Topics

Questions of a similar nature have been bundled or paraphrased, without losing the original intent. If, after reviewing this document, you have outstanding questions, please reach out through the opg.com/newnuclear contact form.

Environmental Assessment

Is there an evaluation of the impact from the BWRX-300 to the local environment?

A: The Darlington New Nuclear Project (DNNP) was subject to an Environmental Assessment (EA) under the Canadian Environmental Assessment Act (CEAA). The scope for the assessment included the site preparation, construction, operation, and decommissioning of up to four new nuclear power reactors to produce up to 4,800 megawatts of electrical generating capacity. Once the BWRX-300 reactor was selected, we thoroughly assessed the technology to demonstrate that it fits within our existing accepted EA.

We completed a comparison of BWRX-300 design parameters with the DNNP Plant Parameter Envelope (PPE) values, and a comprehensive review of the Environmental Impact Statement (EIS) for the selected reactor technology.

The effects of the BWRX-300 Small Modular Reactor (SMR) deployment on the environment are within the existing assessment envelope and generally less than those examined in the EIS.

The EIS review has determined that the conclusion of the 2009 EIS remains valid for the deployment of the BWRX-300 at the DNNP site.

What is the aquatic environmental impact?

A: The DNNP is committed through the EA to operate its intake and diffuser systems to the same high standards as at our existing Darlington Nuclear Generating Station.

There are extensive thermal plume impact studies being done now to ensure a low impact to the surrounding waters from the discharge diffuser. Any impacts to aquatic habitat will be evaluated and compensated in order for OPG to proceed with obtaining the Fisheries and Oceans Canada authorization to construct the intake and diffuser structure.

Have there been any environmental releases from nuclear power plants in the last 50 years?

A: Information on OPG's nuclear power plant emissions is published in our quarterly emissions data reports as well as in annual Environmental Monitoring Program reports. Both reports are available to the public on OPG's webpage at https://www.opg.com/reporting/regulatory-reporting/.

Will there be an impact to the Great Lakes Waterfront Trail?

A: In February 2023, the DNNP began work to prepare and construct a road needed to transport soil to an area on the northeast side of the Darlington site. To ensure the safety of the public, this portion of the trail was rerouted along Energy Drive. Signage is posted on the trail for users' reference.

We will seek to re-establish full access to, and use of, the Waterfront Trail in stages once safe access can be provided.

Are OPG's climate change goals based on the amount of carbon created during the entire nuclear fuel cycle, or on the amount of carbon emitted during the operating phase?

A: Our Climate Change Plan (CCP) accounts for direct emissions from our operations (Scope 1) and indirect emissions from our electricity use (Scope 2); the CCP did not account for lifecycle emissions.

However, we recognize that lifecycle emissions are important to consider. OPG's value chain (the business activities and processes involved in creating a product or performing a service, akin to a lifecycle) includes indirect greenhouse gases released due to activities that go beyond our control (Scope 3), but that we can influence. As such, we are working to understand our value chain emissions to reduce them where practical on this and future projects.

You can learn more about our climate goals by reading OPG's CCP available at www.opg.com/climatechange

Technology & Small Modular Reactors

Is OPG considering new Canada Deuterium Uranium (CANDU) technologies for the DNNP? If not, why?

A: CANDU technology forms the backbone of our nuclear generating fleet; we have invested (and continue to invest) in the Darlington Refurbishment project and are now looking into the feasibility of refurbishing the Pickering station.

For the DNNP, we have selected the BWRX-300 SMR for deployment. There is a strong market demand for SMRs as a flexible, scalable option to help address projected capacity needs, and to replace coal in many jurisdictions.

Throughout the development of the DNNP, we will continue to reinforce Canadian content requirements to ensure the Canadian supply chain will be maximized to the extent possible in design, construction, and operational support.

What happened to the other SMR designs?

A: Throughout 2020, we underwent a due diligence process, which included a deep dive into certain SMR technologies. From there, we refined the list to three developers who possessed technology we felt satisfied our commitments and goals.

Each technology was assessed against a number of key areas, such as: safety, technological readiness, licensability at our Darlington site, environmental impact, and economics.

All the technologies we looked at have a great deal of promise for future deployment and the companies continue to advance the designs.

Would OPG ever consider another type SMR in the future?

A: Our team is focused on the successful deployment of an SMR at the Darlington site. Success on an SMR at Darlington could lead to additional units at the site, along with potential deployment elsewhere in Ontario, depending on future needs.

Last year, we announced a partnership and investment into X-Energy to look at potential for industrial applications with their SMR technology. We are also working with Ultra Safe Nuclear Corporation (USNC) on the Global First Power (GFP) Project, a Micro Modular Reactor (MMR) best suited for off-grid or remote locations.

What is the size and total output of the BWRX-300?

A: The BWRX-300 is just over 300 megawatts electrical – enough to power approximately 300,000 homes.

One BWRX-300 reactor and associated building structures has a comparable footprint to a football field. The smaller unit and footprint means there is less environmental impact, something that is a key focus as we continue project planning.

What is the life cycle of a SMR?

A: Based upon the initial design, the BWRX-300 is expected to have an operational life of approximately 60 years.

Is the BWRX-300 Canadian built and designed? Is there a separate Supply Chain team for the DNNP or is OPG going to work with the Approved Supplier List?

A: These Ontario reactors will be Canadian-built by the Building Trades Unions (BTU), with a significant percentage of Canadian content.

We have a very strong nuclear supply chain in Ontario that serves our current plants, and we want to leverage that Canadian quality and know-how to increase the economic potential for Ontario and Canada.

The nuclear areas of the plant, like the containment, will be built by companies that have an audited and approved nuclear quality program.

While we do have a separate team developing the supply chain for this project because it is a new reactor type for OPG, we will also be utilizing our existing approved supplier list where it includes qualified companies. We encourage companies to go through the qualification process to get on our suppliers list.

Can SMR technology operate at remote sites without access to bodies of cooling water?

A: There are SMR designs that don't require external water for cooling; the GFP MMR, for example, is a high-temperature gas reactor that uses helium for heat transfer and does not require external sources of water for cooling.

What enables the use of light water rather than heavy water?

A: In our existing Canadian stations, we use natural uranium fuel and heavy water (D_2O) to help moderate the nuclear reaction. In a light water reactor like the BWRX-300, regular water (H_2O) is used with low enriched fuel (from 3%-5% enrichment) that enables a sustainable nuclear reaction in the reactor core.

What are the basic raw materials that are needed for a SMR?

A: For the most part, the raw materials from a construction standpoint are no different than any other major project or power plant. What is unique, is the fuel that would be sourced. For our CANDU stations for example, we sourced that fuel within Canada. The fuel for the BWRX-300 would be sourced from GE Hitachi, the reactor developer, who manufacture the fuel themselves in the US.

If SMR technology has been in operation for over 50 years, why are we only starting to deploy SMRs now?

A: While some of the SMR technologies being explored today are based on new concepts, others are based on years of nuclear technology and operations experience and learning.

The technology used in the BWRX-300 uses the same fission technology that has been used for decades in larger boiling water reactors throughout the world.

Are any other countries interested in SMR deployment? Does OPG have any plans to provide its SMR expertise to other countries that plan to build their own SMR?

A: The SMR market includes many interested countries such as the United States, France, United Kingdom, Poland, Estonia, Romania, Czech Republic, Lithuania, Finland, Argentina, Japan, Ghana, Kenya, South Africa, Puerto Rico, and the Philippines.

The United States is planning for at least three on-grid SMRs in the late 2020s on a timeline similar to OPG. France, United Kingdom, Estonia, Poland, and Romania are all targeting for the 2030s.

We have partnered with the Tennessee Valley Authority, one of the most experienced operators in boiling water reactors, to advance the DNNP, gain learnings, and support development and deployment of the reactor technology. We've also signed a Memorandum of Understanding with Czech-Republic based ČEZ to collaborate on advancement of nuclear technology, including SMRs, to safely produce clean, reliable electricity in their jurisdictions.

In March, we announced our intention to cooperate with the Tennessee Valley Authority and Poland's Synthos Green Energy on the global deployment of the BWRX-300 SMR. Each party will contribute funding toward the development of a standard design of the BWRX-300 and together form a Design Center Working Group to ensure that the standard design can be deployed in multiple jurisdictions.

In addition, our subsidiary, Laurentis Energy Partners, has signed a Master Services Agreement with Synthos Green Energy to support the development and deployment of SMRs in Poland.

We are learning from experts and sharing our knowledge and excellence in project deployment.

Will the BWRX-300 assist in generating medical isotopes?

A: Our nuclear assets continue to be a major producer of life-saving medical isotopes through our existing CANDU fleet. The BWRX-300 offers the capability to harvest isotopes, which will be explored in the future.

Do SMRs create more waste than other reactor technologies?

A: It's important to note that not all SMRs are the same; there are different fuel types and different technologies. The SMR that we're building at Darlington is very similar to light water reactors that are in operation today. Studies are continuing to determine the specific waste profile for the BWRX-300 as compared to operating BWRs.

As with our existing fleet of reactors, we continue to focus on the key pillars of reduction in volume and reuse and recycling to further reduce the volume of waste. We are very focused on our environmental impact, so waste minimization is something we're incorporating into the design considerations as well as our plans for operating and maintaining the reactor.

OPG has a long history of safely managing radioactive wastes and wastes from the BWRX-300 will be handled in a comparable manner, with the same degree of care and control.

Fuel Availability and Cycle

Where will fuel for the BWRX-300 be sourced from? Are contracts in place for BWRX-300 fuel already? Where is the fuel enriched and manufactured?

A: The BWRX-300 will use the same low enriched uranium currently used in many Boiling Water Reactors (BWRs) worldwide.

We will source the SMR fuel from GE Hitachi's fuel division in the United States. The United States is re-establishing larger scale enrichment, and there are other Western enrichment sources as well.

How long can SMR technology operate between fuel changes? Can this design be refueled online?

A: Boiling water reactors, including the BWRX-300, are fueled during short duration refueling outages. To begin with, we will likely plan for a 12-month cycle between refueling outages, however, this timeline can be revisited as the unit is operated to find the optimal cycle which can be up to 24 months.

What are the characteristics of fuel waste and irradiated fuel? How will BWRX-300 fuel waste differ from other CANDU or previous BWR technologies' fuel waste?

A: Uranium found in nature consists largely of two isotopes, U-235 and U-238. Natural Uranium (used in OPG's CANDU reactors) contains 0.7% of the U-235 isotope. The BWRX-300 is a light water reactor and requires Uranium to be enriched from 0.7% to

between 3% and 5% U-235; this designated Low-Enriched Uranium (LEU) used by the BWRX-300 reactor, is the same fuel used in many BWRs worldwide.

The fuel is arranged into a fuel bundle, which is an assembly of fuel rods filled with uranium pellets. The dimensions of the fuel are about 4 metres tall and 14 cm wide in a square assembly, which is longer than the fuel used in CANDU reactors.

Where will the fuel waste be stored, both short term and long term?

A: We have existing programs and resources which will be leveraged to safely manage the waste and by-products from the DNNP, just as we have done for decades for our existing nuclear fleet.

Once the fuel has reached its end of useful life in the core, it will be moved from the reactor, underwater, safely, to a spent fuel pool where it will reside for approximately eight years (in a process very similar to the way in which we've managed spent fuel at our existing sites for the past 50+ years). After this time, the irradiated fuel is moved to dry storage in an approved storage cask which will be stored in a licensed and approved waste storage structure at the site where the waste was generated.

As for the long term, OPG and GE Hitachi are actively engaged with the Nuclear Waste Management Organization (NWMO) to ensure a long-term solution for safe storage of the irradiated fuel. Under the Nuclear Fuel Waste Act, the NWMO has responsibility for long-term management for all of Canada's used fuel. The NWMO's plan is to have a Deep Geologic Repository (DGR) in service in the 2040s for Canada's used fuel, including used fuel from new nuclear facilities.

Is there any research being done towards recycling or finding a use for the used fuel?

A: The capability to reprocess spent fuel exists and there are facilities in other countries that do it. That is referred to as mixed oxide fuel, which can be reused in reactors. We don't have that capability in Canada, yet; the designs of the ARC and Moltex reactors being considered for deployment in New Brunswick have the potential to use spent fuel.

Emergency Preparedness

What emergency systems are built in to the BWRX-300 design?

A: Following the defence in depth principle, the BWRX-300 design utilizes several safety features including passive safety systems. Among these is a highly reliable, diverse means for shutdown, as well as pools of water that provide passive cooling with minimal operator action and without reliance on external power.

The proposed DNNP facility will utilize security by design principles, creating engineered barriers against malevolent acts. The protected area will include detection and assessment and access control devices that meet or exceed the requirements of the Canadian Nuclear Safety Commission (CNSC).

How does OPG engage and prepare residents of host communities to respond to emergency situations?

A: We collaborate with our federal, regional, and municipal partners on nuclear emergency planning communication strategies targeted at both local and broader communities. We are also a member of the Nuclear Public Education Sub-Committee of the Nuclear Emergency Management Coordinating Committee (NEMCC) led by Emergency Management Ontario, which is developing a coordinated strategy and implementation plan for nuclear emergency communications. We also maintain a very comprehensive emergency preparedness website located at Keeping communities safe > Nuclear safety and emergency preparedness - OPG

Do SMRs have smaller Emergency Planning Zones?

A: In Canada, the provincial and territorial governments have primary responsibility for offsite nuclear emergency planning and response to protect public health, property and the environment. As part of the licensing process, we are required to provide the necessary information for the provincial authorities to effectively establish their emergency planning policies, including establishing the size of the Emergency Planning Zones (EPZs).

As a result of the passive safety features and simplicity of design, the BWRX-300 is expected to have smaller sized EPZs.

Licencing process & timelines

What is the current timeline associated with the DNNP?

A: The CNSC has announced that the first Licence to Construct hearing will occur in January 2024 and we anticipate a decision on the licence by early in 2025. Upon

issuance of a Licence to Construct, we would commence construction right away, having spent the previous year conducting site preparation work under the existing Site Preparation Licence.

Our planning goal is to have construction complete by 2028 and commercially in service by early 2029.

What measures is OPG taking to expedite the approval processes by the CNSC considering the lack of experience with BWR technology in Canada?

A: We are following the licensing process as established by the CNSC, and ensuring we meet all regulatory requirements.

We are also engaging and partnering with other organizations that have relevant experience - particularly experience working with BWRs - to ensure we are in a ready position to carry out the licensed activities.

What is the process to oppose this construction?

A: There are many opportunities and avenues for submitting interventions and expressing perspectives on licence applications.

The standard process is through public interventions ahead of the Commission hearings that take place before any licensing or Commission decision. In addition, the CNSC publishes Regulatory Oversight Reports which offer information on the safety performance of Canadian licensees; these are discussed and intervened upon at Commission meetings.

In the case of the DNNP, the CNSC has started the public consultation process early because we've made a significant amount of the documentation for the Licence to Construct application available from the beginning, in parallel with our submission.

In addition, we conduct our own public engagement activities, including Public Information Sessions, which include thorough question and answer periods.

Is there any possibility of obtaining a site licence for SMRs at the other sites?

A: The Independent Electricity System Operator (IESO) released its *Pathways to Decarbonization* report at the end of 2022, which presents achievable potential pathways to the decarbonization of Ontario's electricity system.

The report, which identifies opportunities and challenges to consider on the pathway to net-zero, is premised on the prediction that an additional 69,000 MW of non-emitting supply will be required. Their recommendations to achieve a decarbonized supply mix by 2050 include contributions from new nuclear, conservation, demand response, renewables and storage. Specifically, the scenario requires an additional 17,800 MW of nuclear supply online by 2050.

Over the next couple of years, we will evaluate the potential at all of our sites for future energy projects, which could include nuclear. We believe achieving net-zero will require an 'all tools in the toolbox' approach.

Would subsequent SMRs require individualized licence applications and review processes? Or would these reactors be included in the existing application through a licence amendment process?

A: We are focused on successful deployment of one SMR unit at the Darlington site, while planning infrastructure for future units, if approved. For subsequent units, a licencing amendment process would likely follow.

Is OPG concerned with lengthy permitting and licensing timelines associated with SMR applications in remote mining communities?

A: We continue to work with the regulator, the impact assessment act, and government of Canada to find ways to make the process more efficient. Recently, the Federal Government announced they are investing 1.6 billion dollars with the Impact Assessment Agency to increase their capacity.

Does the current Preliminary Safety Analysis Report include postulated nuclear accidents and Plant Risk Analysis?

A: Yes, it does. As part of the Preliminary Safety Analysis Report (PSAR), there are requirements to include safety analyses. Generally, we have two different categories: Deterministic Safety Analysis and Probabilistic Safety Analysis. Each of these categories have regulatory requirements outlined in the documents that we need to comply with and that is contained within the PSAR.

Is it possible an existing reactor could be decommissioned at the same time as construction on the BWRX-300? Does this present any issues to manpower requirements?

A: Our Pickering Nuclear Generating Station is approaching its end of life. The decision as to when to decommission Pickering is still being assessed. There is also a feasibility study underway to assess the possibility of extending the life of some of Pickering's units while reviewing safe storage and decommissioning options for the others.

Pending licence approval, the construction window for the first SMR at Darlington falls within the 2025-2029 timeframe. This aligns well with the completion of the Darlington Refurbishment Project work and potential resources becoming available.

We have a number of programs in place, working closely with the communities, schools, colleges, and universities, as well as a number of trades unions to ensure we attract talent into this sector. For example, we attend various trades conferences, in alignment with the Unions, to attract younger generations into the trades.

Cost & electricity needs for Ontario

How much capital is needed up front to ensure this project and its operations continue well into the future?

A: Cost is a very important part of the SMR discussion and is something we continually assess as the design is being developed and opportunities present themselves for efficiencies during development, construction, and future operations.

Our goal is to have a release quality cost estimate before we make a construction decision at the end of 2024.

Will SMRs allow for lower cost of electricity for residents of Ontario?

A: As the largest electricity provider in Ontario, we help moderate the price of electricity. The broader energy plan depends on developing a solid base of clean electricity generation, including nuclear. As this project is very competitive with other forms of clean energy, we are confident it will help us maintain our advantage and continue as the lowest cost producer of electricity in the province.

Could OPG import electricity from Quebec to help meet intermittency needs?

A: Importing electricity from neighbouring jurisdictions is important for the reliability of the grid. However, it is not possible to rely solely on imports to solve the baseload capacity needed to meet Ontario's emerging year-round energy needs, nor will relying heavily on imports support Ontario's economic and environmental objectives to build out new clean energy infrastructure here in the province.

How will northern remote communities afford SMR expansion?

A: OPG and USNC are working together through GFP on a MMR commercial demonstration project at Chalk River. The goal of this project is to demonstrate that MMRs are cost-competitive when compared to the diesel generation currently used in remote locations.

Miscellaneous

What is the status of OPG's new corporate headquarters in Clarington? When is the project expected to be complete, and is this where DNNP staff would sit?

A: On Feb. 13, 2023, OPG announced the Agreement of Purchase and Sale for the former General Motor's (GM's) of Canada building, which will serve as our new corporate headquarters.

This announcement demonstrates our long-term commitment to powering jobs in Durham Region for decades to come; bringing together non-station staff from 15 existing offices across the Greater Toronto Area, Niagara and Durham. We remain on track to move staff to our corporate campus in 2024/2025.

With our advancement of SMRs, nuclear generation, isotope production, and other clean energy technologies, the Darlington site has become an international destination. Partnerships will be activated to re-envision the Darlington Energy Complex as a world-class, clean energy learning, skills training, and innovation centre of excellence.

How much electricity is generated at the Robert Saunders Hydro Facility in Cornwall and the Beck Hydro Facility in Niagara Falls?

A: Robert Saunders Hydro Facility in Cornwall generates 1045 MW. The Beck 1 Hydro Facility in Niagara Falls is 446 MW and Beck 2 Hydro Facility is an additional 1499 MW.

When is the project hiring, and for what roles? Will the SMR be operated by less employees per megawatt compared to traditional CANDU reactors?

A: A 2021 **Conference Board of Canada study** projects that a 300-megawatt grid-scale SMR built in Ontario and operated for 60 years would create direct and related employment on an average annual basis of:

- Close to 700 jobs during project development
- More than 1,600 jobs during manufacturing and construction
- Over 200 jobs during operations, and
- About 160 jobs during decommissioning

Staffing requirements will be solidified as the design and planning for the unit progresses.

The project has opportunities posted for positions in our projects and implementation organization, support functions as well as engineering. Positions in operations and maintenance will be posted closer to commencement of commercial operation. Ensure you check back regularly to explore newly added career opportunities www.opg.com/careers/

Acronym List

- BTU - Building Trades Unions
- BWR - Boiling Water Reactors
- CANDU - Canada Deuterium Uranium
- CCP - Climate Change Plan
- CEAA - Canadian Environmental Assessment Act
- CNSC - Canadian Nuclear Safety Commission
- DGR - Deep Geologic Repository
- DNNP - Darlington New Nuclear Project
- EA - Environmental Assessment
- EIS - Environmental Impact Statement
- EPZ - Emergency Planning Zones
- GFP – Global First Power
- GM - General Motors
- IESO - Independent Electricity System Operator
- LEU – Low Enriched Uranium
- MMR - Micro Modular Reactor
- MoC - Memorandum of Cooperation
- NEMCC - Nuclear Emergency Management Coordinating Committee
- NRC - Nuclear Regulatory Commission
- NWMO - Nuclear Waste Management Organization
- PPE - Plant Parameter Envelope
- PSAR - Preliminary Safety Analysis Report
- SMR - Small Modular Reactor
- USNR - Ultra Safe Nuclear Corporation