

Jan. 11, 2016

## **OPG READY TO DELIVER REFURBISHMENT OF DARLINGTON NUCLEAR STATION** ***OPG also planning continued operation of Pickering Station***

**Toronto** - Ontario Power Generation (OPG) is ready to deliver on the Government's decision to invest in refurbishing the first of four units at the Darlington Nuclear Generating Station. The Province has also approved plans to pursue continued operation of the Pickering Nuclear Generating Station to 2024.

"Refurbishing Darlington is an investment in Ontario -- in clean air, in jobs, in innovation, and in lower energy prices," said OPG President and CEO Jeffrey Lyash. "We've been preparing since 2009 and we're ready to deliver the job safely, on time and on budget."

The \$12.8 billion investment will generate \$14.9 billion in economic benefits to Ontario, which include thousands of construction jobs at Darlington and at some 60 Ontario companies supplying components for the job. This investment will also preserve about 3,000 jobs as it provides 30-plus years of clean, reliable, base load power, at a cost lower than other alternatives considered. The budget is about \$1.2 billion less than originally projected by OPG, and all four units are scheduled for completion by 2026.

"OPG has already delivered the single largest action in North America to combat climate change by ending the use of coal to generate electricity," added Lyash. "Having a clean, reliable electricity system with predictable, stable prices is not just an environmental achievement, it's essential to the province's long-term competitiveness."

The price of power from the refurbished station is expected to be between seven and eight cents per kilowatt hour. The Ontario Energy Board (OEB) will determine the final rate.

The refurbishment project will be subject to strict oversight to ensure safety, reliable supply and value for customers. OPG has also implemented a robust risk management strategy to ensure contractors are held accountable and appropriate off-ramps are in place.

Also announced today, OPG will work with the Ministry of Energy, the Independent Electricity System Operator and the OEB to pursue continued operation of the Pickering Station to 2024. All six units would operate until 2022; two units would then shut down and four units would operate to 2024. Extending Pickering's operation would ensure a reliable, clean source of base load electricity during the Darlington and initial Bruce refurbishments.

"Our technical work shows that Pickering can be safely operated to 2024 and that doing so would save Ontario electricity customers up to \$600 million, avoid eight million tonnes of greenhouse gas emissions and protect 4,500 jobs across Durham Region," said Lyash. "We'll work closely with our community partners as we go through this process."

Any plan to extend Pickering's life would require approval from the Canadian Nuclear Safety Commission (CNSC). OPG has started work on a licence application for CNSC approval in 2018.

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## **DARLINGTON REFURBISHMENT INVESTING IN ONTARIO**

OPG's Darlington Nuclear Generating Station is one of Ontario's most important assets. Since the early 1990s, it's been producing about 20 per cent of the province's electricity. That's enough to power two million homes each day. After years of reliable generation, this clean-power workhorse now requires a mid-life refurbishment.

Refurbishing Darlington will provide 30 more years of safe, reliable base load power with virtually no greenhouse gas emissions, helping Canada meet its climate change targets. It will also allow OPG to continue to moderate electricity prices and maintain the positive economic benefits of generation at the Darlington Station.

### **KEY FACTS - OPG GENERAL**

- Province's clean energy provider – 99.7 per cent free of smog and greenhouse gas emissions;
- Produces more than half of the power Ontarians rely on;
- Provides customers with power at lower costs than other generators;
- Our profit goes back to the provincial government;
- Investing hundreds of millions of dollars in clean and renewable power;
- Successful closure of our coal stations represents North America's largest single climate change action.

### **KEY FACTS - REFURBISHMENT**

- Darlington Nuclear Generating Station is one of the top-performing nuclear stations in the world;
- It's a four-unit station with a total capacity of 3,512 MW;
- Refurbishment will create thousands of jobs and result in positive economic benefits across Ontario;
- Expected to boost Ontario's nominal GDP by \$14.9 billion from 2010 to 2026;
- Average increase of 8,800 jobs per year from 2010 to 2026;
- Projected to boost household income in Ontario by \$8.5 billion;
- Majority of the refurbishment work is being done in Ontario;
- More than 60 companies from over 25 communities will be directly engaged in the job;
- Approximately 96 per cent of the project's suppliers are based in Ontario (see map on page 2).



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## **DARLINGTON REFURBISHMENT ENSURING SUCCESS, PROTECTING CUSTOMERS**

OPG is well-positioned to deliver the Darlington Refurbishment on time and on budget. Darlington is one of the world's top performing nuclear stations. We've put in years of detailed planning, built a state-of-the-art training facility, assembled an excellent team, and partnered with top companies from across Ontario.

### **Years of Extensive Project Planning**

- Detailed planning commenced in 2010 and concluded at the end of 2015;
- Lessons learned from other major projects have been incorporated;
- A state-of-the-art full-size reactor mock-up was built to test specialized tools and train workers;
- Engineering was completed before field execution starts;
- Site preparations focused on maximizing worker productivity;
- Scope, schedule and cost are developed to a level of detail not seen on prior projects;
- Co-operating closely with Bruce Power;
- Contracts structured so contractors are accountable for price and schedule to minimize risk to ratepayers.

### **Experienced Project Management Team**

- OPG has a project management team with extensive refurbishment experience from Canada and around the world;
- Team members include those seconded to Atomic Energy of Canada Ltd. to work on the Pt. Lepreau refurbishment project in New Brunswick; OPG managers delivered the balance of the project on time and on budget;
- Continuing to acquire talent from other major projects to enhance the project management team and develop future leaders;
- We're also working with the best in the business via our contract partners.

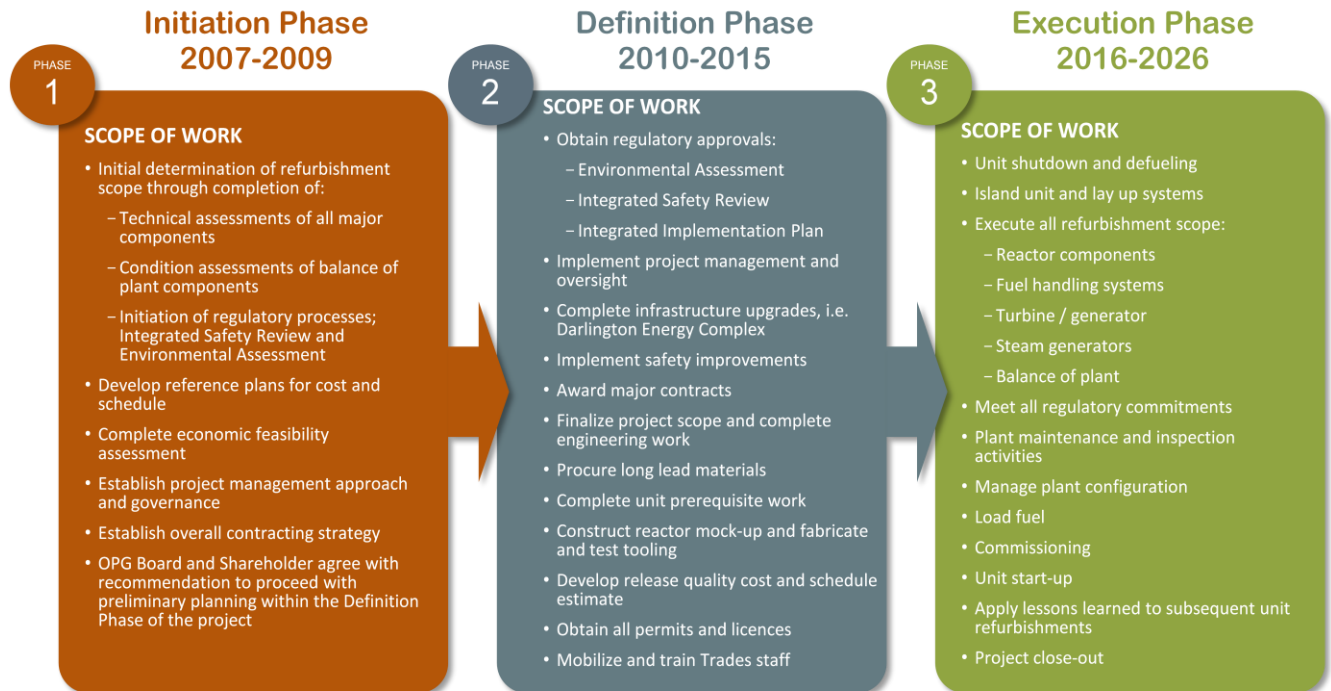
### **Significant Oversight and Public Reporting**

- OPG has direct oversight of all aspects of the project, plus two independent oversight organizations in place;
- One oversight group reports directly to the Project Executive and the OPG Board of Directors;
- One oversight group reports directly to the Ontario Ministry of Energy;

- OPG Board approval and authorization is required prior to moving to next phase of the project;
- Risks are actively monitored, managed, and mitigated.

## A Phased Approach

- Detailed reviews at key decision points ensure work is completed before moving to the next phase (see phases below);
- OPG will ensure success on the first unit before proceeding to the next.



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## **DARLINGTON REFURBISHMENT WHAT HAPPENS DURING REFURBISHMENT**

The refurbishment of each of Darlington's four reactors involves a number of steps.

### **Shutdown of the Reactor**

The first major activity during the refurbishment will be to shut down the reactor. At this time, systems not required for an extended period of time are placed into a safe state referred to as lay-up.

### **Removal of Fuel and Heavy Water**

The fuel will be removed from the reactor using fuelling machines. The removed fuel will be placed in the fuel bays as we currently do. Once the reactor fuel is removed from the reactor, heavy water will be drained from the system and transferred to an appropriate storage facility. The heavy water will be processed and available for reactor use when the outage is completed.

### **Islanding the Refurbishment Unit from the Operating Units**

Once the reactor undergoing refurbishment has been defueled, it will be separated (islanded) from the other operating units. This is done by putting up physical barriers to delineate the refurbishment island from the operating reactors. This helps OPG staff and contractors work efficiently on the reactor while reducing the impact of refurbishment on the operating units and common systems.

### **Replacement of Reactor Components**

The reactor components will be restored or replaced. This includes removing and replacing 480 fuel channel assemblies and 960 inlet and outlet feeders per reactor. The components will be processed and placed into appropriate storage containers.

The remaining components will be inspected to ensure they are acceptable for continued operation.

Removing and replacing the reactor components is the critical part of the outage. OPG has applied lessons learned from past refurbishment efforts. This includes developing intensive personnel training and tool testing programs in the full scale reactor mock-up.

### **Turbine and Steam Generators**

A majority of the turbine generator systems and auxiliary systems will be disassembled and rebuilt or replaced. OPG has concluded the steam generators will remain fit for service over the

life extension period and will not require replacement. The steam generator tubes and parts will be inspected, inspection nozzles will be installed and the steam generators will be cleaned to improve heat transfer.

### **Balance of Plant Repair and Maintenance**

The remaining scope of work is being carried out to maintain or improve the safety and reliability of the station to the post-refurbishment end of life. The scope of work includes:

- Work on nuclear systems, such as the primary heat transport system and the reactor regulating systems; and
- Work on conventional systems, such as the low pressure service water system and the fire protection system.

### **Return to Service of Reactors**

Return to service involves returning the reactor to commercial operation, and includes demonstrating the work meets specified requirements. Return to service covers the range of activities from completing the installation work to achieving 100 per cent reactor power.

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## CONTINUED OPERATION OF PICKERING NUCLEAR

OPG's Pickering Nuclear Generating Station is one of Ontario's most important generating assets, providing 14 per cent of the province's electricity. That's enough to power half a million homes each day. Since the early 1970s, it's been producing safe, reliable base load power with virtually no greenhouse gas emissions, helping Canada meet its climate change targets.

Extending Pickering's operation would ensure a reliable, clean source of base load electricity during the Darlington and initial Bruce refurbishments.

Our early technical work shows that Pickering can be safely operated to 2024 and that doing so would save Ontario electricity customers up to \$600 million, avoid eight million tonnes of greenhouse gas emissions and protect 4,500 jobs across Durham Region.

OPG has started work on a licence application for Canadian Nuclear Safety Commission approval in 2018. We will continue our studies and work closely with our community partners to ensure Pickering Nuclear is operated reliably and to the highest standards of safety, security and environmental stewardship.

### KEY FACTS

Pickering Nuclear is a strong performing CANDU station with six units and a total capacity of 3,100 megawatts (MW).

All six units would operate until 2022; two would then shut down, and four would run to 2024.

Sectors across Durham Region that would benefit from Pickering's continued operation include:

- Equipment and manufactured components,
- Engineering and construction,
- Raw materials and fuel cycle,
- Operations and business services.

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