



**Written submission from
GEH SMR Technologies
Canada Inc. & GE-Hitachi Nuclear
Energy Americas, LLC**

**Mémoire de GEH SMR Technologies
Canada Inc. & GE-Hitachi Nuclear
Energy Americas, LLC**

In the Matter of the

À l'égard d'

Ontario Power Generation Inc.

Ontario Power Generation Inc.

Application for a licence to construct one BWRX-300 reactor at the Darlington New Nuclear Project Site (DNNP)

Demande visant à construire 1 réacteur BWRX-300 sur le site du projet de nouvelle centrale nucléaire de Darlington (PNCND)

**Commission Public Hearing
Part-2**

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

January 8, 2024

8 janvier 2024



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**GEH SMR Technologies Canada, Ltd.
GE-Hitachi Nuclear Energy Americas, LLC**

M240245
November 4, 2024

Ms. Candace Salmon
Commission Registrar

Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
280 Slater Street
Ottawa, Ontario K1P 5S9

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Subject: CMD 24-H3: Written Submission in Support of the Ontario Power Generation, Inc. (OPG) Application for a Licence to Construct a BWRX-300 Reactor at the Darlington New Nuclear Project Site (DNNP)

Dear Ms. Salmon,

On behalf of GEH SMR Technologies Canada, Ltd. (GEH SMR Canada) and GE-Hitachi Nuclear Energy Americas, LLC (GEH-A), together referred to as “GE Hitachi”, this written submission is provided in support of the Ontario Power Generation, Inc. (OPG) application for a Licence to Construct the first of four BWRX-300 reactors at the Darlington New Nuclear Project Site (DNNP).

GE Hitachi is a world-leading provider of advanced reactor technology, fuel and nuclear services. The BWRX-300 is a tenth generation Boiling Water Reactor (BWR) which incorporates lessons learned in design from over 100 previous BWRs that have been built, operated, and in some cases, decommissioned. With over 60-years of operating experience, GE Hitachi’s design of the BWRX-300 reactor core and control rod design philosophy are not first-of-a-kind. Concurrently, with 67 reactors licensed in 10 countries, GE Hitachi has been instrumental in engineering, design, procurement, manufacturing, and construction of nuclear power plants, globally.

GE Hitachi has operated as a committed, local partner in Canada since 1892, and has been a pioneer for Canada’s commercial nuclear energy industry since the 1950’s. In 1962, GE Hitachi participated in a consortium that developed Canada’s first nuclear power plant, the Nuclear Power Demonstration (NPD) unit. In the 1970s and 1980s, GE Hitachi supplied fuel handling equipment for the Bruce and Darlington Nuclear Generating Stations located in Ontario and supplied manufactured fuel for the CANDU fleet for several decades. GEH SMR Canada is also located in Markham, Ontario, with over 155 employees supporting deployment of the BWRX-300 in Canada.

GE Hitachi has reviewed the written submissions made by Canadian Nuclear Safety Commission (CNSC) staff (CMD 24-H3) and OPG (CMD 24-H3.1) and agrees, as outlined in CMD 24-H3, that OPG, as the licence applicant, meets the requirements set forth in paragraphs 24 (4)(a) and (b) of the *Nuclear Safety and Control Act*, including that OPG is qualified to carry on the activities authorised by the licence, and supports CNSC staff’s recommendation to the Commission to issue a Licence to Construct for a single BWRX-300 reactor at the DNNP site.

GE Hitachi supports the conclusions of CNSC staff in determining that OPG has provided sufficient information to support a recommendation to the Commission on the licence, that OPG is qualified to carry out the proposed activity of constructing a single BWRX-300 reactor, and that OPG will make adequate provisions for the protection of the environment, health and safety of persons, and maintain national security measures required to implement international obligations to which Canada has agreed. It is noted that assessments to support CNSC staff conclusion are based on review of the safety case for the BWRX-300 as described in the *OPG DNNP BWRX-300 Preliminary Safety Analysis Report (PSAR)*, and supporting documents formally submitted through OPG's Licence to Construct application, together forming the licensing basis.

GE Hitachi appreciates the opportunity to participate in the public commission hearing and the opportunity to be heard before the Commission.

Should you have any questions, please contact Suzanne Karkour at suzanne.karkour@ge.com (289-385-193) or Sean Sexstone at sean.sexstone@ge.com (910-200-4976).

Sincerely,



Suzanne Karkour

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Vice President, New Power Plant Licensing
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Sean Sexstone

President
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Written Submission By:



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Before the Canadian Nuclear Safety Commission

Part 2 Public Hearing – Ontario Power Generation, Inc. (OPG) Application for a Licence to Construct a BWRX-300 Reactor at the Darlington New Nuclear Project Site (DNNP)

Reference Commission Member Document (CMD)
CMD24-H3

CNSC Public Hearing Scheduled for:
January 8-10, 2025

GE Hitachi Supports CNSC Staff Recommendation

GE Hitachi supports Canadian Nuclear Safety Commission (CNSC) staff's recommendation to the Commission to issue to Ontario Power Generation (OPG) a Licence to Construct for a single BWRX-300 reactor at the Darlington New Nuclear Power (DNNP) site.

GE Hitachi has reviewed the written submissions made by CNSC staff (CMD 24-H3) and OPG (CMD 24-H3.1) and firmly believes that OPG is qualified and competent to carry out the Licence to Construct activities in accordance with section 24(4)(a) of the *Nuclear Safety and Control Act*, and that OPG will make adequate provisions for the protection of the environment, health and safety of persons, and maintain national security measures required to implement international obligations to which Canada has agreed. Based on information presented by CNSC staff in CMD 24-H3, GE Hitachi is of the position that OPG has met all requirements imposed by the *Nuclear Safety and Control Act*, the *General Nuclear Safety and Control Regulations* (GNSCR), and the *Class 1 Nuclear Facilities Regulations* (C1NFR) for the construction of a Class 1 facility and as per CNSC staff expectations for a Licence to Construct application.

As outlined in CMD24-H3, CNSC staff have determined that OPG has provided sufficient information to recommend the Commission issue a Licence to Construct. GE Hitachi staff acknowledge the commitments summarized in the proposed draft *Licence* PRCL 32.00/2035 and draft *Licence Conditions Handbook* LCH-PRCL-DNNP with which OPG must comply. GE Hitachi has full confidence in OPG's ability to fulfill the commitments as summarized in Appendix D.2 - *Summary List of BWRX-300 Licensing Regulatory Commitments for Construction*.

Integrated Project Delivery Framework

As detailed in CMD24-H3 Section 2.1.2.1, OPG is employing an Integrated Project Delivery (IPD) model for the Licence to Construct phase with its partners. The IPD framework promotes long-term project success by providing a diverse range of expertise and services to develop, engineer and construct the BWRX-300. The IPD framework has been successfully used in the transportation and construction industries, for example, as a lean tool to deliver projects on-time and with quality. This innovative framework is structured to combine the strengths and capacities of various team members to promote coordination and cooperation through project design, construction, and implementation. The IPD framework establishes strong mechanisms for owner/operator support through active involvement of a broad project team, comprised of the designer, constructor, architect, engineer, and other expertise.

GE Hitachi is the technology developer as part of OPG's IPD project team, responsible for design, procurement of major components, and engineering support. GE Hitachi is a world-leading provider of advanced reactors, fuel and nuclear services. As such, GE Hitachi is an experienced Boiling Water Reactor (BWR) and GNF technology developer with licensed, proven fuel and reactor designs. The BWRX-300 design leverages proven components and systems of the BWR technology and employs similar core configurations to the BWR operating fleet; such proven components include the steam separator, dryers, nuclear instrumentation and the reactor pressure vessel, among others. The design also incorporates know-how and construction techniques of the BWR technology – leveraging the use of existing GNF2 fuel, licensed by the U.S. Nuclear Regulatory Commission (NRC). Through collaboration with GE Hitachi, Atkins Réalis, and Aecon, OPG is able to leverage decades of nuclear energy experience in delivering the BWRX-300 at DNNP.

In addition to its fuel, the BWRX-300 utilizes design tools that are qualified and licensed by the U.S. NRC. This includes the use of Transient Reactor Analysis Code “GE Hitachi” (TRACG) described in CMD24-H3, Section 2.4.2.3.4.1 and the use of Licensing Topical Reports in design and safety analysis approaches for the BWRX-300. GE Hitachi maintains established and mature relationships with vendors, such as Hitachi-GE Nuclear Energy Ltd. (HGNE), to pull on expertise in manufacturing of major components. Other IPD team members also have extensive experience in nuclear energy and reactor projects. Atkins Réalis, as the architect engineer providing design, engineering and procurement support, and Aecon, as the constructor providing construction planning and execution for the BWRX-300, have mature management systems and long-established partnerships in Canada. The innovative IPD project agreement, which leverages strengths across four companies, is strategically assembled to successfully deliver the first Small Modular Reactor (SMR) in North America.

The BWRX-300 Design and Licensing Process

GE Hitachi has designed and built proven and safe Boiling Water Reactors (BWRs) for over 60 years and maintains a mature and robust design control process. A rigorous design process is used to define the design requirements, develop and maintain design basis, authorize design changes, maintain configuration control, and ensure that work is performed by qualified and competent people under established organizations for the BWRX-300. GE Hitachi employs highly experienced, qualified experts who have designed and operated the BWR technology. Industry experts on staff also include team members in licensing, engineering, and safety analysis from Canada’s nuclear portfolio. Work at GE Hitachi is conducted in accordance with the U.S. NRC accepted NEDO-11209-A, *Quality Assurance Program Description*. OPG has confirmed that GE Hitachi, as the technology developer in the IPD, has an established management system that meets the design control requirements of CNSC REGDOC-2.5.2, Section 5, and CSA N286-12, among other regulatory requirements.

In supporting global deployment opportunities, GE Hitachi is designing the BWRX-300 standard plant to align with international requirements and guidance. As such, GE Hitachi is uniquely positioned to engage with the international community to support harmonization of requirements, and is an active member of the World Nuclear Association (WNA) CORDEL Working Group, the International Atomic Energy Agency (IAEA) Nuclear Harmonization Standardization Initiative (NHSI), the European Commission Pre-Partnership on Benchmarking of Small Modular Reactors, the European Industrial Alliance, the Nuclear Energy Institute, the United States Nuclear Industry Council (U.S. NIC), and The Nuclear Innovation Alliance (NIA).

GE Hitachi is also a member of the Institute of Nuclear Power Operators (INPO) and is engaged in working groups, such as with the Canadian Standards Association (CSA) supporting codes and standards development in Canada and the CANDU Owners Group.

GE Hitachi acknowledges that the CNSC is a world-class regulator with established cooperation agreements with other regulators to support its mandate and commends its support for collaboration and engagement with the international regulatory community.

BWRX-300 is an Industry Best Standard

The BWRX-300 is the tenth generation Boiling Water Reactor (BWR) which incorporates lessons learned in design from over 100 previous BWRs that have been built, operated, and in some cases, decommissioned. Each generation of the BWR provides design engineers the opportunity

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to incorporate improvements into the overall plant design. The Control Rod Drive System, as an example, was redesigned for the Advanced Boiling Water Reactor (ABWR) to include Fine Motion Control Rod Drives (described in A.2.5.4.3 – *Design of Reactivity Control Systems*) and was further improved for the Economic Simplified Boiling Water Reactor (ESBWR) licensed by the U.S. NRC. In designing the BWRX-300, GE Hitachi introduced additional operating experience in the Control Rod Drive system by designing it also to include dedicated battery power motor back-up to the Fine Motion Control Rod Drives. The design of passive safety systems and functions also leverage the design and licensing basis of GE Hitachi's Economic Simplified BWR (ESBWR).

The BWRX-300 at DNNP is not only Canada's first new reactor since the 1990s but will also mark the first BWR type reactor in Canada. With over 60-years of operating experience, GE's design of the BWRX-300 fuel, reactor core and control rod, as examples amongst many others, are proven and not first-of-a-kind designs. Industry best practices and lessons learned are incorporated in system and component designs and adopted in GE Hitachi's managed system. As the technology developer, GE Hitachi believes that the BWRX-300 meets the regulatory requirements or the safety objectives of those requirements, of the CNSC for design of a reactor facility. OPG continuously performs intrusive oversight of design activities as the owner and licensee of the BWRX-300 at DNNP.

As a technology collaborator, GE Hitachi has developed a partnership with OPG, Tennessee Valley Authority, and ORLEN Synthos Green Energy to support the design and deployment of the BWRX-300. Through this partnership, OPG is an active participant in the BWRX-300 design decision making process ensuring that Canadian standards and requirements are upheld.

Concluding Remarks

GE Hitachi supports the conclusions of CNSC staff in determining that OPG has provided sufficient information to support a positive recommendation to the Commission on the issuance of a licence, that OPG is qualified to carry out the proposed activities of constructing a single BWRX-300 reactor, and that OPG will make adequate provisions for the protection of the environment, health and safety of persons, and maintain national security measures required to implement international obligations to which Canada has agreed. GE Hitachi have full confidence in OPG's ability to fulfill the commitments as summarized in Appendix D.2 - *Summary List of BWRX-300 Licensing Regulatory Commitments for Construction* and support CNSC staff's recommendation that the Commission issue to OPG a Licence to Construct a single BWRX-300 reactor at the DNNP site.