Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 24-H2.1

File / dossier : 6.01.07
Date: 2023-09-18
Edocs: 7129164

Written submission from Ontario Power Generation Inc.

Mémoire d' Ontario Power Generation Inc.

In the Matter of the

Ontario Power Generation Inc.

Applicability of the Darlington New Nuclear Project environmental assessment and plant parameter envelope to selected reactor technology

Commission Public Hearing

January 2024

À l'égard d'

Ontario Power Generation Inc.

Applicabilité de l'évaluation environnementale et de l'enveloppe des paramètres de la centrale à la technologie de réacteur sélectionnée pour le projet de nouvelle centrale nucléaire de Darlington

Audience publique de la Commission

Janvier 2024

Canada

OPG
Written Submission

In support of the Darlington New Nuclear Project Commission Hearing on

Applicability of the Darlington New Nuclear Project Environmental Assessment and Plant Parameter Envelope to the Selected Reactor Technology

Where a brighter tomorrow begins.

ONTARIO POWER GENERATION

CMD 24-H2.1 PUBLIC HEARING JANUARY 24, 2024

This page is intentionally left blank

Table of Contents

Land Acknowledgement

The lands and waters on which the Darlington Nuclear Generating Station (DNGS) and Darlington New Nuclear Project (DNNP) are situated on are the treaty and traditional territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations.

DNGS and DNNP are within the territory of the Gunshot Treaty and the Williams Treaties of 1923. These rights were affirmed in 2018 in a settlement with Canada and the Province of Ontario.

To acknowledge traditional territories is to recognize their history, predating the establishment of the earliest European colonies. It is also to acknowledge the significance for the Indigenous people who lived and continue to live upon the land, to acknowledge the people whose practices and spiritualties were tied to the land and water, and continue to develop in relation to the territory and its other inhabitants today.

As a company, OPG remains committed to fostering positive and mutually beneficial relationships with Indigenous people and communities across Ontario.

Executive Summary

Ontario Power Generation Inc. (OPG) currently holds a Nuclear Power Reactor Site Preparation Licence (PRSL) [R-1] for the Darlington New Nuclear Project (DNNP). OPG has applied for a Canadian Nuclear Safety Commission (CNSC) licence to construct the first of up to four nuclear power reactors on the Darlington Nuclear site.

This CMD summarizes the work OPG has undertaken to review the environmental impact statement for the DNNP based on the selected BWRX-300 design in support of its application to construct a BWRX-300 nuclear power reactors on the Darlington Nuclear site.

Cleaner Energy Solution

The world is facing a climate change crisis. Meanwhile, the demand for energy will increase worldwide, whether to address economic imbalances, reduce poverty, improve standards of living, support increasing world population, or simply to satisfy consumer demand for goods and services. As a result, cleaner energy solutions that do not release significant Greenhouse Gases (GHGs) are required now.

While many analyses have been performed to identify the right technical solutions and in the right proportion, the evidence is clear as stated by experts like the International Energy Agency (IEA) [R-2] and the Intergovernmental Panel on Climate Change [R-3]. Nuclear power is essential in attaining GHG emission reduction targets.

New Nuclear Technology

For nuclear power to play a significant role in helping decarbonization efforts, it must be deployed quickly, cost effectively and with the appropriate nuclear regulatory and safety oversight.

OPG has concluded that Small Modular Reactors (SMRs) support the decarbonization objective using technology that is safe, easy to operate, and efficient to construct and maintain.

From 2019-2021, OPG undertook an extensive and rigorous selection process and the General Electric Hitachi (GEH) BWRX-300 was selected as the nuclear technology for deployment at OPG's existing DNNP site.

The BWRX-300 is a leading example of a reactor designed for simplicity, enhancing both operation and safety. By including passive safety features and reducing the number of active components, reliance on operator actions is reduced. This enhances reliability, minimizes potential for human errors and enables a high level of safety.

Nuclear Safety

Safety was a critical consideration in technology selection, and the BWRX-300 meets or exceeds regulatory requirements. Leveraging lessons learned and operating experience from the previous nine generations of BWRs deployed and operating around the world, the simplified BWRX-300 design incorporates passive safety features and optimizes safety, operability and maintainability.

Environmental Stewardship

DNNP plays a key part in OPG's Climate Change Plan [R-4]. DNNP will provide greenhouse gas free electricity and will be a key component of OPG's contribution to Canada's goal of net-zero by 2050. DNNP, along with the greater OPG organization, has the goal of protecting the environment through wildlife preservation, habitat preservation and decarbonizing Ontario.

Long-standing partnerships with various environmental organizations have allowed OPG to plant more than eight million native trees and shrubs, and help stock more than five million Atlantic salmon as lead sponsor of the Lake Ontario Atlantic Salmon Restoration Program. OPG's efforts and partnerships in site communities are consistently recognized by the Wildlife Habitat Council (WHC), an international group that promotes and certifies habitat conservation and management. Engagement with Indigenous rights holders is a key component of environmental planning for the DNNP site. Through this relationship, OPG is working to ensure that Indigenous knowledge is incorporated in the site preparation, build and restorative efforts of the project.

OPG was previously recognized by the Oshawa Chamber of Commerce with their first-ever Environmental Sustainability Award for ongoing efforts to support sustainability in the local community surrounding the Darlington NGS. OPG has worked with its partners to help protect and restore biodiversity and the environment and this will continue with the DNNP.

Environmental Assessment

The DNNP underwent an environmental assessment (EA) that was completed in 2012. It was concluded that the Project is not likely to cause significant adverse environmental effects, taking into account the mitigation measures. The scope of the EA encompassed the lifecycle for four nuclear power plants with a total capacity of 4800MW. The Environmental Impact Statement (EIS) that was prepared and submitted by OPG as part of the EA process, used a Plant Parameter Envelope approach that was based on the reactor technologies being contemplated at the time. Following reactor technology selection at the end of 2021, as part of its application for a licence to construct, and in meeting its ongoing commitments [R-5], OPG undertook a comprehensive review of the EIS for the DNNP based on four BWRX-300 reactors. OPG assessed the deployment of four BWRX-300 SMRs to demonstrate that its environmental effects fit within the existing DNNP EA. To support this assessment, OPG completed both (i) a comparison of BWRX-300 design parameters with the DNNP Plant Parameter Envelope ("PPE") values and (ii) a comprehensive review of the BWRX-300 against the EIS prepared in the EA process.

The effects of those BWRX-300 parameters that fall outside of their respective PPE values remain consistent with the conclusions of the EIS and the effects of the BWRX-300 deployment on the environment are less than those examined in the EA. This review demonstrates that, considering environmental effects over the entire lifecycle of the proposed plant, the BWRX-300 is not fundamentally different from the reactor technologies assessed under the DNNP Environmental Assessment. .

Public Engagement and Communications

OPG values the relationships it has with communities, the public and stakeholders. OPG fosters open and ongoing communications and engagement programs with the public and stakeholders in communities where our facilities are located, as well as with the broader public.

Since the DNNP was initiated, OPG has kept the public and stakeholders informed about DNNP by integrating with and building on the existing public information program for the Darlington Nuclear Generating Station (DNGS). To ensure targeted and thorough engagement, the program is augmented to include activities and stakeholders potentially interested in DNNP, but who are typically outside the scope of the DNGS program. OPG's relationship with the local community remains strong due to ongoing, open and transparent engagement and sustainable partnerships with the local community, including government, media, business leaders, educational institutions, interest groups, and community organizations.

Indigenous Engagement

OPG acknowledges the Aboriginal and treaty rights of Indigenous People as recognized in the Constitution Act, 1982. OPG's Indigenous Relations policy provides a framework for engagement with Indigenous peoples and communities to advance its reconciliation efforts. OPG regularly reports on the company's activities and progress in achieving the goals found in its Reconciliation Action Plan.

OPG's objectives with respect to engagement with Indigenous rights holders, and Indigenous communities with interests in the Project area are to share information regarding DNNP, understand concerns about potential impacts to Aboriginal and treaty rights, promote dialogue and meaningful engagement, and create opportunities for participation in the development, implementation, and review of environmental mitigation measures. This engagement is built on a relationship of trust and respect to ensure its meaningfulness. For example, OPG has capacity funding agreements with members of the Williams Treaties First Nations; agreements are in place with Curve Lake, Scugog Island, and Hiawatha First Nations. Capacity funding has also been provided to other Indigenous communities based on submitted costs and expenses.

OPG will continue to work with Indigenous communities to better understand the spectrum of potential impacts related to the Project and the incorporation of Indigenous Knowledge Systems to assist OPG in achieving feasible mitigation measures.

1.0 Overview

1.1 Introduction

OPG is responsible for approximately half of the electricity generation in the Province of Ontario. OPG provides low-cost power in a safe, clean, reliable, and sustainable manner for the benefit of the people of Ontario and its shareholder, the Province of Ontario.

The Darlington Nuclear (DN) site is home to the four-unit Darlington Nuclear Generating Station (DNGS) and the Darlington Waste Management Facility (DWMF). The DNNP is located on the DN site in the Municipality of Clarington, in the Regional Municipality of Durham. Figure 1 provides an aerial view of the DNGS site, the DNNP site to the east of it highlighted in yellow.

Figure 1: DNGS and DNNP Sites

1.2 Project History

The licensing process for DNNP began in 2006 when OPG submitted an application for approval to prepare a site for the Project to the CNSC [R-6]. This led to an environmental assessment (EA) of the Project under the Canadian Environmental Assessment Act (CEAA) [R-7]. The scope for the assessment included the site preparation, construction, operation, and decommissioning of four nuclear power reactors to produce up to 4,800 megawatts of electrical generating capacity.

At the time of the application, OPG used a Plant Parameter Envelope (PPE) as a bounding envelope of plant design and site characteristics to evaluate the potential safety and environmental effects of the multiple reactor designs being considered for the site. This was used as a key input to OPG's Environmental Impact Statement (EIS) to support the EA.

In 2009, a three-member Joint Review Panel (referred to as JRP or the Panel) was appointed to consider the EA and the Application for a Licence to Prepare Site for DNNP. The mandate of the Panel was to assess the environmental effects of the Project and to determine whether it was likely to cause significant adverse environmental impacts considering the implementation of mitigation measures.

The review of the Project was framed by the CEAA and the Nuclear Safety and Control Act. The Panel incorporated other federal, provincial and municipal policies and requirements, industry standards and best practices in its analysis and recommendations.

The JRP concluded that "the Project is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review, and the JRP's recommendations are implemented." In May 2012, the Government of Canada (GOC) accepted the JRP's conclusions for the DNNP and a number of the JRP's recommendations [R-8].

In accepting JRP recommendation #1, the GoC stated that:

> *"Any RA (Regulatory Authority) under the CEAA will need to determine whether the future proposal by the proponent is fundamentally different from the specific reactor technologies assessed by the JRP and if a new EA is required under the CEAA."*

Following the GOC's acceptance of the JRP's conclusions, the Canadian Nuclear Safety Commission (CNSC) issued a 10-year Power Reactor Site Preparation Licence (PRSL 18.00/2022) for the DNNP[R-9].

Since 2012, OPG has continued to meet the commitments it made during the JRP, which are tracked in the DNNP Commitments Report. During this period, OPG has maintained the Power Reactor Site Preparation Licence (PRSL) for the DNNP, which was renewed in 2021 [R-1].

The PRSL allows OPG to conduct site preparation activities for the future construction and operation of a new Nuclear Generating Station (NGS) consisting of up to four units with a maximum net electrical output of 4800 megawatt electric (MWe).

After a thorough review of several reactor options, in December 2021 OPG selected the GEH BWRX-300 reactor for deployment at the DNNP site.

On October 31, 2022, OPG submitted to CNSC an application for a licence to construct one BWRX-300 power reactor on the DNNP site[R-10].

For planning purposes, OPG envisions the new nuclear facility at DNNP will be in commercial operation by 2029. An indicative schedule for DNNP, as illustrated in Figure 2 below, shows approximate timelines for the DNNP.

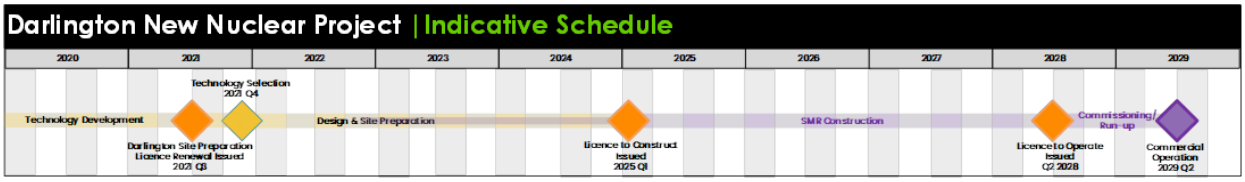

Figure 2: DNNP Milestones

To support this application and to meet commitments made during the EA conducted for DNNP, as documented in DNNP Commitments D-P-12.1(a) and D-C-3.1, OPG undertook a comprehensive review [R-11] of the PPE and EIS, taking into consideration up to four BWRX-300 units.

1.3 Purpose and Scope

OPG has submitted to the CNSC the "Application for a Licence to Construct a Reactor Facility" for the DNNP [R-10]. In support of this application, a first hearing is being conducted.

The purpose of the first public hearing is for the Commission to consider and decide on the applicability of the DNNP EA with respect to OPG's selected BWRX-300 small modular reactor technology, as per the Government of Canada response to recommendation #1 of the joint review panel's 2012 report. In deciding on the

applicability of the DNNP EA, the Commission will consider the information in OPG's environmental impact statement review report along with the updated plant parameter envelope. The Commission will also consider whether the predictions of the EA remain valid. [R-12]

To support the CNSC in making this determination, OPG assessed the BWRX-300 SMR to demonstrate that its environmental effects fit within OPG's existing EA for the DNNP. To support this assessment, OPG completed both (i) a comparison of BWRX-300 design parameters with the DNNP Plant Parameter Envelope ("PPE") values and (ii) a comprehensive review of the BWRX-300 against the Environmental Impact Statement ("EIS") prepared in the EA process.

This Commission Member Document (CMD) summarizes the results of OPG's assessment of the EIS and PPE, which determined that the conclusions of the EIS remain valid. The results additionally show that the BWRX-300 is not fundamentally different than the technologies originally considered.

1.4 The Darlington New Nuclear Project

OPG is requesting a licence to construct a Class 1A nuclear facility at OPG's Darlington Nuclear site located in the Municipality of Clarington, in the Regional Municipality of Durham. The nuclear facility will utilize the GEH BWRX-300 reactor technology and will be built adjacent to the current DNGS, on the north shore of Lake Ontario.

The proposed activities include:

- The completion of any remaining activities under the existing site preparation licence;
- The construction of one BWRX-300 unit, which includes the structures, systems and components associated with one reactor building, control building, turbine building, and auxiliaries;
- The construction of the support structures, such as cooling water systems, for up to four BWRX-300 units; and
- The inspection and testing of equipment, and the conduct of fuel-out commissioning (i.e. the commissioning of systems prior to loading fuel in the reactor).

The DNNP's primary purpose is to supply non-greenhouse gas emitting electrical power to the Ontario grid. The construction period is planned to start immediately following the granting of a construction licence.

1.5 The BWRX-300 Reactor

GEH's BWRX-300 is a 300 MWe water-cooled natural circulation SMR utilizing simple passive operating and safety systems. It is the tenth generation of the BWR and represents the simplest BWR design since General Electric, GEH's predecessor in the nuclear business, began developing nuclear reactors in 1955. The BWRX-300 is an evolution of the U.S. Nuclear Regulatory Commission (USNRC) design-certified, 1520 MWe Economic Simplified Boiling Water Reactor (ESBWR).

The BWRX-300 is designed to provide safe, clean, baseload generation.

Table 2.1-1 below summarizes the basic design parameters for the BWRX-300.

Table 2.1-1: Basic BWRX-300 Design Parameters

Parameter Description	Value
Current/Intended Purpose	Commercial – Electric
Output Power (gross)	~300 MWe, 870 MWth
Reactor Type	BWR
Core Coolant	H_2O
Neutron Moderator	H_2O
Steam Supply System	Direct-cycle
Primary Circulation	Natural
Thermodynamic Cycle	Rankine
Secondary Side Fluid	n/a (No secondary side since it is direct-cycle)
Fuel Form	Fuel Assembly/Bundle
Fuel Lattice Shape	Square
Fuel Bundles	GNF2 (240-bundle core configuration)
Rods per Fuel Bundle	92
Fuel Material	UO_2 with 4.95% max. enrichment
Refuelling Cycle	12-24 months

The BWRX-300 includes several design features that simplify the design and ensure a high level of safety. These features include:

- Integral Reactor Pressure Vessel (RPV) isolation valves: The BWRX-300 RPV is equipped with isolation valves that are integral to the RPV. These RPVs would rapidly isolate to help mitigate the effects of a loss of coolant accident. All large fluid pipes with RPV penetrations are equipped with double isolation

valves in series. These are integral to the RPV and preserve reactor coolant inventory, ensuring adequate core cooling is maintained following a pipe break.

- No Safety Relief Valves (SRVs): SRVs have been eliminated from the BWRX-300 design, while meeting requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Class 1 equipment. The BWRX-300 design includes a large volume in the RPV that supports overpressure robustness of the design. Historically, BWR SRVs have been the most likely cause of a Loss of Coolant Accident (LOCA) but have been eliminated from the BWRX-300 design.
- Dry containment: The BWRX-300 has a dry containment. This has been proven to effectively contain the releases of steam, water, and fission products in the event of a LOCA.
- Passive design features: The BWRX-300 incorporates passive design features which do not require dependence on external sources of power or operator action to perform their functions. For example, the Isolation Condenser System (ICS) passively removes decay heat from the reactor without any loss of reactor coolant inventory when the main condenser is unavailable.
- Reliable plant shutdown: The BWRX-300 design uses fast acting hydraulic control units as the first means of shutdown, and electric fast motor run-in insertion as the second means of shutdown. This ensures that two separate and diverse methods are available to shutdown the reactor.

Practices and Safety Concepts

The BWRX-300 employs a combination of proven and innovative manufacturing techniques while incorporating passive safety response. The design implements a safety strategy structured on the Defense Lines of the International Atomic Energy Agency's Defence-in-Depth methodology [R-16].

The BWRX-300 Defense-in-Depth provides for effective implementation of Fundamental Safety Functions and protection of physical barriers at the independent Defense Lines to prevent escalation of events and incidents to accident conditions. The Fundamental Safety Functions for the BWRX-300 are:

- Control of reactivity;
- Cooling of fuel;
- Long-term removal of heat; and

- Containment of radioactive materials.

General Approach to Design

The high-level design goals for OPG's DNNP BWRX-300 are to develop an electrical generation facility that:

- Has safety as an over-arching priority;
- Minimizes risk to workers, the public and the environment;
- Has a low environmental impact;
- Is highly reliable; and
- Provides low-cost and non-GHG electricity.

To achieve these goals, the design incorporates:

- Industry design and operating experience;
- Lessons learned from previous designs and events;
- Proven and reliable technology;
- Advanced design and construction methods;
- Proven engineering processes, practices, and tools; and
- Compliance with national and international codes and standards.

The BWRX-300 design enhances safety by implementing:

- Increased margins to the safety goals. Increased margins reduce the consequences of some Postulated Initiating Events (PIEs) and event sequences, and increase the time before any operator action is needed, improving safety.
- Inherent safety characteristics limit consequences of certain PIEs. This is accomplished by using risk-informed design approaches, Operating Experience (OPEX), as well as natural physical characteristics. Such physical characteristics include:
    - The BWRX-300 fuel and core dynamic characteristics, including negative reactivity coefficient, which is effectively used as inherent backup shutdown mechanism.
    - Coolant flow through the reactor core that is driven by natural circulation, enhanced by a long chimney above the core, which can effectively remove heat in normal or abnormal conditions.
    - The large volume of water in the ICS pools provide a long-term heat sink using natural circulation.

    - A reduction in the number and size of RPB nozzles and locating all significantly above the level of active fuel. This design innovation helps to mitigate the impact of any potential Loss of Coolant Accidents (LOCAs)
- Operational simplicity reduces the number, complexity, and frequency of operational tasks as well as the maintenance requirements, to maintain safe and reliable operation. Operational simplicity reduces the number of complex systems required to operate the station and improves reliability.
- Leveraging significant experience from the operating BWR fleet. Lessons learned from hundreds of thousands of hours of operating experience is used to inform the BWRX-300 design.
- A proven and modern generation of fuel design is used because of its advanced performance characteristics and reliability. Using a proven fuel type with known performance characteristics improves predictability and certainty of behaviour under operating conditions.
- Complementary design features for low probability events. Features have been incorporated into the design to mitigate the impact of certain extremely low probability event sequences (e.g., boron injection system as an added means of shutdown).
- Practical elimination of event sequences. Using Industry OPEX and risk informed engineering approaches, some traditional event sequences have been practically eliminated (e.g., non-isolatable large break LOCA, and control rod ejection).

The BWRX-300 design minimizes its environmental impact by:

- Maintaining a small overall terrestrial and in-water footprint.
- Maintaining a low waste volume for both conventional and radioactive waste. This is accomplished by using advanced design and construction methods that reduce waste during construction as well as the amount of irradiated material for decommissioning. In addition, the design requires fewer operational and maintenance activities that generate waste.
- Operating with zero radiological liquid effluent release. As a result, during normal operation there is no contribution from waterborne releases to public dose or exposure to non-human biota .

High reliability is achieved in the design by using:

- Well established system/component designs and supply chain lines with proven operating experience, leading to increased design and operating performance certainty.
- Low complexity systems and components require less reliance on engineered redundancy for improved reliability.
- The use of passive systems that do not require external inputs or a change in state to perform their design functions (e.g., ICS heat removal).
- Reduction in single point vulnerabilities (SPV). SPV are those single components whose failure can cause the station to reduce output or shutdown. Fewer SPV improve overall station predictability and reliability.

2.0 Review of Plant Parameters Envelope

2.1 Overview of the Plant Parameters Envelope (PPE)

The EIS for the Darlington New Nuclear Project EA assessed the potential environmental effects that might result from a range of reactor types considered for the DN site. A key input to the assessment is a PPE [R-13] that brackets the range of parameters from all the reactor types to be assessed.

The PPE is a set of data that provides an envelope of plant design and site parameter values for use in the EA process to help bound the potential environmental effects of the Project. This concept is consistent with CNSC REGDOC-1.1.1 [R-14] Section F.1 and has also been accepted by the USNRC for use in the early site permit process in the US. For example, in 2019 the NRC issued the Tennessee Valley Authority (TVA) an early site permit for their Clinch River project, which used a PPE approach. Although a reactor design was not specified, TVA identified bounding parameters for a surrogate nuclear plant, which NRC will use to evaluate the suitability of the site [R-15].

The PPE for the DNNP was derived from vendor information for multiple reactor designs. Parameter values provided by the reactor vendors were compared to each other, and the limiting value, be it a minimum or a maximum, was chosen for the PPE. In simple terms, the PPE represents the theoretical bounding envelope of a generic nuclear power plant consisting of the limiting value for each parameter from all the designs considered at the time of the EA. While some of the parameters in the PPE could change as a result of technology choices or project developments, their overall significance from an EA perspective would be assessed by reviewing the potential environmental effects resulting from the change and determining whether the EIS conclusions remain valid.

At the early stages of the Project in 2007, the PPE was first developed based on nine large reactor designs including Atomic Energy of Canada Ltd's EC6 and ACR-1000, Areva's EPR, GE Hitachis' ABWR and ESBWR, Korea Hydro and Nuclear Power's OPR1000 and APR1400, Mitsubishi's US-APWR Westinghouse's AP-1000.

In 2008, Infrastructure Ontario (IO) issued a competitive Request for Proposal (RFP) for a new nuclear power station in Ontario. Four vendors were invited to participate in the RFP process: AECL (the ACR-1000), Areva (the EPR), GE-Hitachi (the ESBWR) and

Westinghouse (the AP1000). GE-Hitachi chose not to participate in the process. As a result of the IO RFP, it was deemed necessary to revise the PPE to reflect the bounding limits for the three remaining designs (the ACR-1000, the EPR and the AP-1000). OPG committed to the JRP during the review, that should the Government of Ontario decide to include boiling water-type reactors in its procurement process, the plant parameters envelope would be updated accordingly [R-8].

During the licensing process, OPG committed to demonstrate that the design of the selected technology fits within the PPE, once a reactor technology was chosen for the Project. If not bounded by the PPE, appropriate assessments would be conducted, and the PPE would be updated, or the design modified.

The BWRX-300 was not one of the original designs incorporated into the PPE evaluation as OPG's deployment strategy was focused on large reactor designs available at the time. In December 2021, the BWRX-300 technology was selected for DNNP. Per its commitment, OPG reviewed the design of the BWRX-300 against the PPE.

The review concluded BWRX-300 design was well within the established PPE for the majority of the individual PPE parameters. For the eight (8) parameters where the BWRX-300 was determined to be outside the PPE, further assessment based on the updated parameters showed that the EIS conclusion remains valid.

The following provides additional details of the BWRX-300 PPE review, including details on the eight (8) PPE parameters that were outside the original PPE envelope and their assessment.

2.2 Parameters Inside the Bounds of the PPE

The 2009 PPE consisted of 198 parameters. 60 of those parameters are not applicable, as they are related to equipment which will not be deployed for the BWRX-300 at DNNP. These are the result of design differences, such as the decision to use once through cooling. Many of these have a positive impact on the Project. As an example, the decision not to use cooling towers eliminates the noise, visual effect, and potential bird strikes associated with their presence.

One hundred and thirty (130) BWRX-300 parameters are within the PPE considered in the EIS. These are values such as site water level, soil properties, and once through

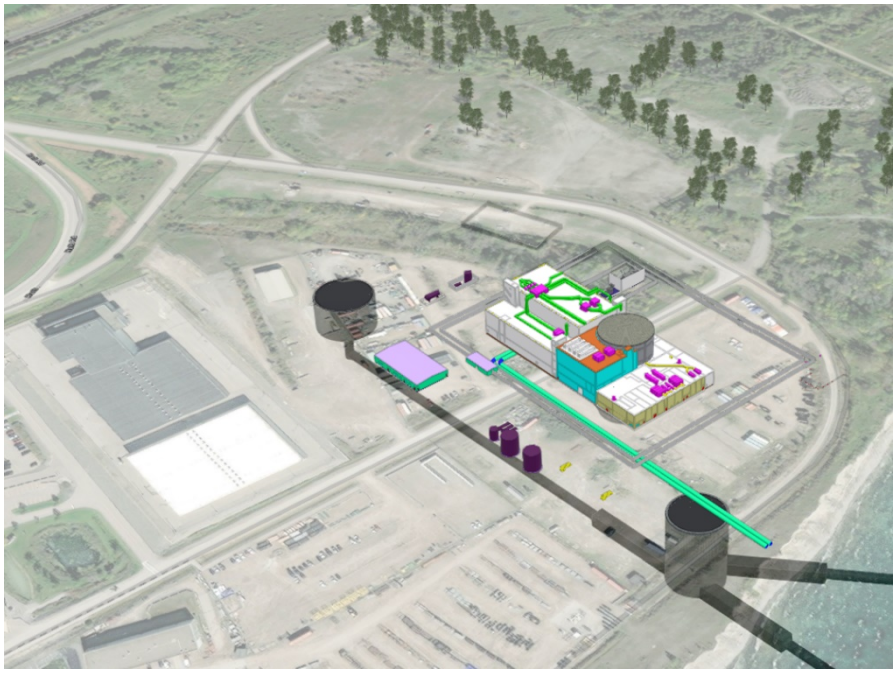

Figure 3: 3D Rendering of BWRX-300 at DNNP

cooling design parameters. The BWRX-300 values for these parameters are bounded by the PPE and, in some cases, have less impact than the designs considered at the time of the EA.

The remaining eight (8) parameters are discussed in section 2.3.

2.3 Parameters Outside the Bounds of the Original PPE

Eight BWRX-300 parameters were outside the previous PPE. These parameters were assessed, and it was determined that they do not impact the conclusion of the EIS. These eight parameters are:

1. Fire Protection, short-term withdrawal rate from the water source

    The BWRX-300 has a higher short-term withdrawal rate from the fire protection water source.

    While the required maximum short-term rate of withdrawal from the water source for fire protection has increased, the average total raw water for the potable water/sanitary waste system, demineralized water system, and fire protection system combined is less than previously considered, hence less

water is withdrawn overall. Correspondingly, less wastewater is discharged to the municipal system than what had been assessed in the EIS, and therefore the effect is less. As such, there is no impact to the conclusions of the EIS.

2. Fire Protection, quantity of water stored

The BWRX-300 requirements for quantity of water stored is greater than that in the original PPE. The fire water storage requirements are used for informational purposes and not used in any EIS calculations, and therefore there is no impact to EIS conclusions.

3. Importance Factor for Wind Load

The importance factor for wind load is a design requirement based on the design code, rather than a site characteristic. The importance factor defined in the PPE is based on an older methodology. The Wind Speed Multiplication Factor used for the BWRX-300 design is aligned with an updated methodology for calculating wind loading; ASCE 7-16 Minimum Design Loads for Buildings and Other Structures. [R-17] The same strength targets are met with the new methodology, compared to previous methodology used for the PPE reactor designs. As such, the change to the Importance Factor for Wind Load has no consequence to the conclusions of the EIS.

4. Reactor Embedment

The environmental impact associated with an embedded reactor is primarily related to groundwater flows.

The BWRX-300 is considered a deeply embedded reactor and its embedment depth is greater than what was stated in the PPE. A cylindrical excavation is constructed through the overburden and continues into the bedrock. The reactor building is then constructed within the excavation. The BWRX-300 will have a temporary impact on groundwater flows during construction as de-watering activities will be required. Once construction is completed there is no further dewatering required, the permanent effects on the groundwater would be negligible. Permanent dewatering will not be required because of the planned installation of a waterproof foundation. The net impact of BWRX-300 on the groundwater flows will be less than the original PPE which considered permanent changes to the groundwater.

Other effects resulting from BWRX-300 deployment on quantity of soil and rock removal, air quality, blasting and ground vibrations, sound level, stormwater, and liquid effluents from dewatering operations were assessed

as consistent with the EIS. This was primarily due to the much smaller footprint of the BWRX-300 compared to the reactors considered in the PPE.

Therefore, the depth of the reactor embedment does not impact the conclusions of the EIS.

5. Lower Minimum release height above finished grade

Minimum release height above finished grade is in the PPE as an input to the radiological dose modelling, which is carried out to ensure that the regulatory dose limit for the public is met. BWRX-300 has a lower release height parameter compared to the PPE value because the BWRX-300 reactor building, and surrounding buildings, are shorter than the PPE reactors. When this parameter was analysed in the dose model, the dose results were verified to be a small fraction of the regulatory dose limit to the public and less than assessed in the EIS. As such, there is no impact to the conclusions of the EIS as a result of the lower minimum release height.

6. Activity by isotope of airborne releases

Activity by isotope of airborne releases during normal operation in the PPE is used as an input to radiological dose modelling, which is carried out to ensure that the regulatory dose limit for the public is met. In the original PPE a Boiling Water Reactor was not one of the compared technologies. The BWRX-300 releases contain the same radionuclides as the previously assessed technologies, but in different proportions. However, when these isotope releases were analysed in the dose model, the total dose results were verified to still be a small fraction of the regulatory dose limit to the public, and less than those assessed in the EIS. As such, there is no impact to the conclusions of the EIS as a result of the radioisotopes' airborne release profile.

7. Activity by isotope of solid radioactive waste

Activity by isotope of solid radioactive waste in the PPE is an input to the assessment of dose to the public and to workers related to radiological malfunctions and accidents. This assessment was carried out to ensure that radiological doses are kept below regulatory limits.

The PPE parameters for the solid radioactive waste are total annual volume generated and annual activity by radionuclides present in solid radioactive waste. The annual solid radioactive waste volume generated by the operation of the BWRX-300 is within the PPE value. The estimated total annual

activity for solid radioactive wastes generated during routine BWRX-300 plant operations is lower than those identified in the PPE. While the radionuclide composition of the BWRX-300 solid radioactive wastes is similar to that of the previously assessed technologies, it has different proportions. The effect of the change in waste composition was assessed, confirming that the same dose criteria are met, and therefore there is no impact on the conclusions of the EIS.

8. Spent Fuel Cask Weight

The PPE listed a parameter for spent fuel cask weight, but this value is not directly used in the Environmental Impact Statement. The PPE reactors had a limiting weight of 100 tonnes. The BWRX-300 design will require a cask that slightly exceeds the PPE value. While the BWRX-300 value exceeds the PPE value, this will be mitigated by designing the hauling roads for the cask weight and has no impact to the conclusions of the EIS.

3.0 Environmental Impact Statement Review

3.1 Purpose and Approach

The EIS review examined the fundamental elements of the EIS (which considered up to four reactor units) and compared them to those that would result from the deployment of up to four BWRX-300 reactors at the DNNP site. As previously discussed in section 2.0, the scope of comprehensive review of the EIS also included a review of BWRX-300 parameters that were not within the PPE used in the EIS. This was done to confirm the EIS conclusion, that the Project will not result in any significant adverse environment effects, remains valid.

This included the review of:

- Existing environmental conditions;
- Project works and activities for each project phase;
- Likely environmental effects;
- Residual adverse effects, taking into consideration mitigation measures including project design features;
- Follow-up and monitoring programs to verify predictions of environmental effects identified in the EIS;
- Effects of the environment on the Project;
- Malfunctions, accidents, and malevolent acts;
- Cumulative effects; and
- Significance of residual adverse effects.

3.2 Review Findings

A key difference between the reactors considered in the EIS and the BWRX-300 deployment is the smaller footprint and physical size of the BWRX-300. As a result, the effects of the BWRX-300 deployment on the environment are generally less than those examined in the EIS. A summary of the findings from the comprehensive review of the EIS is provided below.

- The construction of the BWRX-300 requires a reduced workforce, less on-site traffic, and reduced excavation of soil and rock. This results in lower atmospheric emissions and noise during site preparation and construction.
- For the BWRX-300 deployment, there is an opportunity to retain on-site ponds, wetlands, vegetation habitats, and shoreline habitats. These opportunity areas were not considered in the EIS. Studies have been undertaken to determine the effects of the Project from noise, dust, groundwater, and surface water on the retained habitats. The review results indicated that residual adverse effects to the retained ponds, wetlands, and terrestrial habitats are expected to be minor.
- The BWRX-300 deployment utilizes once-through lake water cooling. The cooling tower structures considered as options in the EIS are no longer considered for DNNP. The adverse effects associated with the cooling towers (potential bird strikes, effects on the visual landscape, and the enjoyment of private property) are therefore no longer applicable. In addition, the cooling water flow rate for the BWRX-300 is substantially lower than that considered in the EIS and will result in lesser effects to the aquatic environment.

- The BWRX-300 will require less marine and shoreline work. Reduced effects are anticipated for lake water circulation patterns, shoreline processes, and temperature at the mouth of Darlington Creek). Residual adverse effects to the retained shoreline habitat, in the short term, from vibration and changes to groundwater flow are anticipated to be minor. Residual adverse effects predicted for aquatic biota during the construction of the cooling water intake and discharge structures are anticipated to be less now that lake infill is no longer a consideration.

- The BWRX-300 will be operated as a zero radiological liquid release facility, which results in no contribution to public dose from waterborne releases during normal operation.

- The EIS described permanent changes to groundwater flow on the site during the construction and operation phases, as pumps would maintain a lower water table. However, for the BWRX-300, there will be negligible impact to the groundwater flow during the operations phase, as the groundwater will be allowed to recharge to natural levels after construction.

- Environmental effects (including effects from accidents, malfunctions and malevolent acts, effects of the environment on the Project,) from the BWRX-300 are expected to be less than those assessed in the EIS. Cumulative effects were also assessed, and it was determined to have no impact on the

conclusions of the EIS. Therefore, the determinations regarding the significance of residual adverse effects made in the EIS remain valid.

Figure 4:Bank Swallow and Habitat

- OPG made a commitment to have an environmental monitoring and EA follow-up program in place to verify predictions of environmental effects identified in the EIS, and to determine the effectiveness of mitigation measures. One example of a long lead study undertaken to support future mitigation measures is the construction and testing of an artificial bank swallow nesting structure. If successful, this nesting structure could mitigate potential project impacts on the bank swallows' natural habitat along the shoreline bluffs. The nesting structure is partway through a seven year testing period and results are promising. The EIS review concluded that the EA follow-up and monitoring program remains suitable for BWRX- 300 deployment.

3.3 Conclusions

The EIS review determined that the conclusion of the 2009 EIS remains valid for the deployment of the BWRX-300 at the DNNP site, namely that the DNNP will not result in any significant adverse environmental effects, provided the mitigation measures are implemented.

4.0 Community Engagement

OPG's role is much more than the kilowatts it produces for the people of Ontario. We value our relationships with Indigenous Nations and communities, our stakeholders in communities where our facilities are located, as well as the broader public. We strive to be engaged and valued community members, sharing information early and often and offering and encouraging dialogue with our neighbours, local community, and our stakeholders.

Since the outset of the Project, OPG has kept the public and stakeholders informed about DNNP by integrating with and building on the existing public information program for the Darlington Nuclear Generating Station. To ensure targeted and thorough engagement, the program is augmented to include activities and/or stakeholders potentially interested in DNNP, but whom are typically outside the scope of the DNGS program.

OPG's Corporate Affairs organization adheres to the principles and process for external communications governed by N-STD-AS-0013, Nuclear Public Information and Disclosure. This document guides OPG's external stakeholder activities, public response requirements for issues or significant events, and OPG's standards for communicating with the public. OPG's nuclear public information disclosure protocol is posted to our public website: https://www.opg.com/documents/nuclear-public-information-disclosure-and-transparency-protocol/.

OPG's community relations and public information program has been recognized as a strength by national and international utility peers. OPG benchmarks current best practices amongst others within and outside the nuclear industry to ensure continuous performance improvement. OPG's relationship with the local community remains strong due to ongoing open engagement and sustainable partnerships with community stakeholders including government, media, business leaders, educational institutions, interest groups, and community organizations.

4.1 Communications and Engagement – Darlington New Nuclear Project

Since 2006, OPG has undertaken a comprehensive outreach and communications program with stakeholders and the public to support the DNNP through all phases of the Project.

The program builds on the communications and stakeholder relations program in place at DNGS, which has been in existence for many years and meets or exceeds all regulatory requirements.

Members of the public and stakeholders are continually updated on the status of DNNP as an adjunct to the existing DNGS public information program, through various methods and forums.

Information Sharing including:

- A fully staffed public information centre;
- Information on a dedicated public website www.opg.com/newnuclear;
- A toll-free information phone line;
- Environmental partnerships and programs;
- Station tours and site visits;
- Public inquiries and feedback;
- Public opinion polling;
- Community stakeholder letters;
- Social media platforms (Facebook, Twitter, Instagram, LinkedIn);
- Advertising in local newspapers, newsletter, television, and radio; and
- Contact us information (email, website, phone number) included in all communication materials.

Community Outreach including:

- Briefings with key stakeholder groups, elected officials, and municipal representatives;
- Presentations and site tours of the DNNP lands to community groups, key stakeholders, industry peers and partners and the public;
- Virtual reality tours of the BWRX-300 SMR technology to information centre visitors, tour groups, stakeholders, and the public;

Figure 5: OPG Open House at the Darlington Information Center

- Dedicated DNNP inserts in issues of the quarterly Neighbours Newsletter, distributed to ~120,000 residents and businesses within ten kilometers of the DN site and posted on the opg.com website;
- DNNP booth, SMR virtual reality experience and information available at OPG's annual public open house, which in recent years has drawn approximately 3,000 people each year;
- Project Information booths at community fairs, festivals, and events offering information about the Project status, next steps, and how the public can be involved in the licensing process; and

- Regular updates to community committees (including the Darlington Community Advisory Council, Pickering Nuclear Community Advisory Council, Durham Nuclear Health Committee), Clarington Board of Trade and Office of Economic Development).

Figure 6:DNNP Booth

4.2 EIS Review and PPE Report Review Engagement

As part of the preparation of the EIS Review Report and the PPE review, OPG undertook engagement activities to ensure stakeholders and members of the public were informed, provided required information, and were offered opportunities to ask questions and provide feedback through the following methods:

- Copies of the EIS Review Report and the PPE report were posted prominently on the Project website (www.opg.com/newnuclear) for stakeholders and members of the public to review.
    - OPG also posted the CNSC's Notice of Public Hearing and Participant Funding to the Project website.
- More than 600 stakeholders and members of the public registered for two public information sessions on the Project. The sessions provided a project update, introduced the EIS review and PPE review, and outlined mechanisms for the public to be involved in the licensing process. The

sessions also provided an opportunity for the public to ask questions and share their views. A second round of public information sessions is planned for fall 2023.

- Stakeholder letters are sent to about 80 local community leaders and stakeholders several times throughout each year. The most recent, sent in April 2023 contained a project update information on the PPE and EIS review reports and the CNSC public hearing.
- OPG presented to Clarington and Oshawa Councils providing an update on the Project and discussion on the work completed in support of the EIS review and PPE review.
- OPG participated in a CNSC workshop on the Project, focusing on the EIS and PPE reviews. OPG presented on the Project and answered questions from attendees (CNSC participant funding recipients).
- Two dedicated workshops were held on the EIS review and PPE review with community stakeholders at the Municipal, Regional and Provincial levels and Non-Governmental Organizations. These sessions included a detailed presentation on the PPE and EIS reviews and offered opportunity for dialogue, questions and answers and formal and informal conversation on the work done to support the reviews.
- Dedicated update presentations on the Project status, PPE review and EIS review were provided to the Darlington Community Advisory Committee and the Durham Nuclear Health Committee. Project updates are provided at all CAC and DNHC meetings as part of the "community update" agenda item.
- OPG attendance at community fairs, festivals, and events across Durham Region with materials on the DNNP and project staff available to discuss the Project, including PPE and EIS review.
- OPG attendance at local educational institutions, highlighting the DNNP and other fleet-wide initiatives.
- Ongoing Information sharing including:
    - Posters located in community spaces including a link to the Project website;
    - Newspaper advertising;

- Television advertising in local communities;
- A targeted social media presence; and
- Project information and dedicated inserts in issues of Neighbours newsletter.

OPG has undertaken a comprehensive outreach and communications program including activities designed to reach a broad audience of stakeholders and the public to ensure they are well informed about the DNNP, including the EIS and PPE review. OPG will continue ongoing dialogue with stakeholders and the public and is prepared to maintain communication and engagement activities through all phases of the Project.

5.0 Indigenous Engagement

OPG has engaged with the local rights holders of the Williams Treaties First Nations (WTFN) in a renewed capacity on Small Modular Reactor development at Darlington since 2018. WTFN member First Nations are:

- Beausoleil;
- Rama;
- Georgina Island;
- Curve Lake;
- Hiawatha;
- Scugog Island; and
- Alderville.

OPG has received feedback from WTFN on how the Nations preferred to be engaged and OPG has strived to increase the quality of engagement to include:

- Information sharing;
- Engagement and employment opportunities;
- Constructive dialog and involvement;
- Trust building and collaboration;
- Meaningful consultation; and
- Sustainable and empowered relationships.

Engagement has also included: invitation to virtual and in-person meetings, recurring monthly meetings, regular newsletters, project permitting reviews, and review of project activities which may impact Aboriginal or treaty rights. There are also ongoing discussions on environmental impacts and monitoring, natural habitat restoration initiatives, archaeological monitoring, in-community visits and meetings with Chief and Councils.

Indigenous communities with interests in the Project have been engaged at various levels and these include the Métis Nation of Ontario Region 8, Kawartha Nishnawbe, Six Nations of the Grand River, Mohawks of the Bay of Quinte, Huron-Wendat Nation, and Saugeen Ojibway Nation.

OPG is committed to working with Indigenous communities with rights and interests regarding project activities in order to develop positive, mutually beneficial

relationships. OPG recognizes that each Indigenous community is distinct with its own unique history, worldviews, and concerns. Engagement has included invitations to virtual and in-community meetings, the provision of project information for review, project newsletters, and participation in reviewing the marine archaeology study.

A summary of key engagements on the Environmental Impact Statement (EIS) Review, and general engagements from January 2019 to June 2023, is shown below.

5.1 Indigenous Engagement on Environmental Impact Statement Review

Engagement activities conducted to discuss Environmental Assessment validation work and conclusions included:

- Early 2019, OPG provided information to the WTFN on Darlington site aquatic and wildlife habitat (including an excerpt from Darlington Environmental Risk Assessment report undergoing review/updates at the time).

- April 16, 2019, meeting at the Darlington Energy Complex (DEC) regarding the Darlington site Environmental Risk Assessment report.

- February 18, 2020, waste management plan discussion with the Mohawks of the Bay of Quinte during virtual meeting.

- February 11, 2020, meeting at the DEC where OPG provided a high-level overview of the DNNP's EA and licensing timelines. An explanation of OPG's waste management plan was also provided.

- December 8, 2020, validity of SMR technologies within the Environmental Assessment discussed with the Mohawks of the Bay of Quinte

- March 25, June 24, July 29, September 27, 2021, and January 27, 2022, DNNP EA follow-up monitoring plan discussed with at WTFN monthly meetings with Curve Lake, Alderville, Hiawatha, and Scugog Island First Nations.

- On April 19, 2021, the Darlington Nuclear site Environmental Risk Assessment (ERA) results were discussed with Curve Lake, Scugog Island, and Alderville First Nations at the WTFN monthly meetings.

- October 1, 2021, the validity of the EA discussed with Curve Lake, Hiawatha,

Scugog Island Rama and Beausoleil First Nations during WTFN monthly meeting.

General information related to the EA and Environmental Impact Statement (EIS) was also provided in meetings and emails as follows:

- WTFN on May 29, 2020;
- Métis Nation of Ontario Region 8, September 30, 2020;
- Métis Nation of Ontario Region 8, October 7, 2020;
- WTFN on October 13, 2020, and December 11, 2020;
- WTFN (EIS Review Methodology) on April 28, 2022; and
- WTFN (EIS Review Update) on July 28, 2022, to Curve Lake, Scugog, Alderville and Hiawatha First Nations.

Figure 7: DNNP staff attended the opening of Peterborough Museum and Archives' display of Hiawatha ancestral gifts to the Prince of Wales in 1860, from the Royal Collection Trust in the UK.

On August 25, 2022, Curve Lake and Scugog Island First Nations provided separate comments regarding the draft EIS review report, and on September 22, 2022, OPG provided an update on the EIS review report to Curve Lake and Scugog Island First Nations during the WTFN monthly meeting. The comments were discussed on October 27, 2022, with Curve Lake, Hiawatha, and Scugog Island First Nations. On November 4, 2022, OPG dispositioned Curve Lake and Scugog Island comments regarding the draft EIS review report.

On November 27, 2022, OPG provided the EIS review report to the Métis Nation of Ontario Region 8 review and comment with a follow-up email on November 28, 2022.

Figure 8: OPG was a key sponsor and was pleased to attend Curve Lake's Archaeological Liaison Program Graduation at Trent University in May 2023.

In a site visit on December 4, 2022, the EIS review report was discussed generally; no comments requiring disposition were received.

On December 8, 2022, Revision 1 of the Environmental Monitoring and Environmental Assessment Follow-Up (EMEAF) Plan was provided for WTFN review. In March 2023, OPG received Curve Lake and Hiawatha First Nations comments on the EMEAF Plan.

5.2 Indigenous Engagement – All other areas

From January-April 2023, the WTFN and OPG have continued monthly meetings, and discussed topics have included:

- Cultural learnings;
- Project permits;
- Project design elements like shoreline protection, stormwater and condenser cooling;
- Nuclear Waste;
- Small Modular Reactor site layout;
- Impacts to Aboriginal and treaty rights; and

- Site visit by Hiawatha / Curve Lake consultants for environmental stormwater monitoring.

Figure 9: OPG attended the Métis Business Expo in Midland, in March 2023.

In May and early June of 2023, a pause in engagement with Curve Lake, Hiawatha, and Scugog Island First Nations was taken while OPG, with the assistance of the Nations, developed a plan to improve the relationship as well as improve OPG staff learnings on Indigenous culture and engagement.

OPG has had continuing and productive discussions with the Chief of Alderville First Nation, both in the community (November 2022 treaty symposium) and at OPG sites (July 2023 SMR ground-breaking ceremony), with additional meetings planned with his successor.

Also in 2023, OPG had discussions with representatives of the Chippewa First Nations of Rama, Beausoleil, and Georgina Island and will work to further the relationship with these Nations.

From January to June 2023, the OPG team was pleased to attend First Nation and Indigenous community events including the Métis Business Expo in Midland, Hiawatha Pow Wow and National Indigenous Day celebrations, Curve Lake

Archaeological Liaison Graduation at Trent University, and the Alderville Skilled Trades Fair.

Additionally, communication outreach was made to Kawartha Nishnawbe and the Mohawks of the Bay of Quinte, and a project update was provided to Six Nations of the Grand River. The Huron-Wendat have been engaged for marine archaeology as requested by the Province of Ontario.

6.0 Overall Conclusion

Following the selection of the BWRX-300 technology in December 2021, in meeting the commitment made by OPG during the EA Joint Review Panel, a comprehensive review of the PPE and EIS for the DNNP was undertaken.

The PPE review concluded that BWRX-300 design was well within the established PPE envelope for the majority of the 198 individual PPE parameters. For the eight parameters where the BWRX-300 was determined to be outside the PPE, the PPE was updated to encompass those specified parameters. Further assessment of these eight BWRX-300 parameters showed that they do not alter the conclusion of the EIS and supports OPG's conclusion that the BWRX-300 is not fundamentally different from the reactor technologies assessed under the DNNP Environmental Assessment.

The comprehensive EIS review examined the fundamental elements of the EIS (which considered up to four reactor units) and compared them to those that would result from the deployment of up to four BWRX-300 reactors at the DNNP site. This included a review of BWRX-300 parameters that were not within the PPE.

Due to the smaller footprint and physical size of the BWRX-300 and selected design features the effects of the BWRX-300 deployment on the environment are generally less than those examined in the EIS. The EIS review determined that the conclusion of the 2009 EIS remains valid for the deployment of the BWRX-300 at the DNNP site, namely that the DNNP will not result in any significant adverse environmental effects, provided the mitigation measures are implemented.

7.0 References

[R-1] CNSC License, "Nuclear Power Site Preparation Licence OPG New Nuclear at Darlington Generating Station" PRSL 18.00/2031 E-DOC 6504521, Oct. 21, 2021

[R-2] IAE, Nuclear Power, 2021

[R-3] International Panel on Climate Change, "Global Warming of 1.5 C, An IPCC Special Report on the impacts of global warming of 1.5 C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty," 2018.

[R-4] OPG Plan "Building A Brighter Tomorrow Our Climate Change Plan" Nov. 26, 2020

[R-5] OPG Report, "Darlington New Nuclear Project Commitments Report", CD# NK054-REP-01210-00078, Aug. 31, 2022

[R-6] OPG letter, J. Hankinson to M. Leblanc, "Application for a Site Preparation Licence - New Nuclear Power Generation", CD# N-CORR-00531-03717, September 20, 2006.

[R-7] OPG Report, "Environmental Impact Statement New Nuclear - Darlington Environmental Assessment", CD# NK054-REP-07730-00029-R000, September 2009.

[R-8] Joint Review Panel Environmental Assessment Report, "Darlington New Nuclear Power Plant Project", Aug 25, 2011

[R-9] CNSC License, "Nuclear Power Site Preparation Licence OPG New Nuclear at Darlington Generating Station" PRSL 18.00/2022 E-DOC 3990795, Aug. 17, 2012

[R-10] OPG Letter, M. Knutson to D. Saumure, "Darlington New Nuclear Project-Application for License to Construct A Reactor Facility", CD# NK054-CORR-00531-10738, Oct. 31, 2022.

[R-11] OPG Report, "Darlington New Nuclear Project Environmental Impact Statement Review Report For Small Modular Reactor BWRX-300" CD# NK054-REP-07730-00055 R01, June 28, 2023.

[R-12] CNSC Notice of Public Hearing and Funding "CNSC to conduct a public hearing on applicability of the Darlington New Nuclear Project environmental assessment and plant parameter envelope to the selected reactor technology" 2024-H-02, April 3, 2023

[R-13] OPG Report, "Use of Plant Parameters Envelope to Encompass the Reactor Designs being considered for the Darlington Site", N-REP-01200-10000 R06, July 14, 2023.

[R-14] CNSC Regulatory Document, "Site Evaluation and Site Preparation for New reactor Facilities", REGDOC-1.1.1 Version 1.2 July, 2022

[R-15] Tennessee Valley Authority "Cinch River Nuclear Site, Early Site Permit Application" Section 2.0. April 8, 2019.

[R-16] IAEA Report "Defense in Depth in Nuclear Safety" INSAG-10, 1996.

[R-17] ASCE Standard "Minimum Design Loads and Associated Criteria for Buildings and Other Structures" ASCE/SEI 7-16", 2017

Glossary

ACR-1000- The Advanced CANDU Reactor®1000 design is Atomic Energy of Canada Limited's evolutionary, 1200 MWe class pressure tube reactor

AP-1000-The AP1000® Plant is a two-loop pressurized water reactor from Westinghouse. It has a gross power rating of 3,415 megawatt thermal (MWt) and a nominal net electrical output of 1,110 megawatt electric (MWe).

ASBWR- The Advanced Boiling Water Reactor is a BWR from GE-Hitachi with an up to 1460 MWe net generation.

EC6-The Enhanced Candu 6® is a 700 MWe class heavy-water moderated and cooled pressure tube reactor

ESBWR-The Economic Simplified Boiling Water Reactor (ESBWR) is a 1520 MWe boiling water reactor.

OPR1000- The OPR-1000 is a two loop 1000 MWe PWR nuclear reactor, developed by KHNP and KEPCO.

US-APWR- The USAPWR is a 4451MWt pressurized water reactor by Mitsubishi Heavy Industries Lt.

US-EPR- The U.S. EPR is an evolutionary pressurized-water reactor (PWR), designed by AREVA NP, Inc. It is a four-loop plant with a rated thermal output of 4,500 MWt.

Acronyms

ASME- American Society of Mechanical Engineers

BWR- Boiling Water Reactor

CEAA- Canadian Environmental Assessment Act

CNSC - Canadian Nuclear Safety Commission

CMD- Commission Member Document

CSA - Canadian Standards Association

CRD- Control Rod Drive

CNEP - Consolidated Nuclear Emergency Plan

DN - Darlington Nuclear

DNGS - Darlington Nuclear Generating Station

DNNP - Darlington New Nuclear Project

DWMF - Darlington Waste Management Facility

EA - Environmental Assessment

EIS - Environmental Impact Statement

ERA - Environmental Risk Assessment

FSF- Fundamental Safety Function

GEH- General Electric Hitachi

GHG- Greenhouse Gases

GOC- Government of Canada

IEA-International Energy Agency

IAEA - International Atomic Energy Agency

ICS- Isolation Condenser System

IO- Infrastructure Ontario

JRP - Joint Review Panel

LCH - Licence Conditions Handbook

LOCA- Loss of Coolant Accident

LTC - Licence to Construct

masl - Metres Above Sea Level

mSv - millisievert

MWe - megawatt electric

NGS - Nuclear Generating Station

NWMO - Nuclear Waste Management Organization

OPG - Ontario Power Generation Inc.

OPEX- Operating Experience

PIE-Postulated Initiating Event

PPE - Plant Parameter Envelope

PRSL - Power Reactor Site Preparation Licence

REGDOC - Regulatory Document

RPV- Reactor Pressure Vessel

SPV- Single Point Vulnerabilities

SRV- Safety Relief Valves

USNRC-U.S. Nuclear Regulatory Commission