopt new technologies prefer to wait until the products are adopted by the first movers.

These "followers" are seeking to better understand the costs and schedule of advanced reactors so that they can more accurately factor the risks into their business decisions. However, if these followers wait until the first projects are completed, market adoption will be too slow to enable large-scale deployment of advanced reactors in the timeframe that the market needs to achieve national decarbonization goals. Enabling "fast followers"—those who proceed with projects soon after the first projects start and with reduced risks similar to having waited until the first project is completed—will allow the industry to meet the needs for clean energy between now and the mid-2030s, while also establishing the foundation for large-scale deployment through 2050.

The key opportunities to enable fast followers are:

De-Risking

The industry is developing a framework for reducing the risks for fast followers so that they are similar to the risks of having waited until the first projects are completed. This framework aligns the lead project deliverables and milestones that significantly reduce risk, in the areas of design, licensing, procurement, and construction, with the milestones of the fast follower projects. The outcome is that the fast followers benefit from the lower risks so that business decisions for moving forward can be made, in some cases reducing the timespan between the first and second project from five years to less than two years. Stakeholder support for the first projects to achieve these derisking milestones and for the fast followers to benefit from the first project's successes in their decision making will enable these fast followers to accelerate the deployment of advanced reactors. Examples of support include government policies, investment decisions, and public support.

Streamlining

The industry is pursuing design standardization and partnerships around individual designs of developers, customers, and suppliers that will streamline the deployment of the first wave of advanced reactors. This enables a process of learning that is well established to rapidly reduce the cost, schedule, and risks. Stakeholder support for streamlining advanced reactor deployments, by resisting the temptation to pursue major design or partnership changes for each project, and for encouraging risk sharing among the partners, will enable the industry to accelerate the deployment of advanced reactors.

REGULATORY EFFICIENCY

The market need for advanced reactors to enable the United States and Canada to meet their decarbonization goals will result in innovative designs that regulators have not previously approved and at a volume of licensing applications that far exceeds the NRC's or Canadian Nuclear Safety Commission's (CNSC's) current capacity.

Current regulations and key policy and technical positions in the United States and Canada have been established based on existing technologies—light-water reactors (LWRs) in the United States and heavy-water reactors in Canada. While some progress has been made to update the regulatory framework, the current regulatory framework is not efficient for advanced reactor technologies. If not updated, the regulatory framework may discourage the innovation necessary for providing valuable benefits to the market. It is understood the first time a new design undergoes a review it will take longer than later applications.

In fact, the current regulatory framework cannot process applications at a sufficient pace, even for those technologies on which it is based. The historical schedule for NRC approvals is four to eight years. The NRC review fees, which have historical cost of $28–$42 million and continue to grow exceeding $70 million in some estimates for future applications, is both cost and schedule prohibitive to achieving the scale of advanced reactor deployment that is necessary to meet the market need.

Although both the U.S. and Canada have already embarked on initiatives to revise or update regulations or regulatory documents and standards and to implement policy and technical positions that consider advanced reactor technologies, these efforts have been slow to reach completion and have not included all aspects of the regulatory processes and framework that must be updated or re-aligned to address the urgency of the climate change crisis.

A recent letter from NEI to the NRC states that the NRC could have as many as 60 applications in the licensing process at one time by 2030. In Canada the largest concern about the regulatory process relates to the federal Impact Assessment Act (IAA), which has long timelines and has not been tested for nuclear projects. The regulatory framework in both countries will also need to be updated to align with the innovations in advanced reactors. Although the NRC and CNSC have made progress, there is much work to be done, and the first advanced reactor applications are already in progress.

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ENABLERS

REGULATORY EFFICIENCY

The key opportunities to enable regulatory efficiency are:

Regulatory Review and Reform

Regulatory reform by the NRC and in Canada by the CNSC and by the Federal government on the IAA would establish regulatory frameworks to facilitate the efficient and timely approval and licensing of innovative and safe advanced reactors. This regulatory reform would support deployment of the first advanced reactors and fast followers, and set the foundation for large-scale deployment in the early 2030s. Regulatory reform includes the following:

- Efficient and timely licensing of advanced reactor licenses in less than 12 months from docketing of the application to issuance of the license in the U.S. (Note that additional time will be necessary for the first regulatory review of a design.)
- Resolving key policy and technical issues (for example, emergency preparedness, environmental reviews, security) prior to the submittal of applications to minimize the need for subsequent design changes that prevent the streamlining of fast followers
- Updating the regulatory framework to align requirements with the advanced reactor technologies
- Collaboration between the NRC and CNSC to minimize the duplication of regulatory reviews of designs that are commercialized in both countries and also to enable standard designs between the two countries

Policy

The U.S. Congress and the Canadian Parliament can enable and encourage both nations' regulators to pursue the needed regulatory reforms that enable deployment of advanced reactors at the scale necessary. Regulatory reform is in the national and public interest because there is a market need for advanced reactors to achieve national energy, climate, environmental, economic and national security goals.

SITING AVAILABILITY AND PERMITTING

Site selection for nuclear energy facilities has historically been limited to locations based on population density, natural weather and geological conditions, and access to resources like a local water supply or rail spur.

However, advanced nuclear reactors are being designed with innovative features that eliminate or at least reduce these siting constraints. Enhancements to safety enable siting in areas with more extreme weather and geological conditions and closer to population centers where the power is needed. Enhancements to safety also enable advanced reactors to be used in island mode (separated from the grid) and for black start (the generation relied on to restart the grid after an outage). More efficient operations and smaller size can make dry cooling more economically feasible, eliminating the need for drawing water from a local body of water. Innovations that make advanced reactors smaller and easier to operate enable them to be located in remote areas, and even to be periodically relocated for humanitarian and disaster relief.

These features as well as standardization of designs will maximize the areas in which advanced reactors can be located. This is essential because the scale of advanced reactor deployment to meet the market need is not limited to a small scope of siting conditions, but will be wide and varied, just as the market and customer needs are diverse.

The key opportunities to enable siting efficiency are:

Permitting

Numerous stakeholders have roles in the siting availability of advanced reactors. Federal, state/provincial/territorial, municipal, and Indigenous governments will be involved in decisions for site permitting and, in some cases, making available public lands for siting advanced reactors. Local communities and the public will be involved in the process for deciding on the sites for advanced reactors. Industrial end-users of power, steam and

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ENABLERS

SITING AVAILABILITY AND PERMITTING (CONT'D)

heat will also be significant stakeholders in site selection. Regulators, market operators, investors, and insurance companies will also influence these decisions. Supportive engagement by these stakeholders with rapid decision making will enable the acceleration of the deployment of advanced reactors to meet the diverse set of market and customer needs.

Design Flexibility

The variability of site conditions across North America creates an incentive for advanced reactor designs to be tailored to each site to minimize costs and maximize performance. However, such an approach would not enable the efficiencies that come from design standardization. On the other hand, design standardization creates a natural tension between minimizing costs and maximizing the range of acceptable sites. To address this, the industry will need to develop flexible designs that are both standardized and adaptable to a range of site conditions. The industry needs regulators, customers, and other external stakeholders to make decisions that enable it to pursue this type of design flexibility.

INDIGENOUS AND PUBLIC ENGAGEMENT

Indigenous peoples and the public have a vested interest in the policies to meet energy, climate, environmental, economic, and national security goals. They also have a vested interest in the technologies that are commercialized to meet these goals and the plans for deployment to meet the market needs.

There are numerous opportunities for Indigenous peoples and the public to engage in the government processes for establishing policies and making regulatory decisions, including decision making related to specific project decisions, such as siting, safety, and environmental impact. In some instances, engagement of these parties happens late in the process, posing potential delays in the deployment of advanced reactors.

It is recognized that, in many cases, the public is not well informed about the opportunities to engage with the industry or government on decisions about energy and climate policies, technologies pursued to meet market needs, or projects to deliver value to the market. Establishment of programs by third parties or the government that enable communities and the public to more effectively engage with the industry and government can lead to deployment of advanced reactors.

In Canada, Indigenous peoples and community consultation (an accountability of the Crown, as represented by both Federal government and Provincial government agencies); early, ongoing and meaningful engagement by nuclear project proponents and licensees; incorporation of Indigenous knowledge into projects; benefits agreements or agreed-upon value (potentially equity); and potentially some form of Free Prior Informed Consent (FPIC) in recognition of the UN Declaration of the Rights of Indigenous Peoples (UNDRIP), are necessary (but not necessarily sufficient) requirements for successful nuclear deployment in Canada.

The key opportunities to enable public engagement are:

Public Engagement

Government processes that enable early engagement of the public in the process for establishing policies and making regulatory decisions can significantly reduce risks for advanced reactor projects, enabling deployments. Such processes would need to reach final decisions early in the timeline of the industry's business decision making to avoid delays that come when policies and regulatory positions change late in an advanced reactor project.

Community Engagement

The industry desires a strong, positive relationship with local communities and the public, one built on the fair treatment of all communities regarding industry operations and activities. This commitment includes fostering and sustaining inclusive, trust-based, and mutually beneficial relationships with local and disadvantaged communities. The industry is pursuing a path forward on advanced reactors that would lead to early and frequent engagement with potential host communities and others in the public that have equity in a potential advanced reactor project.

Indigenous Engagement

It is recognized that in Canada the CNSC has community and public engagement processes in place, as well as a significant Indigenous consultation program. As well, the Canadian federal government has established an Indigenous Advisory Council for the SMR (advanced reactor) Action Plan. Project proponents will engage Indigenous peoples to achieve the outcomes above for the public and community engagement outlined above as well as potential partnerships.

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ENABLERS

SUPPLY CHAIN RAMP UP

The United States and Canada have deployed only a few new nuclear energy facilities in the last several decades.

Projects like the AP1000 at Vogtle 3 and 4 and the refurbishments of the CANDU reactors in Canada continue to maintain a domestic supply chain. However, much of the new nuclear supply chain is located outside of North America. Policies for domestic content drive the need for an increase in the U.S. and Canadian supply chains. Advanced reactor technologies also incorporate new materials and innovative components for which there is little experience in manufacturing. The shift from in-field construction to factory manufacturing of advanced reactors enables larger-scale deployment, but it also makes the need for a strong domestic supply chain even more essential to meeting the market need.

The key opportunities to enable supply chain ramp-up are:

Fuel Enrichment

Fuel enrichment from Russia, once a significant contribution to the worldwide supply, is no longer a desired option for advanced reactors. Increasing development of nuclear facilities around the world mean that there will be growing demand for the existing enriched fuel supplies. Potential scarcity of supply and desire for fuel security have both Canada and the U.S. considering their options for domestic supply. The time and investment needed for the industry to expand or develop new enrichment facilities requires clear government policies. Some advanced reactors will also use enrichments at higher levels than are commercially available. Although the industry could establish supply of this new enrichment level, the same factors—uncertain government policies and unclear timing and scale of market demand—discourage investment. Rapid implementation of the currently authorized and funded HALEU Availability program is essential to the success of many Advanced Reactor developers. Significant government investment would catalyze industry build-out of needed HALEU production capacity. In cases where the timelines for adding new fuel enrichment capacity do not support near-term need, government policies that provide the needed enrichment will ensure that first projects and fast followers are not delayed.

Canada and the U.S. government are collaborating to explore options to secure supply, both through import and fuel enrichment in the U.S. Developing enrichment capacity in the near term will be an important step to ensuring energy security in both countries.

Component Manufacturing

The industry is pursuing the expansion of the supply chain for advanced reactors; however, uncertainty in the timeliness and scale of advanced reactor deployment is likely to suppress the investment needed in the supply chain. Government support for the expansion of domestic supply chains will enable the industry to use the benefits of government policies, depending on use of the domestic supply chain. Furthermore, innovative advanced reactor designs with novel components will have longer lead times and are more prone to early design changes, putting at risk the ability to standardize the design, which is important to fast followers, regulatory efficiency, and cost reduction in progressing to "nth of a kind." Government support would enable the prototyping of novel components early in the design, so that any design changes that improve the value of advanced reactors can be made before applications for the first movers are submitted to the regulators. These novel elements might include advanced manufacturing methods and commercial standards to meet nuclear-grade quality requirements.

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ENABLERS

WORKFORCE DEVELOPMENT

Workforce challenges are being experienced today, not just in the nuclear and broader energy industries, but across the economic sectors worldwide. This challenge is fueled by an aging workforce, which leads to staffing reductions through retirements and a change in work culture amongst the younger generations.

Cultural differences between the existing workforce and younger generations entering the workforce could also be factors. For instance, younger workers are less inclined to pursue jobs with significant travel, untraditional hours, or in remote situations. There has also been a long-term decline in the number of skilled craft workers that will be essential in the manufacturing, construction, and operation of advanced reactors. The industry action plan describes the path forward to ensure a stable and sufficient workforce for the deployment of advanced reactors as well as to support the long-term operation of the current fleet.

The key opportunity to enable workforce development is:

Training and Recruitment

The industry's plans for workforce development include programs to create a pipeline of sufficient qualified workers in all areas, including engineering and design, technical knowledge (such as O&M, radiation protection, and chemistry), skilled trades for manufacturing and construction, legal and regulatory affairs, communications, and human resources. These programs are designed to attract, train, and retain the workforce for advanced reactors. These workforce issues will also impact the regulators and other government agencies that have actions necessary to support the commercialization of advanced reactors. Government programs that attract individuals into the trade schools and colleges to study in areas that develop the skills and knowledge needed by the nuclear industry will enable the deployment of advanced reactors.

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ACTIONS

- REGULATORY EFFICIENCY
- TECHNOLOGY READINESS
- PROJECT EXECUTION

ACTIONS

The actions that industry plans to take to deliver advanced reactors into the market are built on the strengths of today's high-performing nuclear power industry, using those assets to develop and apply innovative and enabling solutions.

The industry actions focus on what the industry can control in delivering a timely portfolio of products with benefits to the market. A cross-section of industry subject matter experts, leaders, and stakeholders engaged to develop an informed assessment of the key opportunities and the actions needed to address those opportunities within the context of wide-scale deployment of advanced reactors in the 2030s. This assessment included deep dives into multiple strategic elements (see Figure 3) in three primary pillars:

1. **Regulatory Efficiency** – informing the regulators as they prepare to accept, review, and approve the required volume of applications on the needed timeline, including applications for new technology and FOAK applications

2. **Technology Readiness** – the readiness of the nuclear industry to deliver needed advanced reactors that are reliable and perform to customer expectations and needs, and the associated supply chain providing supporting components, equipment, and materials

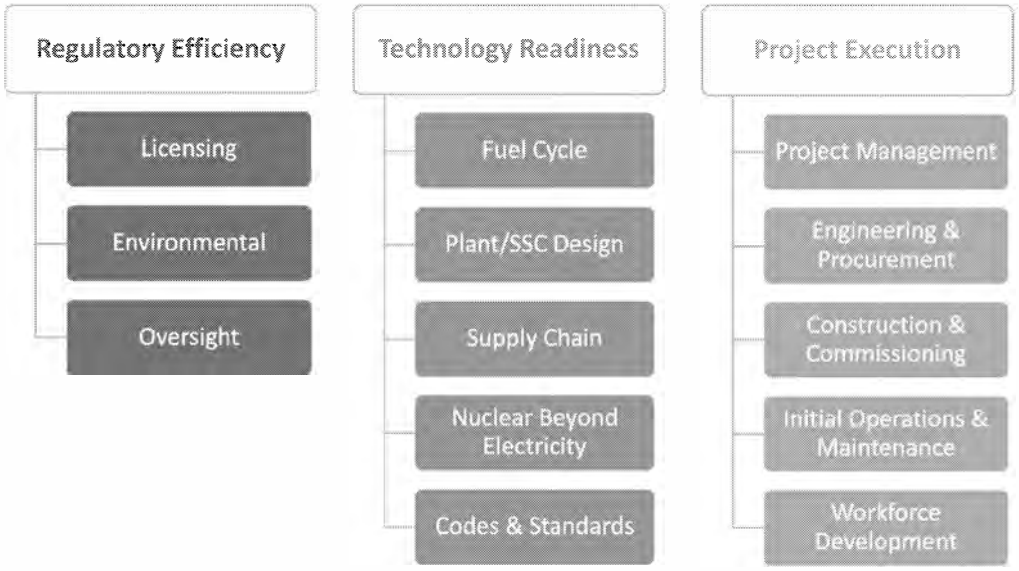
3. **Project Execution** – the ability of the nuclear industry to deliver advanced reactor projects on schedule and budget, and the readiness to operate the delivered facilities reliably and safely

There are a total of 46 actions. These actions are prioritized to identify those actions that make the greatest contribution to delivering value to the market (Priority 1) and other actions that could help further improve success (Priority 2).

Note that for actions where Canada is already, or is planning to address these issues, the Canadian Nuclear Association (CNA) has been listed as the place holder action owner for Canadian entities that are/will take on these actions alone or jointly with United States counterparts. As the CNA further develops and rolls out its Nuclear for Net Zero Strategy in the coming months, collaboration with the NEI and EPRI on the Advanced Reactor Roadmap and the actions it reflects will grow and better reflect the activities already underway, and those planned, for the Canadian nuclear energy industry.

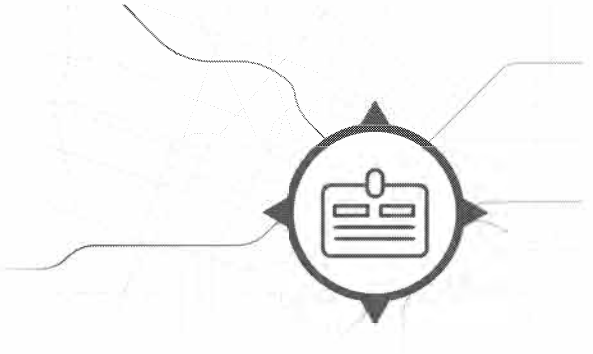
The analysis identified opportunities for investments, expanded capability, and progress across all pillars and the spectrum of scope areas and infrastructure to design, license, deploy, and operate advanced reactors, all with the expected outcome to strengthen the industry. Collectively, these opportunities, along with the associated actions, represent the action plan for key accomplishments by industry and partner stakeholders.

Figure 3. Strategic Elements



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REGULATORY EFFICIENCY
LICENSING



To reach the objective of deploying a large fleet of advanced reactors during the 2030s, licensing must be predictable, timely, efficient, and cost-effective to facilitate the regulator's throughput of applications needed for large-scale deployment. Advanced reactor regulations, guidance, and licensing must take advantage of lessons from licensing the existing North American fleet and then move forward based on the enhanced margins of safety.

KEY ISSUE: LICENSING TIMELINES

NRC and CNSC review schedules for new reactor reviews can delay deployment of new and advanced reactors that are critical to achieving the nation's environmental, economic, and national security goals.

Although more time might be needed for FOAK reviews, reviews of previously approved designs should take no longer than 12 months from submittal to approval (that is, no longer than 12 months for both the safety and environmental reviews).

ACTION:

Priority 1

Develop recommendations for enhancements to licensing processes: Recommendations will be established that would enable more timely and efficient reviews and approvals of advanced reactors.

Action owner: NEI and CNA

Need Date: 2024

KEY ISSUE: EMERGENCY PREPAREDNESS

The existing regulatory framework for emergency preparedness does not take into consideration the innovative design features, smaller source terms, and safety characteristics of advanced reactors. These designs are disadvantaged because they cannot scale their emergency planning zone and emergency response based on their safety profile.

ACTION:

Priority 2

Develop emergency planning methodologies: Methodologies will be needed for implementing the new NRC rule and guidance (pending approval) that can be used to establish the emergency planning zone distance. For Canada, technical justifications will be needed for appropriately sized emergency planning zones meeting Canadian requirements and expectations.

Action Owner: Advanced reactor vendors

Need Date: 2023

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REGULATORY EFFICIENCY
LICENSING

KEY ISSUE: SECURITY

The existing regulatory framework for physical security does not take into consideration the safety and security characteristics of advanced reactors. These designs are disadvantaged because they cannot scale their security organization and response based on their ability to protect against radiological sabotage without the need to interdict and neutralize the threat.

ACTION:

Priority 1

Provide industry input into the regulator rule making on security: Ensure that the new rule and guidance appropriately reflect advanced reactor technology safety and security features.

Action owner: NEI and CNA

Need Date: 2023

KEY ISSUE: REGULATORY EFFICIENCY AND ALIGNMENT

Canada and the United States recognize the need to collaborate on addressing a series of issues that can be addressed through regulatory alignment between the two nations.

ACTION:

Priority 1

Provide joint recommendations to regulator and CNSC on regulatory alignment: Review and develop recommendations for enhancing alignment of regulatory processes and requirements to facilitate the efficient approval and licensing of advanced reactors in both countries.

Action Owner: NEI and CNA

Need Date: 2024

KEY ISSUE: OPERATOR STAFFING

The existing regulatory framework for all aspects of operation does not take into consideration the features of advanced reactors. Alternative approaches, which still maintain the level of protection to the safety of the public provided by existing reactors, are needed so that the business case for new reactors is not disadvantaged.

ACTION:

Priority 2

Develop industry recommendations for NRC guidance on operator staffing: Recommendations will be established to implement operator requirements appropriate for advanced reactor technologies.

Action Owner: NEI and CNA

Need Date: 2023

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REGULATORY EFFICIENCY
LICENSING



KEY ISSUE: PART 53 (U.S. ONLY)

The current regulatory framework for technical requirements is prescriptive and inefficient for the regulation of advanced reactor technologies. A rule is needed that reflects a technology-inclusive, risk-informed, and performance-based regulatory framework, thereby providing an efficient and adaptable approach that enables applicants to meet their needs for schedule, cost, and predictability.

ACTION:

Priority 1

Provide industry feedback and recommendations on Part 53: Establish and communicate detailed feedback and recommendations for enhancing the NRC's Part 53 rulemaking to enable rules and guidance that are technology-neutral, performance-based, and risk-informed and efficiently reflect the safety and security features of advanced reactors.

Action Owner: NEI

Need Date: 2024

KEY ISSUE: PART 50 AND 52 (U.S. ONLY)

NRC plans to address lessons learned with the experience of the first applicants and licensees to use 10 CFR Part 52 and update 10 CFR Part 50 for technical consistency with Part 52, which does not clearly include key lessons learned as identified by the industry. The outcome of the rulemaking should be that the Part 50 and 52 regulatory processes do not impose undue risks and delays in licensing and construction of new reactors.

ACTION:

Priority 1

Provide industry input into the NRC rule making for Parts 50 and 52: Ensure that the new rule and guidance appropriately reflect advanced reactor technology safety and security features.

Action Owner: NEI

Need Date: 2024

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REGULATORY EFFICIENCY
ENVIRONMENTAL & SITING

Over time, implementation of the National Environmental Protection Act (NEPA) in the United States and the Impact Assessment Act (IAA) in Canada have both become unjustifiably complex and time-intensive, with reviews frequently spanning several years or more and requiring massive resource expenditures. Maintaining the status quo will hinder the timely licensing of the advanced reactors. To achieve widespread deployment of advanced reactors, the implementation of NEPA and IAA must be streamlined to achieve efficient and timely environmental reviews. The NEI 2020 white paper "Recommendations for Streamlining Environmental Reviews for Advanced Reactors" provides recommendations for how this might be accomplished in the United States. Canadian industry is working diligently with government and Indigenous peoples and other stakeholders to streamline the IAA process to facilitate efficient approvals while maintaining environmental and human health safety.

KEY ISSUE: CATEGORICAL EXCLUSIONS (U.S. ONLY)

Current NRC regulations (10 CFR 51.20(b)) require the NRC to prepare an environmental impact statement (EIS) for specific categories of actions, including permits/licenses to construct and operate a nuclear power reactor or testing facility under 10 CFR Part 50 or Part 52. This requirement does not reflect consideration of the innovative design features, smaller source terms, and safety characteristics of advanced reactors, which are expected to result in even smaller site preparation/preconstruction, construction, and operation-related impacts relative to current large LWRs. Also, as relevant to DOE-funded, NRC-licensed projects, DOE's categorical exclusion regulations at 10 CFR Part 1021, Subpart D, do not fully account for the novel characteristics and reduced impacts of advanced reactors.

ACTION:

Priority 1

Enable NEPA exclusions: Develop input to the NRC that enables the implementation of proposed categorical exclusions under NEPA and 10 CFR Part 51 for advanced reactor licensing and/or operation.

Action Owner: NEI

Need Date: 2025

KEY ISSUE: ENVIRONMENTAL ASSESSMENTS

Current NRC regulations (10 CFR 51.20(b)) require the NRC to prepare an EIS for specific categories of actions, including permits/licenses to construct and operate a nuclear power reactor. This requirement does not reflect consideration of the innovative design features, smaller source terms, and safety characteristics of advanced reactors, which are expected to result in even smaller site preparation/preconstruction, construction, and operation-related impacts relative to current large LWRs. In Staff Requirements Memorandum (SRM)-SECY-21-0001 (April 19, 2022), the NRC noted that their staff may "further explore the idea of preparing environmental assessments to meet NEPA requirements for some categories and subcategories of license applications presently falling within the scope of 10 C.F.R. § 51.20(b)."

For Canada, to have one project, assessment, and decision, it will be key to coordinate federal reviews between the two agencies involved (the CNSC and the Impact Assessment Agency) along with the provincial or territorial environment assessment process. Reviews of second-of-a-kind and fleet deployments need to take credit for assessments of safety performed in FOAK deployments and focus instead on the site-specific project differences.

ACTION:

Priority 1

Enable environmental assessments in place of EIS: Develop input to the NRC that enables the future use of environmental assessments in lieu of more detailed environmental impact statements for the licensing of certain advanced reactors.

Action owner: NEI

Need Date: 2025

A0120238_30-002949

REGULATORY EFFICIENCY
ENVIRONMENTAL & SITING

ACTION:

Priority 1

Streamline the Canadian Impact Assessment Act and CNSC Environmental Assessment for Advanced Reactors. Specifically:

- Short term: Ensure no delays at the regulator end to the legislated or regulated assessment timelines. Drive for Tailored Impact Statement Guidelines that have appropriate scope for nuclear projects.
- Medium term: Revise implementing regulations to streamline the process and shorten timelines, especially as applied to Nth-of-a-kind and fleet deployments, to require only assessment of site-specific aspects, not reassessment of aspects addressed at other sites.
- Revise federal acts and provincial legislation to recognize the climate-change imperative and environmental benefits of nuclear power. Revise legislative requirements appropriately to enable faster, more predictable deployment of energy sources that do not emit greenhouse gases.

Action Owner: CNA working with the Canadian federal government and provincial agencies

Need Date: 2023, sustained

KEY ISSUE: GENERIC ENVIRONMENTAL IMPACT STATEMENT (GEIS) (U.S. ONLY)

In September 2020, the NRC approved their staff's development of an advanced reactor GEIS and future codification of the GEIS in the NRC's Part 51 regulations. In November 2021, the NRC staff issued SECY-21-0098, seeking NRC approval to publish for public comment a proposed rule that would amend Part 51 to codify the findings of the Advanced Reactor GEIS. By allowing applicants for advanced reactors that meet the performance measures and assumptions in the GEIS to reference the GEIS in their applications, the GEIS is expected to simplify and expedite advanced reactor environmental reviews.

ACTION:

Priority 1

Support the successful implementation of GEIS: Participate in the NRC rulemaking process and provide technical and legal input to ensure that the agency's final advanced reactor GEIS, associated rule, and implementing guidance meet its objective to "streamline the time and effort needed to complete environmental reviews under NEPA for most advanced nuclear reactors."

Action owner: NEI

Need Date: 2025

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REGULATORY EFFICIENCY
ENVIRONMENTAL & SITING

KEY ISSUE: POPULATION SITING (U.S. ONLY)

The existing population-related siting guidance is prescriptive and based on large LWR technology. NRC guidance and expectations for population-related siting of advanced reactors should appropriately consider their smaller source terms and safety characteristics through the use of technology-inclusive, risk-informed, and performance-based criteria.

ACTION:

Priority 2

Develop technical input to siting criteria: The industry will provide technical input to support the NRC's preparation of guidance on technology-inclusive, risk-informed, and performance-based criteria for the policy on siting away from population centers that will increase the number of allowable sites for advanced reactors in comparison to current guidance while still controlling societal risks.

Action Owner: NEI

Need Date: 2024

KEY ISSUE: SITE SELECTION AND EVALUATION (U.S. ONLY)

The site selection process requires the collection of significant safety and environmental information and detailed analysis that must be supplied to the NRC to support an applicant's siting decision. A site must meet NRC regulatory requirements for construction and operation (that is, requirements related to site suitability and radiological health and safety). An applicant also must comply with environmental review requirements under NEPA and 10 CFR Part 51 for the consideration of alternative sites. Some requirements might be outdated or inapplicable due to advancements in reactor technologies and analytical methods as well as expected new non-electric applications of advanced reactors (such as process heat).

ACTION:

Priority 2

Develop guidance for site selection and evaluation: The guidance will focus on simplifying and streamlining the site selection and site suitability evaluation processes for advanced reactors, including reactors that might be sited on former coal-fired power plant sites.

Action owner: NEI and EPRI

Need Date: 2025

KEY ISSUE: INCREASINGLY STRINGENT PERMITTING PROCESS

Population growth, climate change, pollution, and aging water delivery systems have created an increasing array of challenges with water supply, water quality, ecological impact, and infrastructure. As a result, many states' permitting agencies have been adopting increasingly stringent water quality standards and thermal discharge limitations that make permitting closed-cycle wet cooling plant designs increasingly difficult, if not impractical.

ACTION:

Priority 2

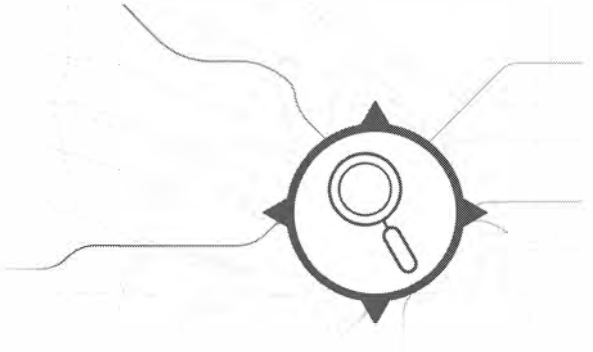
Utilize best waste heat cooling technologies in order to ease permitting process: Develop guidance on available cooling water technologies and cooling water system design options to help applicants using water-cooled advanced reactor technologies avoid or mitigate challenges related to cooling water availability and permitting.

Action owner: Owner with guidance from EPRI

Need Date: 2023

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REGULATORY EFFICIENCY
OVERSIGHT



This section is primarily focused on the regulatory and safety oversight of the construction and operations of advanced reactors. This includes external stakeholders such as electrical grid and service area authorities. Other forms of oversight, for example, project execution, are consolidated into those sections.

KEY ISSUE: MODERNIZE REGULATORY OVERSIGHT

The strong oversight processes, which have evolved over the past 40 years, have contributed to the high levels of safety and reliability achieved by the operating fleet. Innovative design features and safety enhancements of advanced reactors must be met with further evolution of these oversight processes to improve efficiency and effectiveness.

ACTION:

Priority 2

Develop guidance on modernizing regulatory oversight: The guidance will modernize the oversight of advanced reactors during the construction and operation phases. The focus will be to reduce unnecessary burden and gain efficiencies while retaining elements necessary to achieve outcomes related to safety and reliability.

Action Owner: NEI, CNA, EPRI

Need Date: 2024

KEY ISSUE: EXTERNAL ENGAGEMENT

History has shown that the success or failure of an infrastructure project is heavily influenced by the level of support garnered from all facets of a community. The successful deployment of advanced reactors will require commitment and attention to external engagement on par with the robust business and engineering practices that the industry already implements. It is in the best interest of the industry as a whole to share experiences, options, and best practices for external engagement.

ACTION:

Priority 2

Engage external stakeholders: For each advanced reactor deployment project, implement an Indigenous, community and public engagement plan consistent with the industry's commitment to environmental justice principles, community engagement best practices, and a just transition to a decarbonized energy economy.

Action Owner: Owner/operators, Institute of Nuclear Power Operations (INPO) and dedicated energy users with support from NEI

Need Date: Prior to the selection of site

A0120238_33-002952

TECHNOLOGY READINESS
FUEL CYCLE

KEY ISSUE: ADVANCED REACTOR FUEL QUALIFICATION & TESTING

Most of the advanced reactor developers are using fuel different than what is used in the current fleet. All these fuel designs will require qualification and testing. Specifically, some advanced nuclear fuel fabricators and advanced reactor developers are planning to rely on existing benchmark data to qualify their HALEU fuels up to 20%. However, these data might be outdated or not applicable. Therefore, it is expected that approval of HALEU fuels used in the core of advanced reactors will require in-pile testing.

ACTION:

Priority 2

Qualify Advanced Reactor Fuel: The qualification conditions for advanced fuels should be defined, a test plan for each advanced fuel should be developed, and a gap analysis to determine needs and develop new equipment should be performed. Additionally, the use of existing testing facilities should be coordinated and the need for new testing capacity determined.

Action Owner: Advanced reactor vendors, EPRI

Need Date: 2024 (First commercial reactors)

KEY ISSUE: USED FUEL HANDLING AND STORAGE STRATEGY

The back end of the fuel cycle for advanced nuclear fuels is not well defined and will likely present significant variability, depending on the advanced reactor design, both in the United States and Canada.

ACTION:

Priority 2

Develop spent fuel handling and storage strategy: A technology-neutral acceptance criteria for long-term storage repository will be established, spent fuel handling technologies for advanced fuels will be evaluated, and a cost-benefit analysis of fuel storage options will be performed. The Canadian Nuclear Waste Management Organization (NWMO) and the U.S. DOE will continue to collaborate on option development.

Action Owner: EPRI, CNA, Advanced reactor vendors

Need Date: 2024

KEY ISSUE: ADVANCED REACTOR FUEL AVAILABILITY

With the shortages in low enriched fuel and with many advanced reactor developers relying on High Assay Low Enriched Uranium (HALEU) to fuel their reactors, it is imperative that a trusted supply chain of domestic (that is, North American) enrichment is brought to market at the earliest opportunity. Government support is needed to create sufficient domestic enrichment of Low Enriched Uranium (LEU) and HALEU fuel for advanced reactors.

ACTION:

Priority 1

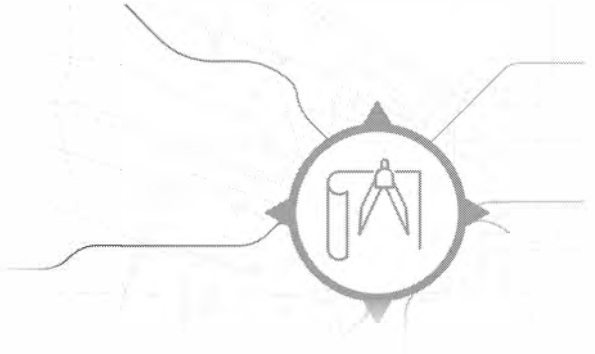
Government Support for Domestic Commercial Fuel Enrichment: Advocate for and employ government funding and/or offtake agreements to catalyze rapid private sector investment and build-out of domestic LEU and HALEU production capacity.

Action Owner: NEI, CNA, advanced reactor developers, owner/operators

Need Date: 2024

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TECHNOLOGY READINESS
PLANT/SSC DESIGN



The plant and SSC design strategic element includes the design of advanced reactors and systems, structures, and components (SSCs). Because a significant amount of time has passed since the current operating fleet of LWRs and CANDU reactors was designed, and due to the different features of advanced reactors in terms of coolant, size, and type of fuel, design of advanced reactors will present unique challenges.

KEY ISSUE: MATERIALS BEHAVIOR

A complete understanding of the behavior of materials selected during the design under relevant conditions might not be available during the design phase. Because some advanced reactor designs are intended to operate at much higher temperatures than the currently operating LWRs, design practices need to account for the "time-dependent" behavior of materials in various coolants for safety and life-cycle analyses.

To fill this gap, the materials roadmap developed by EPRI should be updated, vendors' needs should be collected and prioritized, and the needed tests should be performed with a timeline that meets advanced reactor designers' needs.

ACTION:

Priority 1

Capture material data and close data gaps necessary for deployment of advanced reactors: Identify the materials needed for advanced reactor designers in both the near- and mid-term and ensure that materials testing is performed for on-time qualification. The materials roadmap developed by EPRI should be updated, vendors' needs should be collected and prioritized, and the needed tests should be performed with a timeline that meets advanced reactor designers' needs. In addition, Canada should ensure sufficient laboratory facilities are available for Canadian testing and data development requirement.

Action Owner: EPRI, CNA, advanced reactor vendors

Need Date: 2028 for first mover, 2030–2035 for mid-term needs

KEY ISSUE: INSUFFICIENT DATA AND ANALYTICAL TOOLS

Computer codes and risk assessment tools needed during design to predict the behavior of systems and components might not be qualified for advanced reactor conditions. To qualify the analytical tools needed for design, the experimental data needed and the analytical tools that require verification and validation (V&V) should be identified and V&V qualification for the required analytical tools should be completed.

ACTION:

Priority 2

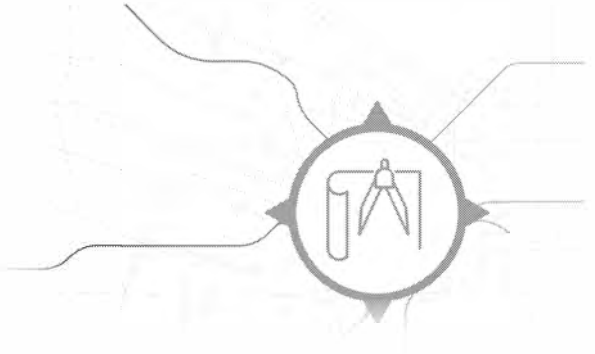
Develop and Qualify Analytical Tools for Advanced Reactor Design: Survey advanced reactor vendors to identify analytical tools needed for optimal design. Create an action plan to develop and/or qualify tools as needed.

Action Owner: EPRI/advanced reactor vendors

Need Date: 2024 for action plan

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TECHNOLOGY READINESS
PLANT/SSC DESIGN



KEY ISSUE: RELIANCE ON LEGACY DESIGNS

New reactor designers often rely on the idea that almost every conceivable type of reactor technology has already been tried out in the past and use this as a basis that proven designs exist. However, design drawings and manufacturing details are often not available, so past experience might not be readily available. Also, the subsequent problems found during operation might not be captured and/or understood.

Furthermore, the modes and mechanisms of operation from the historical technology experience might not be the same as those planned for advanced reactors. These different operational challenges may not be understood through historical precedent. To fill this gap, a guide on how to use past designs should be developed, including the identification of past designs that can be useful for advanced reactors. The guide should be endorsed by the regulators.

ACTION:

Priority



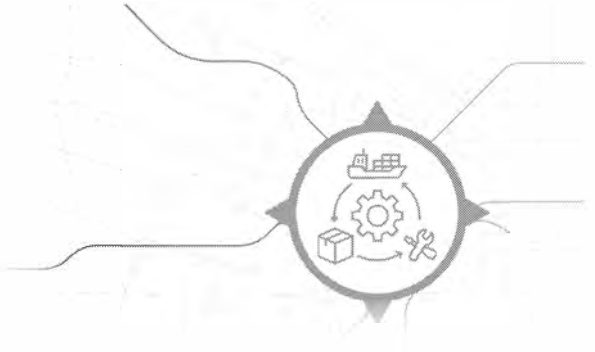
Develop Guide on Leveraging Legacy Reactor Experience: Identify best-practices uses of legacy advanced reactor demonstration experience and data, while providing guardrails based on their shortcomings.

Action owner: EPRI

Need Date: 2024

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TECHNOLOGY READINESS
SUPPLY CHAIN



The supply chain has been identified as a strategic element because advanced reactors employ fuels, coolants, technologies, deployment models, and other attributes and capabilities that extend beyond those of the current operating fleet of LWRs and CANDU reactors. The scope of the supply chain strategic element includes basic commodities (raw materials, steel, concrete, rebar, pipe, and so on), manufacturing (alloys, casting, forging, modularization, and so on), non-light water technology products (such as molten salt heat exchangers and pumps, and nuclear-grade graphite), sustained supply of spares and replacement components, and nuclear fuel, which is addressed in detail in the separate fuel cycle strategic element.

KEY ISSUE: LACK OF FABRICATION CAPABILITY FOR MODULE FABRICATION

Most advanced reactor designs are leveraging modular construction, which will reduce the amount of construction at a reactor site and rely more on factory fabrication. However, the supply chain is not ready to meet the increasing need for larger modularized sections of facilities/plants driven by advanced reactor construction.

ACTION:

Expand module fabrication capability:

Priority 1

Document current domestic/regional capabilities and the projected need for module fabrication facilities. Identify specific production and capability gaps.

Action Owner: NEI, CNA, EPRI

Need Date: 2023

Address strategically important modular capabilities and capacity demand gaps via joint investments of the fabricators, owners, and developers to establish necessary capabilities.

Action Owner: Advanced reactor vendors, suppliers and owner/operators

Need Date: 2028

KEY ISSUE: SHORTAGE OF NUCLEAR-GRADE COMPONENTS

The supply chain for nuclear-grade (Appendix B-Compliant QA Program and N-Stamp qualified manufacturers) components, although generally available for the current operating fleet, needs to be expanded to meet advanced reactor needs.

To secure manufacturer/supply source for needed nuclear-grade components, a plan should be identified and executed. The plan should include feedback from interested stakeholders and should be endorsed by the regulators.

ACTION:

Establish a sufficient supply of nuclear grade components:

Priority 1

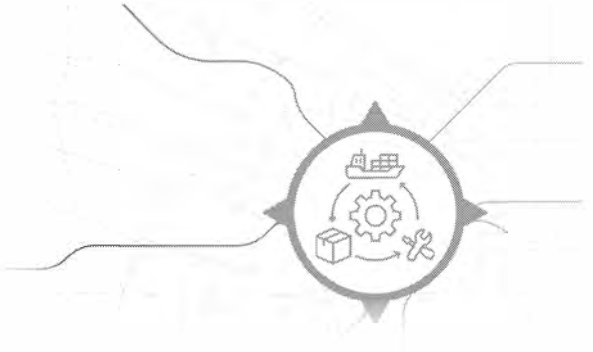
Document current domestic/regional capabilities and the projected need for nuclear grade components; identify gaps.

Action Owner: NEI, CNA, EPRI

Need Date: 2023

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TECHNOLOGY READINESS
SUPPLY CHAIN



Priority 1

Launch domestic/regional "Nuclear Grade Supplier Development Program(s)" and expand Canada's Organization of Canadian Nuclear Industries (OCNI) Ready4SMR program. Use these programs to help non-nuclear suppliers prepare to provide nuclear-grade components.

Action Owner: NEI, CNA, EPRI, INPO, suppliers

Need Date: 2024

Establish a methodology for using international standards (ISO-9001) to meet nuclear quality assurance requirements.

Action Owner: NEI, and others identified by the Advanced Reactor Roadmap Steering Group.

Need Date: 2025

Expand on established processes to procure low-risk-significant or low-safety-significant components from non-nuclear suppliers, including establish and/or contribute to task groups in nuclear codes and standards to enable procurement of low-risk-significant or low-safety-significant components with reduced auditing burden.

Action Owner: EPRI, CNA, NEI, and others identified by the Advanced Reactor Roadmap Steering Group.

Need Date: 2023-2028

KEY ISSUE: SMALL FORGING FACILITIES INADEQUATE TO HANDLE POTENTIAL DEMAND

Although the United States and Canada have capabilities to support smaller forgings, piping, and other components, these capabilities will be strained as construction and deployment of advanced reactors proceed.

Additionally, for many of the nuclear components, these suppliers will need to acquire and maintain their certifications to fabricate nuclear-grade components.

ACTION:

Increase the capacity of small forging facilities:

Priority 1

Document current domestic/regional production capabilities and the projected need for small forging facilities. Identify specific production and capability gaps.

Action Owner: NEI, EPRI

Need Date: 2023

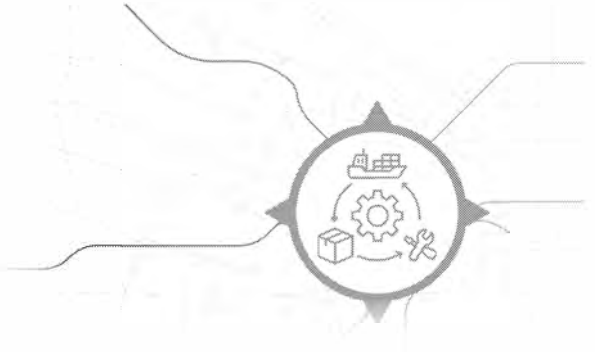
Connect candidate forgers with developers through workshops and industry events to establish shared demand and economies to establish and/or re-establish.

Action Owner: EPRI, NEI

Need Date: 2023-2030

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TECHNOLOGY READINESS
SUPPLY CHAIN



Priority 1

Bring together gaps, industry demand, and candidate manufacturers and manufacturing hubs with applicable government funding opportunities and initiatives, such as what is available under the Inflation Reduction Act.

Action Owner: NEI, CNA, EPRI, suppliers, and others identified by the Advanced Rector Roadmap Steering Group

Need Date: 2023-2030

Form new or join existing consortiums to establish necessary forging capabilities and proof-of-concept research with shared resources.

Action Owner: Advanced reactor vendors, suppliers and owner/operators

Need Date: 2030

KEY ISSUE: SPECIFIC MATERIALS SUPPLY CHAIN GAPS

Specific components needed for advanced reactors, especially for the nuclear island, might be affected by supply chain issues. Materials identified include nuclear graphite, helium, sodium, molten salts, and beryllium. To secure sources for needed nuclear-grade materials, input from nuclear-grade manufacturing vendors and national laboratories should be collected to establish the basis for implementing expansion or starting up new capabilities, and a plan to establish at least one manufacturer/supplier of the nuclear-grade materials needed should be developed and executed.

ACTION:

Establish competent material supply chain with production capacity:

Priority 2

Document current domestic/regional production capabilities and the projected need for specific materials. Identify specific production and capability gaps.

Action Owner: NEI, CNA, EPRI

Need Date: 2023-2024

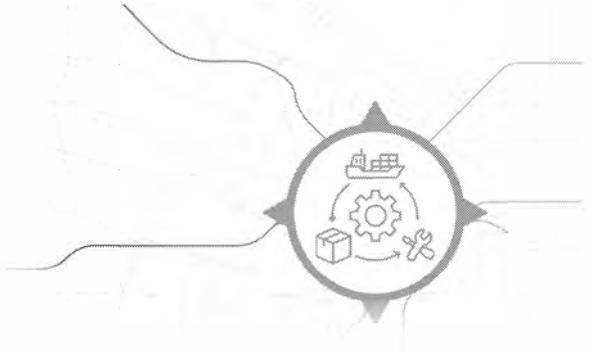
Connect candidate manufacturers with developers via workshops and industry events to establish shared demand and economies to establish and/or re-establish production lines.

Action Owner: EPRI, NEI, CNA

Need Date: 2024-2025

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TECHNOLOGY READINESS
SUPPLY CHAIN



KEY ISSUE: COMMERCIALIZATION OF ADVANCED MANUFACTURING CAPABILITIES

Advanced manufacturing technologies are being considered during design, but they have not reached commercial maturity yet. In that regard, the United States is well positioned in developing advanced manufacturing for nuclear: powder metallurgy–hot isostatic pressing, directed energy deposition additive, electron beam welding, diode laser cladding, and special materials development capable of handling the corrosive and high-temperature conditions of advanced reactor designs.

All of the aforementioned are currently under development. However, these technologies need to be commercialized on an industrial scale to support the deployment of a fleet of advanced reactors.

ACTION:

Commercialize advanced manufacturing capabilities:

Priority 2

Document current domestic/regional capabilities and projected demand. Identify gaps and develop plans to close said gaps for strategic advanced manufacturing technologies that address other manufacturing gaps.

Action Owner: EPRI, NEI

Need Date: 2023

Provide proof-of-concept research and prototype demonstrations for strategic and high MRL / TRL techniques. **Action Owner:** EPRI

Need Date: 2023–2028

Qualify strategic techniques and materials in codes and standards and regulatory bodies based on deployment timeline and demand. **Action Owner:** EPRI, Advanced Reactor developers, suppliers

Need Date: 2024–2030

Connect designers, developers, OEMs, and advanced manufacturers through workshops and industry events to tie demand with capabilities.

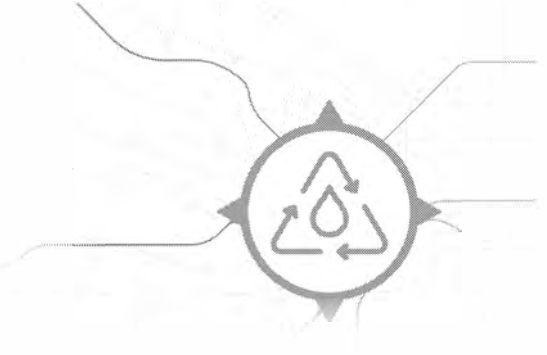
Action Owner: EPRI, NEI

Need Date: 2023–2030

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TECHNOLOGY READINESS

NUCLEAR BEYOND ELECTRICITY



The Nuclear Beyond Electricity (NBE) strategic element includes activities needed to achieve decarbonization goals and capture new business markets for advanced reactors to participate in energy markets beyond providing baseload power to the electric grid. These markets include producing hydrogen, providing direct industrial electricity (for example, data centers), and providing heat for industries or district energy networks, among others.

With the effects of climate change becoming more apparent and increasing engagement in decarbonization policy across the world, the potential role of NBE in North America is increasing in importance. Advanced reactors, with some designs providing a smaller required geographic footprint or higher-temperature heat, present an opportunity for nuclear power plants to provide their reliable, carbon-free energy to other markets. Success in this strategic element will enable newly developed advanced reactors to serve a broad range of market areas by the 2030s.

KEY ISSUE: NBE-RELATED TECHNOLOGY MATURITY AND IMPLEMENTATION

Some NBE technologies are not yet ready for full-scale deployment and need further research and development for implementation even if not paired with an advanced reactor. Others will require development for integration with advanced reactors, including development of a marketplace to make the NBE service economically feasible.

Additionally, advanced reactor technologies must be developed to provide the service and/or form of energy that is useful for NBE customers.

ACTION:

Priority 2

Develop and demonstrate NBE applications: Identify and document application-specific technical requirements; develop conceptual system designs for NBE applications; and identify the need for, develop, and test NBE-related technology.

Action Owner: Owners/Operators, EPRI

Need Date: 2026

KEY ISSUE: CHALLENGES TO DEPLOYMENT DUE TO BUSINESS MODELS

The business model for the nuclear industry has historically been centered on producing electricity and delivering it to the power grid. NBE will have multiple business models that will change this approach by deploying advanced reactors for alternative missions and alternative customers.

The economic viability of these new business models is an essential prerequisite to drive the public and private investment needed for widescale deployment.

ACTION:

Priority 2

Develop novel business models for NBE: Develop a range of business model templates that will document the different owner, operator, and customer relationships to support development of the NBE business models.

Action Owner: EPRI, NEI, CNA, customers, Advanced Reactor developers

Need Date: 2025

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TECHNOLOGY READINESS

NUCLEAR BEYOND ELECTRICITY



KEY CHALLENGE : REGULATORY CHALLENGES FOR NBE APPLICATIONS

Several regulatory barriers and risks are specific to the NBE strategic element. In some instances, these issues may be addressed as part of the process for demonstrating separation of the nuclear island from the end user facility.

Further discussion on regulatory issues (beyond NBE technical issues) is included in the Regulatory Efficiency strategic element.

ACTION:

Priority 2

Establish decoupling framework for NBE users: Develop the methodology to demonstrate separation of nuclear facilities

Action Owner: EPRI, NEI, CNA, advanced reactor developers, owners

Need Date: 2025

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TECHNOLOGY READINESS
CODES & STANDARDS

Consensus codes and standards provide acceptance criteria, methodologies, processes, and other data based on the accumulated experience of the industries they serve and documented by subject matter experts. The design of advanced reactors and a new generation of nuclear reactor construction challenge the context and numerous assumptions that the current consensus codes and standards are based on. The purpose of this document is to identify the most critical gaps related to codes and standards as well as actions and milestones required to successfully deploy more than 100 advanced reactors in North America in the 2030s.

KEY ISSUE: ALIGNMENT AND IMPROVEMENT OF CODES AND STANDARDS

The changes to the basic methodology and assumptions inherent in nearly all advanced reactor designs, construction methods, and operating parameters will need to be understood, challenged, and embraced. Advanced reactors will not come to fruition without industry, government, and public stakeholders stepping out of the legacy "this is how it's always been done" mindset.

ACTION:

Priority 1

Identify gaps in and timelines for advanced reactor codes and standards:

- Consolidate and update prior advanced reactor codes and standards gap analyses
- Define development timelines for commercial relevance
- Prioritize gaps and associated actions
- Secure resources to address gaps in and timelines for advanced reactor codes and standards development

Action Owner: Standard developing organizations (SDOs), NEI, CNA, EPRI and Advanced Reactor vendors

Need Date: Gaps identified by 2024

KEY ISSUE: RISK-INFORMED AND PERFORMANCE-BASED DESIGN APPROACH

Historically, plants were designed using deterministic methods on a component level with system classification and other design conditions as input. Although constructing components will remain largely a deterministic approach, there is a growing belief that a risk-informed, performance-based approach to select licensing basis events, safety classification of SSCs (SSC such as NEI 18-04 in the U.S.), and maintenance strategies (monitoring, nondestructive evaluation, and so on) would lead to a more optimized plant design for construction and operation.

However, a probabilistic and system-based approach is more complex than current risk-informed methods, and many codes and standards are not directly compatible.

ACTION:

Priority 2

Demonstrate risk-informed and performance-based approach: Develop and execute a pilot project that applies risk-informed, performance-based methods in development of a new advanced reactor standard jointly with U.S. and Canadian SDOs (potential crosscut with International Harmonization action).

Action Owner: ANS, ASME, and CSA with NEI, CNA and Advanced Reactor vendors

Need Date: 2025

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PROJECT EXECUTION

PROJECT MANAGEMENT



The scope of the project management strategic element is to develop guidance for project management processes, methods, and tools for new advanced reactor power plant projects. This includes contract, scope, schedule, cost, quality, human resources, communication, and risk management. The desired outcome is to provide resources for organizations and project managers to execute advanced reactor projects on time and on budget with safety, sufficient quality, and regulatory compliance.

KEY ISSUE: INSUFFICIENT PROCESSES, METHODS, AND TOOLS TO MANAGE LARGE PROJECTS

The key challenge is that management of large, complex projects involves significant funding, a large workforce, regulatory and governmental oversight, and public engagement. The anticipated volume of advanced reactor projects also makes delivering new projects a challenge due to competing resources. The action to address this challenge is to research the project management processes, methods, and tools available for management of large complex projects.

ACTION:

Priority 1

Develop effective management of large projects: Research the project management processes, methods, and tools available for management of large, complex projects. Determine which ones require further development, and work with the appropriate parties (the industry, software developers, and so on) to make these a reality. Develop a guideline on implementing these processes, methods, and tools for advanced reactor projects.

Action Owner: NEI, INPO and EPRI with owner/operators

Need Date: 2025 for guidance

KEY ISSUE:NEW ADVANCED REACTOR TECHNOLOGIES

The key challenge is that advanced reactors projects have a significant number of new technologies, which come with unique risks—particularly for the first project implementation. The action should determine how to manage these projects, including risk identification and strategies to resolve those risks.

ACTION:

Priority 2

Develop effective project management guidance for projects with significant new technology: Develop guidance on how to manage these projects, including risk identification and strategies to resolve those risks.

Action Owner: NEI and EPRI with owner/operators

Need Date: 2025

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PROJECT EXECUTION

PROJECT MANAGEMENT



KEY ISSUE: OWNER/OPERATOR CAPABILITY FOR MULTIFACETED ADVANCED REACTORS PROJECTS

The key challenge is that many potential owners might have a knowledge gap with multifaceted advanced reactor projects, which will pose a challenge to the management of the project. The action to address this challenge is to form owner/operator user groups to develop and identify the critical lessons learned from past projects and how to apply them appropriately to future advanced reactor project management teams. These user groups need to distribute this information across the industry and make a clear guideline that others can follow for project management planning.

ACTION:

Priority



Bolster potential owner/operators project capabilities related to the task of deploying Advanced Reactors: Provide training on how to build capabilities in an owner/operator, including key elements in developing an organization capable of safely and reliably commissioning a nuclear plant.

Action Owner: NEI, EPRI and INPO

Need Date: 2025

KEY ISSUE: SELECTING APPROPRIATE CONTRACTING STRATEGY

The key challenge is that ownership groups will be diverse, and owners need to be familiar with various contracting strategies to be able to choose the best one for their project. The action to address this challenge is to develop guidance on options for contracting strategies for advanced reactor projects that owners, developers, advanced reactor suppliers, and vendors can apply.

ACTION:

Priority



Deploy project appropriate contracting strategies: Develop guidance on options for contracting strategies for advanced reactor projects that owners, developers, advanced reactor suppliers, and vendors can apply. Research organizations with expertise in contract strategies for nuclear development and construction should investigate contracting strategies that ensure equitable risk sharing and accountability among stakeholders.

Action Owner: NEI, EPRI with owner/operators, Advanced Reactor vendors and construction companies

Need Date: 2025

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PROJECT EXECUTION

ENGINEERING & PROCUREMENT



The scope of the engineering and procurement strategic element is to develop guidance for engineering processes, methods, and tools to support the design, licensing, construction, and commissioning for advanced reactor power plant projects. The desired outcome of the engineering and procurement strategic element is to provide engineering and procurement resources for organizations to execute advanced reactor projects on time and on budget with sufficient quality and regulatory compliance.

KEY ISSUE: OVER APPLICATION OF NUCLEAR OPERATING STANDARDS AND PROCESSES

The industry's commitment to high levels of safety and reliability is a foundational element of the culture and must be maintained. However, it also must be recognized that over time, some activities have been pursued where the incremental gain from additional processes has not been necessary or cost-effective. Previous industry efforts to reduce unnecessary burden and eliminate low value work, while maintaining or improving safety and reliability, were effective in improving the efficiency of the operating fleet. This same pursuit of efficiency in processes has not necessarily been applied to new nuclear construction projects. It must be recognized that there is a need for engineering to be flexible, adaptive, and timely to support emergent issues that come with advanced reactor designs and large-scale construction.

Nuclear design efforts must apply or adopt similar approaches to pursue increased value and improve efficiency while maintaining focus on safety and reliability. The actions to address this challenge are to develop procedures and processes that clearly define when nuclear versus non-nuclear/commercial design methods can be used and adopting risk informed or graded approaches to design activities. A firewall must be erected to separate the commercial aspects to ensure a right-sized approach. Adopting a mindset of "optimal effort to achieve maximum effect" will aid in delivering nuclear designs that achieve the levels of safety and reliability expected in a nuclear plant in an economical way.

ACTION:

Priority 1

Establish a mindset of "optimal effort for maximum effect": Establish an industry initiative to develop processes that right-size approaches to design activities. Guidance from previous industry-level efforts should be reviewed for application in design activities. Similar action is in construction and commissioning.

Action Owner: to be identified by the Advanced Reactor Roadmap Steering Group with support from NEI

Need Date: 2024

KEY ISSUE: DESIGN COMPLETION BEFORE CONSTRUCTION

Procuring equipment and starting to build the plant before design, analyses, and regulatory reviews are complete entail considerable risk of rework with delays and higher costs. Unfortunately, the economics of a long development time along with regulatory and/or development delays will result in the design phase not being completed when the procurement and construction phases should start.

ACTION:

Priority 2

Institute principles on sufficient design completion before construction: Develop a guide to discuss tradeoffs of more or less design completion and how to ensure that there is sufficient design completion prior to construction.

Action Owner: NEI, EPRI and INPO

Need Date: 2024

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PROJECT EXECUTION

CONSTRUCTION COMMISSIONING



The scope of the construction and commissioning strategic element is to develop guidance for organizing construction contract companies, personnel, and tools to support the building, logistics, construction equipment, and commissioning of advanced reactor power plant projects. The desired outcome would be construction and commissioning, which can be much more efficient and timelier than recent nuclear construction projects.

KEY ISSUE: NUCLEAR CONSTRUCTION CULTURE

Nuclear construction projects have several unique aspects and requirements when compared with other large scale construction efforts. This reality presents a key challenge of meeting the additional nuclear specific construction requirements and expectations while also delivering the project within reasonable tolerances of schedule and budget. While previous efforts to eliminate unnecessary burdens will be informative, more will be needed to right-size approaches for advanced reactors.

ACTION:

Priority 1

Establish a mindset of "optimal effort for maximum effect" for the construction of advanced reactors: Establish an industry initiative to develop right-sized approaches for nuclear construction activities. In particular, processes should be established that eliminate unnecessary or burdensome work that adds little or no value to the project. Similar actions are present in engineering and procurement.

Action Owner: to be identified by the Advanced Reactor Roadmap Steering Group.

Need Date: 2025

KEY ISSUE: ADVANCED CONSTRUCTION TECHNOLOGIES AND STANDARDIZATION

The key challenge is that many new designs are looking to use new, unproven construction technologies. The action to address this is to review and provide assessments of upcoming new technologies. Such assessments should provide an overview of users so that industry stakeholders can reach an agreed-on and clear pathway to commissioning.

Trade organizations must be engaged early to ensure that these groups are aware of and train apprentices and journeypersons on using the collection of innovative tools, machinery, modifications, and so on, during the construction phase of a project.

ACTION:

Priority 2

Develop, enable, and utilize new construction technologies: Assess the capability of new construction technologies to achieve schedule and workforce reductions. Engage advanced reactor developers and construction modularization experts to close technology and codification gaps. If needed, perform construction demonstrations and tests to accelerate their deployment.

Action Owner: EPRI, Advanced Reactor vendors, designers, and constructors

Need Date: Starting 2023 and continuing

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PROJECT EXECUTION

CONSTRUCTION COMMISSIONING



KEY ISSUE: NUCLEAR CONSTRUCTION EXPERIENCE

The key challenge is that most nuclear owner/operators do not have recent construction oversight experience in new nuclear plant construction. Because of this barrier, owner/operators might lack the skills to take on a large new nuclear construction project.

The action to address this key challenge is to compile construction guidelines that contain information on adequate division of responsibilities, construction feasibility, and critical lessons learned from previous construction projects in and out of the nuclear industry. The best practices should be shared with project managers to avoid any future difficulties.

ACTION:

Priority



Use existing construction experience and share new construction experience: Establish a construction task force from Engineering, Procurement and Construction (EPC) experts to put together construction plan guidance. The guidance should include strategies for project optimization, considering various construction technologies planned for the next generation of nuclear power plants.

Action Owner: EPRI, NEI and INPO

Need Date: Starting 2024 and continuing

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PROJECT EXECUTION

INITIAL OPERATIONS & MAINTENANCE

The scope of the Initial Operations and Maintenance strategic element is to identify and determine areas of focus where lessons learned are applied and new technologies and processes are employed to operate the plant safely and reliably. We must leverage our experience to operate and maintain the plant better while being efficient and cost-effective. The strategic element must therefore encompass processes and technologies that ensure that plants are maintained reliably while keeping costs as reasonably low as possible for the design life of the plant. To achieve this strategic objective, the emphasis must be placed on reducing the overall scope of the maintenance program and optimizing maintenance. Setting up the processes and technologies beginning at the design phase is essential in achieving this goal. The desired outcome is a well-thought-out O&M program that enables an advanced reactor to be financially competitive while uncompromisingly ensuring the safety of the plant.

KEY ISSUE: ADVANCED REACTOR O&M FUNCTIONS COST PARITY

Much of a nuclear plant is not different from other thermal plants. After accepting some increase in costs for the nuclear specific aspects, cost parity with those other thermal plants for the non-nuclear SSCs can be achieved. The key challenge is that nuclear has special requirements which are ingrained into the culture of the nuclear industry and the thought of reductions in O&M requirements will fundamentally change the concept of what it means to operate a nuclear power plant.

ACTION:

Reduce operating and maintenance costs to a level similar to other thermal plants:

Priority 1

Perform a gap analysis of all operations functions for the existing fleet and compare to other thermal plants to determine what design and/or regulation changes are needed to drive toward cost parity. A long-term plan to address these gaps will be developed.

Action Owner: EPRI

Need Date: 2026

Advanced reactor vendors should issue designs with safety features that result in fewer safety-related and other regulated SSCs.

Action Owner: Advanced Reactor Vendors

Need Date: Upon significant design completion

Determine how to leverage advanced reactor safety features to minimize engineering programs and nuclear-specific support organizations that exist in the current fleet while still maintaining the high level of nuclear safety with regard to the protection of the public.

Action Owner: EPRI and INPO

Need Date: 2026

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PROJECT EXECUTION

WORKFORCE DEVELOPMENT



The workforce development strategic element will address the development of a new advanced nuclear workforce for design, construction, and operation and the needed skillsets and training. The overall goal of this element is to ensure an adequate level of skilled labor in support of both construction and operation of the advanced reactor fleet. A secondary goal is to accomplish this without undue impact on existing plants.

KEY ISSUE: BUILDING PIPELINE OF QUALIFIED SKILLED TRADES

Lack of supply of skilled trade labor in North America has been well documented in the national press and trade journals for years. It is a well-known problem facing the expansion of power plant construction in the 2030s. Given demographic trends and the preference for four-year degrees by high school seniors, the shortage is not likely to correct itself unless there is meaningful full-time and long-term work prospects for those seeking to enter the workforce.

Many of the skills necessary for building, operating, supporting, and maintaining advanced nuclear technology are known and have been well integrated by the construction industry.

The most in-demand skills in the construction phase are specialized trades, such as pipe fitters, welders, boilermakers, concrete and rebar workers, electrical installers, and wiring technicians. However, there are others that will be required based on the new plant designs. A greater emphasis on digital and software will demand new skills that might not be generally present in the current power plant or general construction workforce. These skills and qualifications must be well understood and addressed in order to build a healthy workforce.

ACTION:

Priority 1

Develop specific programs to create skilled labor workforce:

- Create a clear picture of the workforce demand and supply for advanced reactors
- Develop a strategy to coordinate the development of worker programs with local and state/provincial workforce developers (National Association of Workforce Boards, NGA Center for Best Practices, and so on) and consider collaboration on strategies between Canada and the United States.
- Coordinate with local/regional trade and vocational schools to create greater supply of needed skilled and craft workers
- Implement the U.S. Nuclear Uniform Curriculum Program or similar programs in local or regional community colleges and trade schools
- Coordinate with NEDHO and other veterans' organizations to ensure that qualifications are integrated into undergraduate and graduate programs (that is, work with Troops to Energy, Veterans in Energy, and Veterans Affairs) to ensure pipeline from military

Action Owner: NEI, CNA, EPRI and INPO with support from others identified by the Advanced Reactor Roadmap Steering Group

Need Date: 2024

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PROJECT EXECUTION

WORKFORCE DEVELOPMENT



KEY ISSUE: ATTRACTING AND RETAINING THE ADVANCED NUCLEAR WORKFORCE

To build a workforce, it is necessary first to attract people to the industry. Strong competition for workers is expected in the future. Therefore, advanced nuclear must make an appealing case. Work in construction in general and advanced nuclear specifically will need to be made in an efficient way, with aspects of long-term stability built into the message. Creating a retention and career map for incoming and interested workers will show the longevity and value of an education tailored to building, operating, and maintaining advanced nuclear technology.

To recruit and retain workers, the industry must become more attractive and flexible. More than communicating the idea, the work environment must adapt to the workers of the future. Some aspects of the traditional nuclear work environment would impede the prospect of attracting workers.

ACTION:

Priority 1

Develop and execute a program for attracting and retaining workforce: Meet the demands of the future advanced reactor and existing reactors workforce:

- Develop message that resonates
- Create advertising/messaging to appeal to potential workers
- Work with K-12 education to make craft work attractive

Action Owner: NEI, CNA, and EPRI with support from others identified by the Advanced Reactor Roadmap Steering Group.

Need Date: 2024

KEY ISSUE: MAINTAINING ADEQUATE WORKFORCE FOR EXISTING NUCLEAR FLEET

Maintaining the operational performance of the existing fleet is important to ensuring confidence in the growth of the advanced reactor fleet. It is very likely that an expansion of the advanced nuclear fleet will draw resources from the existing fleet. For current skilled workers, the advanced reactor fleet could be the more attractive opportunity, and it will be impossible to prevent an outflow of talent from the existing fleet. However, it is possible to minimize the impact by focusing on retention and efficiency to ensure safe operation at lower staffing levels.

ACTION:

Priority 2

Develop adequate workforce to meet future nuclear industry demands for existing and new reactors:

- Ensure that sufficient numbers of skilled employees are in the pipelines to meet the needs of both the operating fleet and advanced reactors
- Encourage the modernization of facilities and workplace best practices
- Create advertising/messaging to appeal to workers

Action Owner: NEI and EPRI with support from others identified by the Advanced Reactor Roadmap Steering Group.

Need Date: Four years ahead of deployment of first advanced reactors

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PROJECT EXECUTION

WORKFORCE DEVELOPMENT



KEY ISSUE: TRAINING MODEL

Several training models can conceivably add value for construction and O&M workers. Because training in construction skills is mostly covered by trade schools, attention should be directed to teaching the specialized skills needed by the advanced nuclear workforce.

In the current nuclear model, this nuclear-specific training is covered by accredited training programs maintained by the licensee for each reactor. With differing owner/operator models, and potentially more standard designs with less safety related plant equipment, the old model should be reconsidered.

ACTION:

Priority



Develop the training model that suits the advanced advanced reactor workforce:

- Define requirements
- Define regulatory model
- Clarify ownership of training delivery and accreditation

Action Owner: NEI, CNA, EPRI and INPO with support from others identified by the Advanced Reactor Roadmap Steering Group.

Need Date: 2025

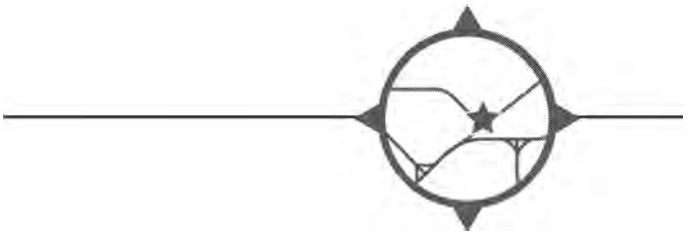
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IMPLEMENTATION

- INDUSTRY ENGAGEMENT, COORDINATION, AND LEADERSHIP
- SUCCESS CRITERIA

IMPLEMENTATION



The Advanced Reactor Roadmap defines a path forward for ensuring successful delivery of valuable advanced reactors in the time frame needed by the market. The successful widescale deployment of advanced reactors can be key for the United States and Canada to achieve their energy, climate, environmental, economic, and national security goals. A coordinated effort of enablers and industry actions will drive the value of advanced reactors to fulfill critical market needs. Implementation will depend on industry engagement, coordination, leadership, and strong support from stakeholders.

INDUSTRY ENGAGEMENT, COORDINATION, AND LEADERSHIP

Achieving the large-scale deployment of advanced reactors to meet the market need will present new opportunities for innovation and impact.

The industry can rise to and capture this opportunity; however, the status quo is unlikely to achieve the needed outcomes. Success will rely on the collaborative and coordinated participation and contributions from many industry and external stakeholders (including non-government and governmental organizations), in particular, the industry participants providing leadership and helping to drive the industry forward.

Industry leadership must drive the path forward, promote collaboration and coordination with external stakeholders, seek and drive solutions to hurdles and barriers, ensure that industry actions are being completed, and ultimately ensure that nuclear energy can support the United States and Canada in meeting their various goals. Industry leadership needs to articulate a vision that attracts capital and investment, as well as inspires the industry to bring new technology to the market and achieve the needed deployments, overcoming potential challenges along the way.

The industry must create momentum toward these critical goals. Based on the complexity, different stakeholders, decision making, timing, and overall responsibility to ensure action and success, dynamic leadership is needed to achieve that outcome. Also, there will be numerous lessons learned and new information that arise from the industry efforts. Success will rely on leadership to ensure effective program management to regularly assess progress, identify and knock down barriers, consider the need for or benefits of refining and evolving the roadmap, and continually maintain a focus on the overall objective to drive the value of advanced reactors in order to deliver the scale, types, and timeliness of technology needed in the market.

ADVANCED REACTOR ROADMAP STEERING GROUP

An industry steering group made up of a small number of industry leaders will be formed to ensure that the opportunities presented in the roadmap are actualized and the roadmap actions are completed. Actions that now do not have specific owners will be assigned owners by the Advanced Reactor Roadmap Steering Group. Regular meetings throughout the year will be established to hold the actions' owners accountable. All actions will have NEI and/or EPRI champions who may not have the action but will also be responsible to see the actions completed.

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IMPLEMENTATION

SUCCESS CRITERIA

Industry success in delivering and deploying advanced reactors is measured by achieving the needed widescale deployments beginning in the mid-2030s, not necessarily by achieving the fastest deployments.

Attributes of the industry vision for the mid-2030s illustrate what success looks like, provide guidance for the industry, and maintain a view on the long-term goals. These attributes include:

- There is strong public acceptance of advanced reactors, recognizing and embracing their role in decarbonizing the energy landscape and welcoming facilities located near communities.
- Customers confidently seek advanced reactor options to address their energy needs.
- A variety of standard designs have been approved by the regulators to meet a range of market and customer needs, ready for owner use.
- The timeline for a customer from deciding to deploy advanced reactors until the facility is in operation is less than three years.
- Each developer can deploy tens of reactors per year, and an owner/customer is able to turn on a new advanced reactor facility every 12 months or less.
- Industry vendors, suppliers, and contractors reliably and predictably deliver technology and facilities on schedule and on budget.
- The cost of advanced reactors is competitive in the market, with steadily decreasing costs through operating experience and technology improvements.
- Government energy and climate policies treat nuclear energy equitably with other low-carbon energy sources.
- Advanced reactors achieve safe and reliable operation; no significant events and industry goals for reliability are met.
- The industry has "changed the game" and culture for deployment of advanced reactors—innovative technology and simplicity with low-risk profiles appropriately regulated are enabling the full benefits of advanced reactors for society.

The approach to deliver value to the market will undoubtedly evolve and strengthen as new information is learned, designs mature, applications become better understood, and the overall demand is refined.

Stakeholders are relying on nuclear technology, along with other carbon-free sources, to deliver a reliable, affordable clean energy portfolio. This collaborative roadmap is intended to be a valuable tool to help the nuclear industry address the need.

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PRIORITY 1 ACTIONS

STRATEGIC ELEMENT	ACTION
LICENSING	**Develop recommendations for enhancements to NRC licensing processes:** Recommendations will be established that would enable more timely and efficient reviews and approvals of advanced reactors
LICENSING	**Provide industry input into the NRC rulemaking on security:** Ensure that the new rule and guidance appropriately reflect advanced reactor technology safety and security features
LICENSING	**Provide industry feedback and recommendations on Part 53:** Establish and communicate detailed feedback and recommendations for enhancing the NRC's Part 53 rulemaking to enable rules and guidance that are technology-neutral, performance-based and risk-informed and efficiently reflect the safety and security features of advanced reactors
LICENSING	**Provide industry input into the NRC rulemaking for Parts 50 and 52:** Ensure that the new rule and guidance appropriately reflect advanced reactor technology safety and security features
LICENSING	**Provide joint recommendations to NRC and CNSC on regulatory alignment:** Review and develop recommendations for enhancing alignment of regulatory processes and requirements to facilitate the efficient approval and licensing of advanced reactors in both countries.
ENVIRONMENTAL & SITING	**Enable NEPA exclusions:** Develop input to the NRC that enables the implementation of proposed categorical exclusions under NEPA and 10 CFR Part 51 for advanced reactor licensing and/or operation
ENVIRONMENTAL & SITING	**Enable environmental assessments in place of EIS:** Develop input to the NRC that enables the future use of environmental assessments in lieu of more detailed environmental impact statements for the licensing of certain advanced reactors
ENVIRONMENTAL & SITING	**Streamline the Canadian Impact Assessment Act and CNSC Environmental Assessment for Advanced Reactors:** • Short-term: Ensure no delays at the regulator end to the legislated or regulated assessment timelines • Medium term: Revise implementing regulations to streamline the process and shorten timelines especially as applied to Nth of a kind and fleet deployments, to only require assessment of site-specific aspects and not re-assessing aspects already addressed at other sites • Revise federal Acts and Provincial legislation to recognize the climate-change imperative and environmental benefits of nuclear power, and revise legislative requirements appropriately to enable faster and more predictable deployment of non-GHG emitting energy sources
ENVIRONMENTAL & SITING	**Support the successful implementation of GEIS:** Participate in the NRC rulemaking process and provide technical and legal input to ensure the agency's final Advanced Reactor GEIS, associated rule, and implementing guidance meet its objective to "streamline the time and effort needed to complete environmental reviews under NEPA for most advanced nuclear reactors."

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PRIORITY 1 ACTIONS

STRATEGIC ELEMENT	ACTION
PLANT/SSC DESIGN	**Capture material data and close data gaps necessary for deployment of Advanced Reactors:** Identify the materials needed for AR designers in both the near- and mid-term and ensure materials testing is performed for on-time qualification. The materials roadmap developed by EPRI should be updated, vendors' needs should be collected and prioritized, and the needed tests should be performed with a timeline that meets AR designers' needs. In addition, Canada should ensure sufficient laboratory facilities are available for Canadian testing and data development requirement.
SUPPLY CHAIN	**Expand Module Fabrication Capability:** • Document current domestic/regional capabilities and the projected need for module fabrication facilities. Identify specific production and capability gaps. • Address strategically important modular capabilities and capacity demand gaps via joint investments of both the fabricators, owners, and developers to establish necessary capabilities
SUPPLY CHAIN	**Establish a sufficient supply of nuclear grade components:** 1. Document current domestic/regional capabilities and the projected need for nuclear grade components. Identify gaps 2. Launch domestic/regional "Nuclear Grade Supplier Development Program(s)" and expand Canada's Organization of Canadian Nuclear Industries (OCNI) Ready4SMR program. Use these programs to help non-nuclear suppliers prepare for providing nuclear grade components 3. Establish and/or contribute to task groups in nuclear codes & standards to enable procurement of low risk-significant or low safety-significant components with reduced auditing burden 4. Expand upon establish processes to procure low risk-significant or low safety-significant components from non-nuclear suppliers
SUPPLY CHAIN	**Increase the capacity of small forging capacity:** 1. Document current domestic/regional production capabilities and the projected need for small forging facilities. Identify specific production and capability gaps 2. Connect candidate forgers with developers via workshops and industry events to establish shared demand and economies to establish and/or re-establish 3. Bring together gaps, industry demand, and candidate manufacturers (and manufacturing hubs) with applicable government funding opportunities and initiatives such as what is available under the Inflation Reduction Act 4. Form new or join existing consortiums to establish necessary forging capabilities and proof of concept research with shared resources
CODES & STANDARDS	**Identify AR Codes & Standards gaps and timelines:** 1. Consolidate and update prior AR C&S gap analyses 2. Define C&S development timelines for commercial relevance 3. Prioritize C&S gaps and associated actions 4. Secure resources to address AR Codes & Standards development gaps and timelines
FUEL CYCLE	**Government Support for Domestic Commercial Fuel Enrichment:** Employ government funding and/or offtake agreements to catalyze rapid private sector investment and build-out of domestic LEU and HALEU production capacity. Advocate for government funding and/or offtake agreements to catalyze rapid private sector investment and build-out of LEU and HALEU production capacity.

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PRIORITY 1 ACTIONS

STRATEGIC ELEMENT	ACTION
PROJECT MANAGEMENT	**Develop effective management of large complete projects:** Research the project management processes, methods, and tools available for management of large complex projects. Determine what processes, methods, and tools require further development and work with the appropriate parties (industry, software developers, etc.) to make these a reality. Develop a guideline how to implement these processes, methods, and tools for AR projects.
ENGINEERING & PROCUREMENT	**Establish a mindset of "optimal effort for maximum effect":** Establish an industry initiative to develop processes that right-size approaches to design activities. Guidance from previous industry-level efforts should be reviewed for application in design activities. Similar action is in construction and commissioning.
CONSTRUCTION & COMMISSIONING	**Establish a mindset of "optimal effort for maximum effect" for the construction of advanced reactors:** Establish an industry initiative to develop right-sized approaches for nuclear construction activities. In particular, processes should be established that eliminate unnecessary or burdensome work that adds little or no value to the project. Similar actions are present in engineering and procurement.
INITIAL OPERATIONS & MAINTENANCE	**Reduce operating and maintenance costs to a level similar to other thermal plants:** • Perform a gap analysis of all operations functions for the existing fleet and compared to other thermal plants to determine what design and/or regulation changes are needed to drive towards cost parity. A long term plan to address these gaps will be developed. • AR designs shall limit the number of safety related and other regulated SSCs. • Determine how to leverage advanced reactor safety features to minimize engineering programs and nuclear-specific support organizations that exist in the current fleet while still maintaining the high level of nuclear safety with regards to the protection of the public.
WORKFORCE DEVELOPMENT	**Develop and execute a program for attracting and retaining workforce:** • Develop message that resonates • Create advertising/messaging to appeal to potential workers • Work with K-12 education to make craft work attractive
WORKFORCE DEVELOPMENT	**Develop specific programs to create skilled labor workforce:** • Creating a clear picture of the workforce demand and supply for advanced reactors • Develop a strategy to coordinate the development of worker programs with local and state workforce developers (National Association of Workforce Boards, NGA Center for Best Practices, and so on) and consider collaboration on strategies between Canada and the United States. • Coordinate with local/regional trade and vocational schools to create greater supply of needed skilled and craft workers. • Implement the U.S. Nuclear Uniform Curriculum Program, or similar programs, in local or regional community colleges and trade schools • Coordinate with NEDHO to ensure qualifications are integrated into undergraduate and graduate programs. e.g. Work with Troops to Energy, Veterans in Energy, and Veteran's Affairs to ensure pipeline from military.

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PRIORITY 2 ACTIONS

STRATEGIC ELEMENT	ACTIONS
LICENSING	**Develop emergency planning methodologies:** Methodologies will be needed for implementing the new NRC rule and guidance (pending approval) that can be used to establish the emergency planning zone distance. For Canada, technical justifications will be needed for appropriately sized emergency planning zones meeting Canadian requirements and expectations. Canada and United States to collaborate on common methodology development and review.
LICENSING	**Develop industry recommendations for NRC guidance on operator staffing:** Recommendations will be established to implement operator requirements appropriate for advanced reactor technologies.
ENVIRONMENTAL & SITING	**Develop technical input to siting criteria:** Industry will provide technical input to support the NRC's preparation of guidance on technology-inclusive, risk-informed, and performance-based criteria for the policy on siting away from population centers that will increase the number of allowable sites for advanced reactors in comparison to current guidance while still controlling societal risks.
ENVIRONMENTAL & SITING	**Develop guidance for site selection and evaluation:** The guidance will focus on simplifying and streamlining the site selection and site suitability evaluation processes for advanced reactors, including reactors that may be sited on former coal-fired power plant sites.
ENVIRONMENTAL & SITING	**Utilize best waste heat cooling technologies in order to ease permitting process:** Develop guidance on available cooling water technologies and cooling water system design options to assist applicants using water-cooled advanced reactor technologies in avoiding or mitigating challenges related to cooling water availability and permitting.
OVERSIGHT	**Develop guidance on modernizing regulatory oversight:** The guidance will modernize the oversight of advanced reactors during the construction and operation phases. The focus will be to reduce unnecessary burden and gain efficiencies while retaining elements necessary to achieve outcomes related to safety and reliability.
OVERSIGHT	**Engage external stakeholders:** For each advanced reactor deployment project, implement an Indigenous community and public engagement plan consistent with industry's commitment to environmental justice principles, community engagement best practices, and a just transition to a decarbonized energy economy.

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PRIORITY 2 ACTIONS

STRATEGIC ELEMENT	ACTIONS
FUEL CYCLE	**Qualify AR Fuel:** The qualification conditions for advanced fuels should be defined, a test plan for each advanced fuel should be developed, and a gap analysis to determine needs and develop new equipment should be performed. Additionally, the use of existing testing facilities should be coordinated and the need for new testing capacity determined.
FUEL CYCLE	**Develop spent fuel handling and storage strategy:** A technology neutral acceptance criteria for long term storage repository will be established, spent fuel handling technologies for advanced fuels will be evaluated, and a cost benefit analysis of fuel storage options will performed. The Canadian Nuclear Waste Management Organization (NWMO) and the U.S. DOE will continue to collaborate on option development.
PLANT/SSC DESIGN	**Develop and Qualify Analytical Tools for AR Design:** Survey AR vendors to identify analytical tools needed for optimal design. Crate an action plan to develop and/or qualify tools as needed.
PLANT/SSC DESIGN	**Develop Guide on Leveraging Legacy Reactor Experience:** Identify best-case uses of legacy AR demonstration experience and data, while providing guardrails based on their shortcomings.
SUPPLY CHAIN	**Establish competent material supply chain with production capacity.** 1. Document current domestic/regional production capabilities and the projected need for specific materials. Identify specific production and capability gaps 2. Connect candidate manufacturers with developers via workshops and industry events to establish shared demand and economies to establish and/or re-establish production lines
SUPPLY CHAIN	**Commercialize Advanced Manufacturing Capabilities:** 1. Document current domestic/regional capabilities and projected demand. Identify gaps and develop plans to close said gaps for strategic advanced manufacturing technologies that address other manufacturing gaps 2. Provide proof of concept research and prototype demonstrations for strategic and high MRL / TRL techniques 3. Qualify strategic techniques and materials in codes & standards and regulatory bodies based on deployment timeline and demand 4. Connect designers, developers, OEMs, and advanced manufacturers via workshops and industry events to tie demand with capabilities
NUCLEAR BEYOND ELECTRICITY	**Develop and demonstrate NBE applications:** Identify and document application specific technical requirements. Develop conceptual system designs for NBE applications. Identify the need for, develop and test NBE related technology.
NUCLEAR BEYOND ELECTRICITY	**Develop novel business models for Nuclear Beyond Electricity:** Develop a range of business model templates that will document the different owner, operator and customer relationships to support NBE. Development of the NBE Business Models.

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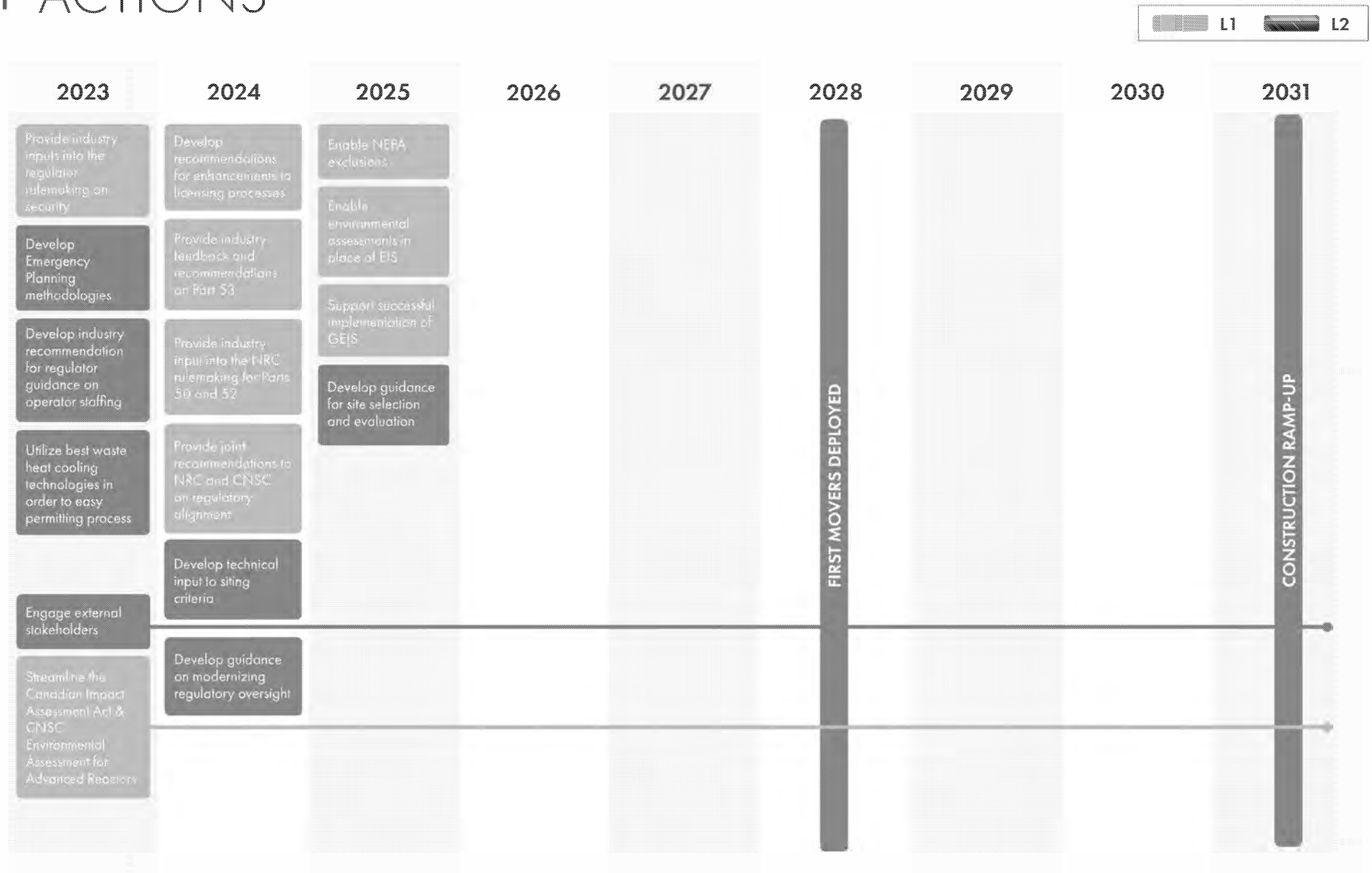
PRIORITY 2 ACTIONS

STRATEGIC ELEMENT	ACTIONS
NUCLEAR BEYOND ELECTRICITY	**Establish decoupling framework for Nuclear Beyond Electricity users:** Develop the Methodology to Demonstration Separation of Nuclear Facilities.
CODES & STANDARDS	**Demonstrate Risk-Informed and Performance-Based Approach:** Develop and execute a pilot project that applies RIPB methods in development of a new AR standard jointly with the United States and Canada-based SDOs (potential cross-cut with International Harmonization action).
PROJECT MANAGEMENT	**Develop effective project management guidance for projects with significant new technology:** Develop guidance on how to manage these projects, including risk identification and strategies to resolve those risks.
PROJECT MANAGEMENT	**Bolster potential owner-operators project capabilities to the task of deploying ARs:** Provide training on how to build capabilities in an owner-operator.
PROJECT MANAGEMENT	**Develop project appropriate contracting strategies:** Develop guidance on options for contracting strategies for AR projects that owners, developers, AR suppliers, and vendors can apply. Research organizations with expertise in contract strategies for nuclear development and construction should investigate contracting strategies that ensure equitable risk sharing and accountability among stakeholders.
ENGINEERING & PROCUREMENT	**Institute principles on sufficient design completion before construction:** Development of a guide to discuss the trade-offs between design completion and construction starting. This will optimize the approach to how much design is needed to start construction.
CONSTRUCTION & COMMISSIONING	**Develop, Enable and Utilize new construction technologies:** Assess the capability of new construction technologies for achieving schedule and workforce reductions. Engage AR developers and construction modularization experts to close technology and codification gaps. If needed perform construction demonstrations and tests to accelerate their deployment.
CONSTRUCTION & COMMISSIONING	**Utilize existing construction experience and share new construction experience:** Establish construction task force from EPCs experts to put together a generic project execution plan. The plan shall include strategies for project optimization considering various construction technologies planned to be used in the next generation nuclear power plants.
WORKFORCE DEVELOPMENT	**Maintain adequate workforce for existing nuclear fleet** • Ensure sufficient numbers of skilled employees are in the pipelines to meet the needs of both the operating fleet and advanced reactors. • Encourage the modernization of facilities and workplace best practices • Create advertising/messaging to appeal to workers
WORKFORCE DEVELOPMENT	**Develop the training model that suits advanced reactor workforce:** • Define requirements • Define regulatory model • Clarify ownership of training delivery and accreditation

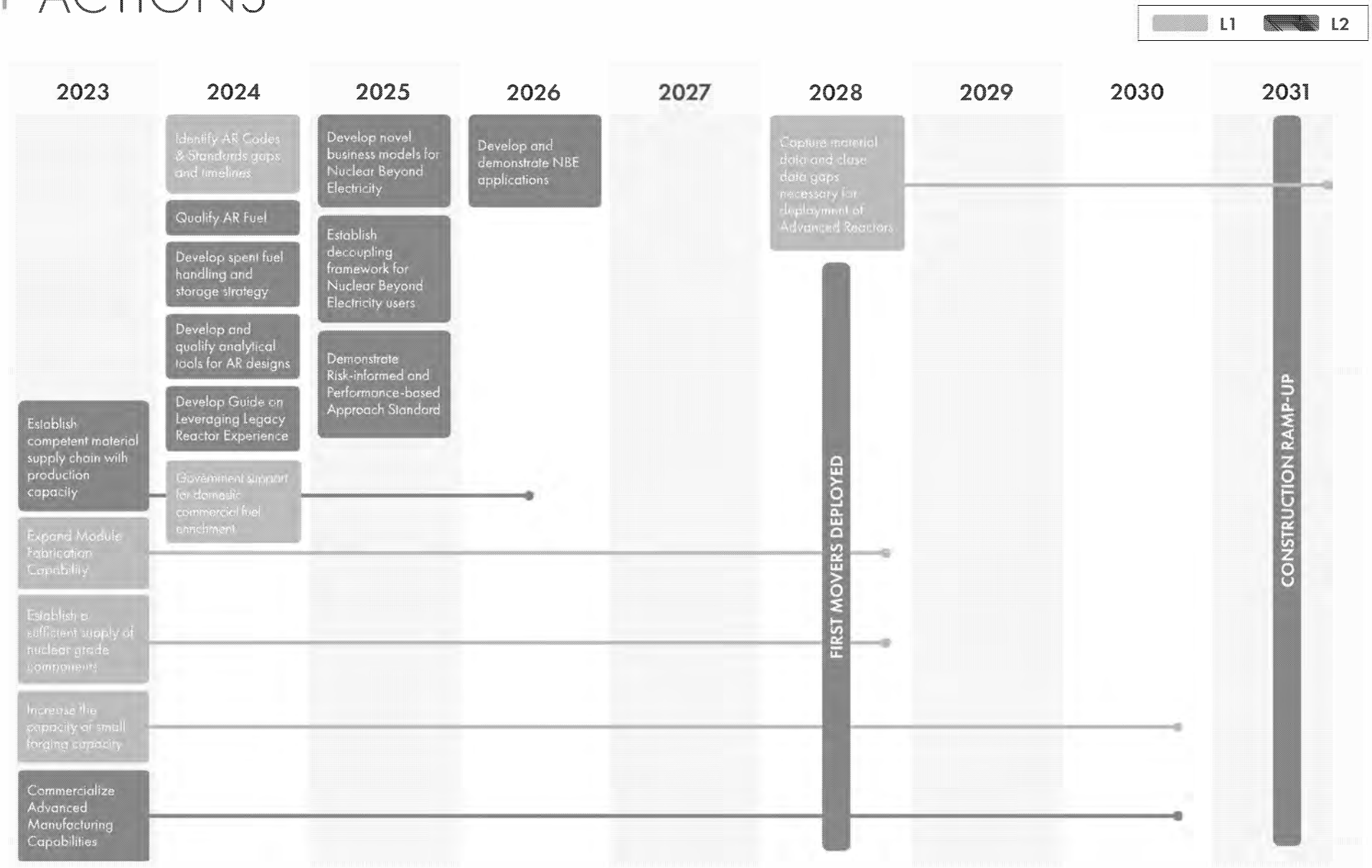
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REGULATORY EFFICIENCY
ACTIONS

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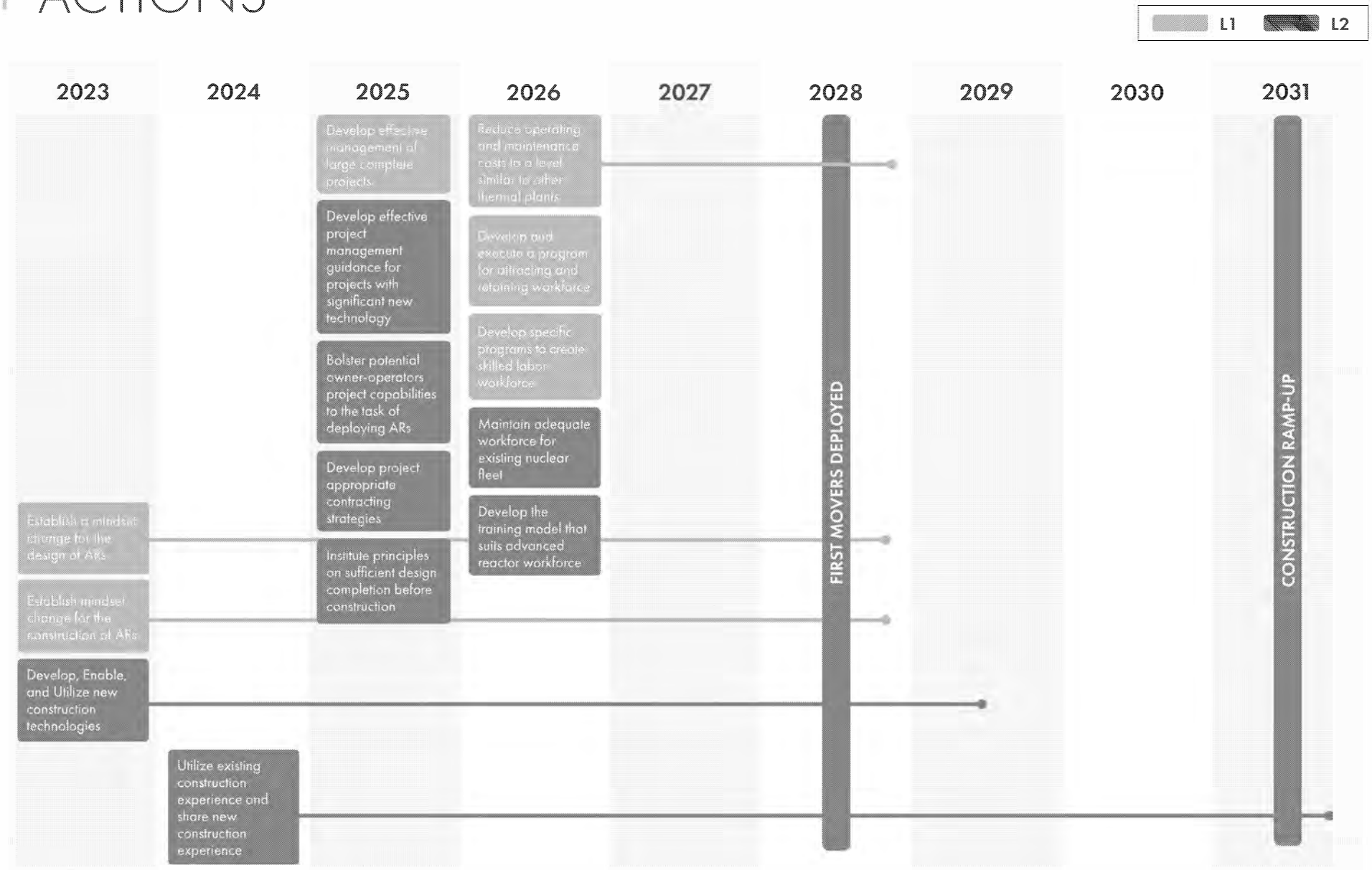
TECHNOLOGY READINESS
ACTIONS



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PROJECT EXECUTION

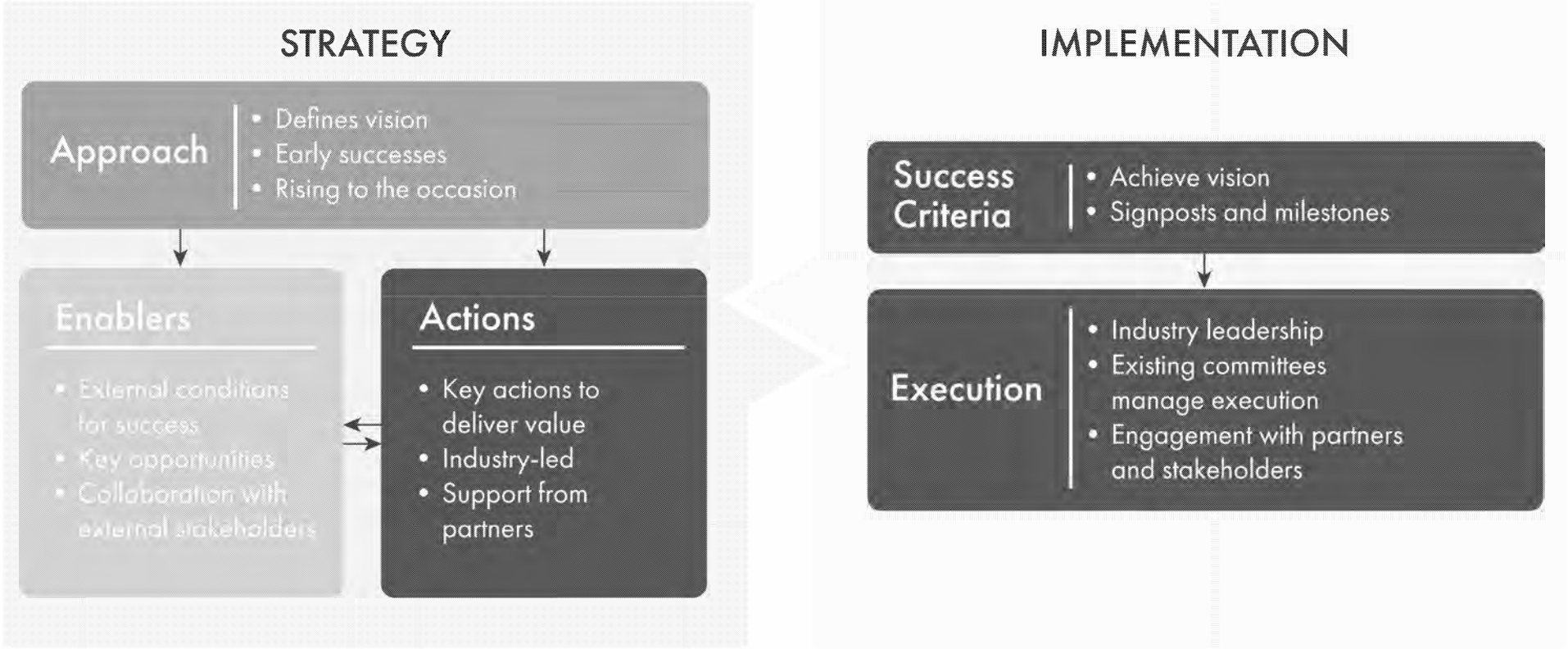
ACTIONS



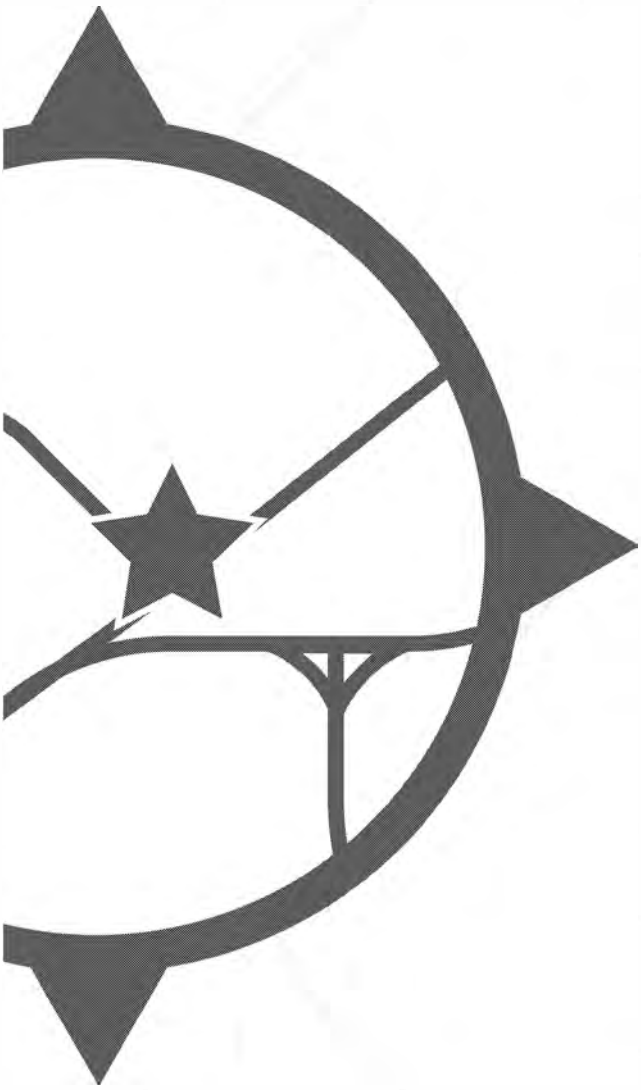
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ROADMAP

ROADMAP



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About EPRI

Founded in 1972, EPRI is the world's preeminent independent, non-profit energy research and development organization, with offices around the world. EPRI's trusted experts collaborate with more than 450 companies in 45 countries, driving innovation to ensure the public has clean, safe, reliable, affordable, and equitable access to electricity across the globe. Together, we are shaping the future of energy.

3002027504 May 2023

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