ONTARIO POWER GENERATION

**Project Charter**

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Title:
# DARLINGTON NEW NUCLEAR PROJECT



**The Project Charter describes the business vision and scope of the project as defined by the line of business. Sections 1.0 through 5.0 are mandatory. Sections 6.0 onwards are recommended however not compulsory. The sponsor should determine whether completion of these sections is required based on the project cost, complexity and needs.**

## General Project Information

| | | | |
|---|---|---|---|
| **Project Number:** | 83274 | **Project Level:** | A |
| **Project Name:** | Darlington New Nuclear Project | **Facility/Site:** | Darlington |
| **Project Manager:** | N/A | **Executing Org:** | Enterprise Projects |
| **Project Manager R2:** | N/A | **Sponsor:** | Subo Sinnathamby |

## Project Charter Approval

| | |
|---|---|
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| **Reviewed by:**<br>Scott Ritzie<br>Project Director, DNNP | 23NOV2023 |
| **Approved by:**<br>Dragan Popovic<br>Senior Vice President, SMR Execution<br>**Project Sponsor** | 1/5/2024 |
| **Accepted by:**<br>Subo Sinnathamby<br>Chief Projects Officer<br>**Executing Organization Approval Authority** | January 11, 2024 |

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## 1.0 NEED BACKGROUND AND PROPOSAL

Ontario Power Generation (OPG) is seeking to grow its business and be a leader in energy innovation via the development of Small Modular Reactors (SMRs). Clean energy alternatives to reduce dependencies on fossil fuels is a priority growth opportunity for OPG. As the province moves to electrification additional generation will be needed to fulfill the expected increase in demand for energy.

To supply the capacity and energy needed, a diverse supply mix will be required. SMRs have the potential to be cost competitive against other clean energy options and provide job and economic benefits that intermittent renewables cannot. Consistent with OPG's Strategic Objectives and Climate Change Plan, enabling additional nuclear generation through SMRs will position OPG as an Energy Industry Leader and be a catalyst for a net-zero economy.

OPG has reviewed multiple SMR technologies and, over the course of 2021, worked with three developers to assess whether they would be a good fit at the Darlington site as well as for future deployments in the province. In December 2021 OPG selected GE Hitachi Nuclear Energy's BWRX-300 as its DNNP SMR technology. OPG's shareholder, the Minister of Energy, has instructed OPG to continue planning and preparation at the Darlington site. Additionally in July of 2023 the Minister instructed OPG to commence the planning and licencing for three additional SMRs at the Darlington New Nuclear site.

SMR technology will support addressing the following for the Ontario electricity market:

- Initiate path towards zero emissions (Immediate)
- Summer and winter capacity deficit (Short Term)
- Increased energy demand (Long Term)

The IESO has completed an analysis of the impact of one SMR on Ontario's electricity system. The analysis concluded that the addition of any of the three SMR technologies OPG considered for Darlington would help meet system capacity needs, reduce energy shortfalls, and reduce carbon emissions at a cost that is in line with the federal government's carbon rate of $170/tonne by 2030, with a minimal impact on the average annual system cost.

This project charter covers Darlington New Nuclear Project (DNNP) – the first four SMR generating stations in Ontario. OPG already holds an Environmental Assessment ("EA") approval and a CNSC Licence to Prepare Site, which are necessary and valuable assets to start an SMR project. Through the first phase of the capital project, OPG partnered with GE-Hitachi (GEH) to progress design and engineering work. Successful completion of this phase further demonstrated the viability and business case for an SMR at Darlington. In October 2022, OPG completed a significant project milestone with the submission for the Licence to Construct application to the CNSC. This licence application is the next step in the deployment of Canada's first SMR at the Darlington site.

## 1.1 Preliminary Project Level (Cost and Complexity Assessment) and Gate Strategy

The DNNP will be a highly complex program. Table 1-2 lists a preliminary breakdown of major scope areas. Within each of these areas there may be multiple projects.

Given the complexity of developing, designing, and building new nuclear technology, it will be broken down into phases with appropriate decision points and gates for progression. The gate strategy is documented in the Program Management Plan.

**Table 1-2. Major Scope Phases**

| Scope Area | | Description | Outcome |
|---|---|---|---|
| **I** | **Technology Development and Design** | Technology development and design of an SMR for on-grid application.<br>Constructability Reviews including incorporation of modular manufacturing techniques. | Management Plan Strategy.<br>Final technology/partner selection decision.<br>Business Case Approval.<br>CNSC Construction license. |
| **II** | **Site Preparation** | Activities required to prepare the site for reactor construction in accordance with the PRSL [1]. | Site prepared for reactor construction activities.<br>PRSL commitments met. |
| **III** | **Procurement & Manufacture** | Progress long lead items.<br>Develop modular manufacturing capability. | Long Lead item procurement.<br>Manufacture of modular components. |
| **IV** | **Construction** | Construction and testing of Reactor and supporting structures & systems. | Construction complete and turnover to Operations for commissioning. |
| **V** | **Operations Preparation** | Implementing the Management System, training staff, developing procedures, defining the operating organization, and implementing other tools (software/hardware). | Operations, Maintenance, and Engineering readiness.<br>Procedures issued.<br>CNSC Operating licence. |
| **VI** | **Commissioning & Unit Start up** | Commissioning & functional tests, fuel load, and synchronization. | First unit in-service for commercial operation. |
| **VII** | **Subsequent Unit Construction** | Complete sequential construction, licensing and turnover to Operations for commissioning. | Units 2, 3 and 4 unit in-service for commercial operation. |

## 2.0 PROJECT OBJECTIVES (CRITICAL SUCCESS FACTORS)

The principal objective of the DNNP is to lead new nuclear technology development to provide safe, clean, efficient, and sustainable power to the Ontario electrical grid in the next decade via an SMR at Darlington. The current goal is to commence construction of the first SMR in 2025, complete construction by the end of 2028, and commercially available by the end of 2029.

Primary Objectives and Success Factors:

1. SMR technology development and design

(i) Safe
   a. Inherently safe design and passive safety response systems.
   b. Off-site releases resulting from a bounding accident scenario are sufficiently low that the need for emergency actions outside the exclusion zone is eliminated.
   c. Security resilience.
   d. As low as reasonably achievable operator radiation dose and operating radiation emissions.

(ii) Clean – minimizes environmental impact over the project lifecycle and supports net zero carbon goals.

(iii) Sustainable – acceptable lifecycle fuel and waste management strategy.

(iv) Efficient – total cost of generation competitive in the Canadian energy market (carbon cost factored in).

(v) Adaptable – able to adapt to a range of site specific conditions which will enable deployment of the technology in a fleet approach.

2. Confirm the business case for design and construction of an SMR facility at Darlington.
3. Construction of an SMR facility on the Darlington site, with up to approximately 300MWe to the grid, complete by the end of 2028.
4. Design the site and infrastructure and construct up to 3 additional reactors of the same design on the site.

Supporting Objectives:

5. Support the establishment of a Canadian supply chain related to SMR build and maintenance, maximizing benefits to Durham Region, Ontario and Canada.
6. Partner with Government and other stakeholders to advance SMR regulatory and technical standard frameworks.
7. Engage and provide opportunities to Indigenous communities.
8. Engage, educate and seek support from key stakeholders, local government, and the surrounding community.
9. Support the vision of a Canadian fleet of SMRs, and specifically an SMR in western Canada in the early 2030's.

## 3.0 COMMITMENTS, CONSIDERATIONS

### 3.1 Regulatory Commitments

CNSC licensing required for this project include:

- Site Preparation Licence (current licence 2021-2031)
- Construction Licence
- Operating Licence
- Waste related licence

A primary assumption of this project is that the new nuclear technology/design will fit into the existing Environmental Assessment (EA). This assumption will be reviewed

periodically in the design phase of the project to ensure any gaps to this are recognized and managed.
With respect to the licensing processes for construction and operation, OPG has developed the necessary administrative protocols with the CNSC to ensure deliverables are provided and reviewed in accordance with an agreed schedule and key regulatory interfaces are managed. In order to increase regulatory confidence and reduce risk of late design changes related to regulatory approvals, designs should undergo the first two phases of the Pre-licensing Vendor Design Reviews [2].

A Notice of Project will be provided to the Ministry of Labour notifying the Ministry of construction activities on the site. A variety of other Permits will be required and will be managed through the Project.

## 3.2 Safety Considerations

☐ No **additional safety considerations.**

☑ Yes**, additional safety considerations (provide details).**

Nuclear Safety shall be the primary consideration in the design. The design should incorporate passive safety features. Nuclear safety considerations will be documented in a supporting Safety Analysis Report.

In addition to the Nuclear Safety aspects, the design should incorporate security resilience features.

Conventional and construction safety requirements will follow all applicable municipal, provincial, and federal regulations as a minimum.

## 3.3 Environmental Considerations

An Environmental Assessment (EA), which includes the Environmental Impact Statement, was prepared and submitted to the Joint Review Panel (JRP) for the DNNP in 2009. The JRP's EA Report concluded that the DNNP Project was not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made are implemented. Detailed regulatory and environmental commitments are tracked in the DNNP Commitments Report NK054-REP-01210-00078 [3].

As discussed in Section 3.1, a periodic review of the assumptions of the PRSL with respect to the technology design and site preparation activities is required to ensure any gaps to this are recognized and managed.

☐ **No, environmental impact assessment is NOT required for the project.**

☑ **Yes, environmental impact assessment IS required for the project.**

## 4.0 MAJOR MILESTONES

The DNNP schedule has been developed as part of the definition and front end planning processes. Milestone targets for the program are provided in Table 4-1.

**Table 4-1. Major Milestones**

| Name | Deliverables/Acceptance Criteria/Rationale for Date | Date |
|---|---|---|
| Licence to Construct Application | Regulatory licencing period of 2 years | Q4 2022 (Complete) |
| Class IV Business Case and Release | Basis for a decision to proceed to Site Preparation construction | Q4 2022 (Complete) |
| Licence to Construct Issued | Regulatory license required to start construction | Q1 2025 |
| Class III Business Case and Release | Basis for a decision to proceed to Nuclear Construction | Q1 2025 |
| Start of Nuclear Construction | Major phase of project | Q1 2025 |
| Construction Complete | Business objective | Q4 2028 |
| Commercially Available | Business objective | Q4 2029 |

## 5.0 STAKEHOLDER SUMMARY

Stakeholders of this project include:

- Indigenous Communities with rights or interests in the project
- All levels of government (Province of Ontario, the municipality of Clarington, Durham Region, the Federal Government)
- General public (particularly residents and businesses in close proximity to the Darlington site)
- Other nuclear utilities and nuclear industry organizations
- Special interest groups
- Independent Electricity System Operator (IESO)
- Hydro One
- CN Rail
- Nuclear Waste Management Organization (NWMO)
- St Mary's Cement
- Nuclear suppliers of goods and services

Stakeholders also include potential future business partners of OPG in SMR build and operation.

The project will develop a comprehensive Indigenous & Stakeholder Relations Plan as part of the overall Program Management Plan.

## 6.0 FUNDING/COST

The full project cost will be estimated during the Development phase, followed by a business case submitted to the OPG Board of Directors for approval. Funding will be

requested and released in phases, based on successful completion of key work programs and program milestones, in accordance with an approved release strategy. This strategy will be documented in the DNNP Program Management Plan.

## 7.0 RESOURCING (PROJECT TEAM)

A partnership between OPG, GEH, AtkinsRéalis, and Aecon Construction Group (Aecon), has been contracted to collectively develop and deploy the BWRX-300 SMR, and its supporting infrastructure at the Darlington Nuclear site in Ontario by the end of the decade. An Integrated Project Delivery (IPD) model has been selected to maximize integration and collaboration with contract partners.

The SVP, SMR Execution, will establish the OPG organization and resources necessary for successful completion of the DNNP.

### 7.1 Risks

A formal risk management process has been implemented within the DNNP to ensure that risks are identified, managed, and reported on a routine basis. These risks and associated actions are managed in a central database and form the basis of planning as well as on-going risk management.

Key risks within the program include:

(a) Issues related to First of a Kind (FOAK) technology development and design may delay the overall schedule of the project and result in increased cost.
(b) Issues with amendments/interpretation/application of Regulatory requirements for new technology and/or new nuclear construction may delay the overall schedule of the project and result in increased cost.
(c) Delays in contract negotiation/issuance or delays in long lead item procurement may delay the overall schedule of the project.
(d) Specialized resources required to execute the project may not be available due to other competing large nuclear and infrastructure projects, which may delay the overall schedule of the project.
(e) Lack of a positive business case or shareholder support may result in project cancellation.
(f) The Ontario Energy Board (OEB) may not approve full cost recovery through the rate case if the economics exceed existing generation options or if the project exceeds the approved budget.
(g) Public and/or Indigenous opposition to new nuclear development may result in legal challenges, and delays or cancellation of the project.
(h) The selected technology may result in gaps to the existing EA resulting in additional public consultation and regulatory reviews/approvals, delaying the project and adding cost.

## 8.0 REFERENCES

[1] Power Reactor Site Licence, PRSL 18.00/2022, OPG New Nuclear at Darlington Generating Station, Nuclear Power Reactor Site Preparation Licence. Licence to Prepare Site e-Doc 3990795

[2] REGDOC 3.5.4 Pre-Licensing Review of a Vendor's Reactor Design, 2018

[3] NK054-REP-01210-00078 Darlington New Nuclear Project Commitments Report