

Oct. 14, 2016

## **OPG STARTS WORK ON CANADA'S LARGEST CLEAN ENERGY PROJECT**

*Project is an investment in clean air, jobs, innovation, and lower energy prices*

**Toronto** -Today, Ontario Power Generation (OPG) starts Canada's largest clean energy project, the refurbishment of the Darlington Nuclear Generating Station east of Toronto.

"Refurbishment of Darlington will ensure emissions-free nuclear continues to be Ontario's single largest source of power. The project will create up to 11,800 jobs annually and contribute nearly \$15 billion to Ontario's economy," said Glenn Thibeault, Ontario Minister of Energy.

"This project is an investment in Ontario's future. It benefits communities across the province, it provides clean, safe and reliable power and will help moderate customer prices," said Jeff Lyash, OPG's President and CEO. "I've been involved in a lot of major projects over the years and I can confidently say, I've never seen one that has had this amount of rigorous preparation and is this poised for success," Lyash added.

The Darlington Nuclear Generating Station is a mainstay of the Ontario economy and its refurbishment will permanently boost the Ontario economy, according to the results of [research](#) conducted by the Conference Board of Canada and presented to OPG.

"The boost to economic activity would have far-reaching and long-term stimulative effects on the Ontario economy," said Pedro Antunes, Executive Director and Deputy Chief Economist, the Conference Board of Canada. "The operational expenditures associated with Darlington through 2055 will lift employment by roughly 555,000 person-years in Ontario over the life of the station, with Darlington serving as a critical source of job creation for Ontarians, both within and outside the utilities industry."

A [report](#) released last week by Intrinsic Environmental Sciences, Inc. says "continued operations of the Darlington Nuclear Generating Station will remove the equivalent of two million cars a year from Ontario's roads."

"These reports clearly show that Darlington will continue to play a major role in Ontario's future economic and environmental success," Lyash said.

OPG is also planning to continue to operate its Pickering Nuclear Generating Station until 2024. The recent "Speech from the Throne" indicated this will save Ontario's electricity customers \$600 million, and provide a clean energy source of electricity when Darlington and Bruce Power units are offline for refurbishment.

### **ABOUT OPG**

OPG provides about half of the electricity used in Ontario and more than 99 per cent of the power it produces has no greenhouse gas or smog causing emissions. OPG's power is priced 40 per cent lower than other generators, which helps moderate customer bills.

## QUICK FACTS

- The Darlington Nuclear Generating Station is an essential source of electricity in Ontario. It produces 20 per cent of the province's generation. This output is baseload generation, flowing into the electricity system 24 hours a day, seven days a week.
- Operating Darlington until 2055 will be the equivalent of removing two million cars from Ontario's roads each year.
- In 2014, OPG stopped burning coal to create electricity. It was North America's largest climate change action to date.
- The price for the electricity from the refurbished station is projected to cost about 8 cents a kilowatt hour. This is below prices for power from alternate sources of baseload power. The final price will be set by the Ontario Energy Board (OEB) after a full public process.
- The ongoing operation of Darlington is expected to boost personal income in Ontario by an average of \$1.6 billion per year from 2017 to 2055, or by a total of \$61.4 billion. Corporate profits before tax will increase by \$7 billion over the same period.
- The continued operation of Darlington is projected to result in a \$9.3 billion increase in Ontario provincial government revenues. The federal government will collect \$13.8 billion in revenue, while local municipalities in Ontario will collect \$356 million.
- OPG will work with the Ministry of Energy, the Independent Electricity System Operator and the OEB to pursue continued operation of the Pickering Nuclear Generating 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 will ensure a reliable, clean source of base load electricity during the Darlington and initial Bruce refurbishments.
- Technical studies show that Pickering Nuclear Generating Station can be safely operated to 2024. Extending its operating life will save Ontario electricity customers up to \$600 million, avoid eight million tonnes of greenhouse gas emissions and protect 4,500 jobs across Durham Region.

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## **DARLINGTON REFURBISHMENT**

*Investing in Ontario*

Ontario Power Generation's (OPG) 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 three million homes over a year. 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 baseload 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 Nuclear Generating Station.

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

- Province's clean energy provider – more than 99 per cent free of smog and greenhouse gas emissions.
- Produces about 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 to date.

### **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 more than 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).

- A [just-released study](#) by the Conference Board of Canada found that continued operations of the Darlington Nuclear Generating Station will boost Ontario's nominal GDP by a total of \$75 billion from 2017 to 2055 and increase the number of jobs in Ontario by an average of 14,200 per year over the same period.
- A [recent study](#) by Intrinsic, an Ontario-based environmental consulting firm, found that compared to the alternatives, continued operation of the Darlington Nuclear Generating Station would reduce annual greenhouse gas emissions by 10 million tonnes, the equivalent of removing two million cars from the road each year for 30 years.



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## **DARLINGTON REFURBISHMENT**

*Ensuring success, protecting customers*

Ontario Power Generation (OPG) is well-positioned to deliver the Darlington Refurbishment on time and on budget. The Darlington Nuclear Generating Station is one of the world's top performing nuclear stations. OPG has 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 Point Lepreau refurbishment project in New Brunswick; OPG managers delivered the balance of the project on time and on budget;
- OPG is 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.

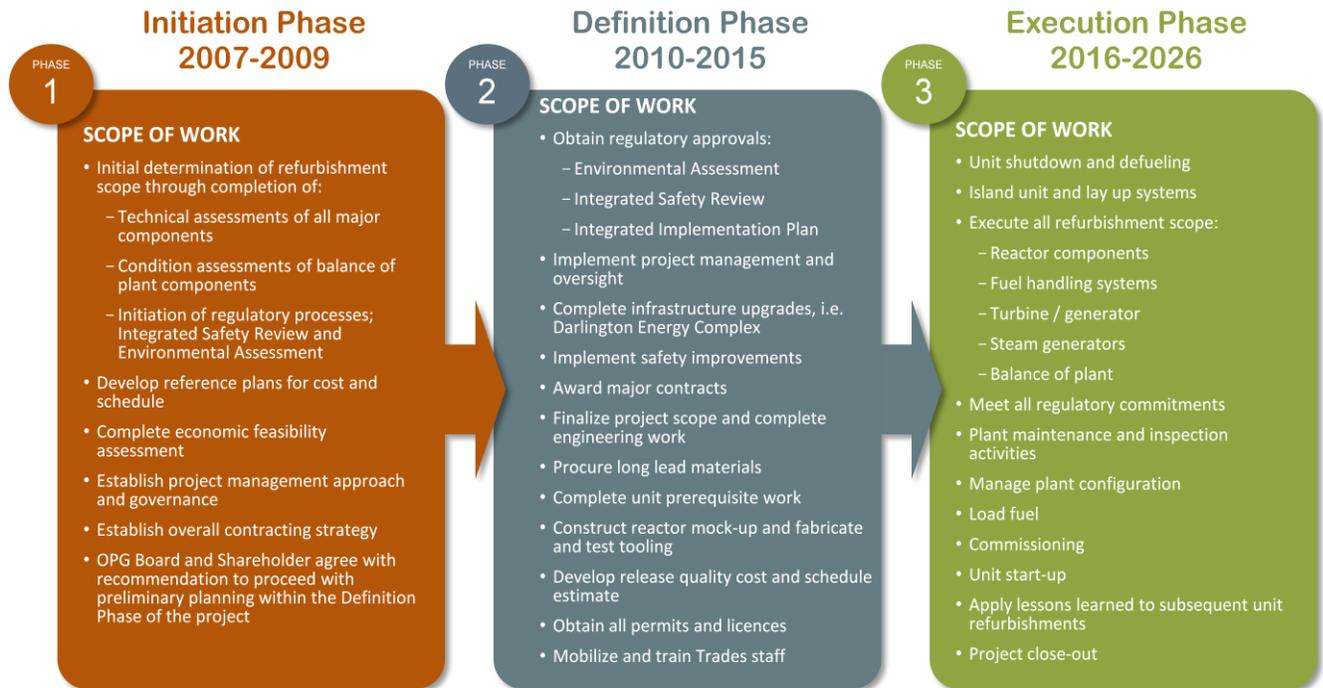
### **Significant Oversight and Public Reporting**

- 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 the project*

Refurbishing each of Darlington Nuclear Generating Station'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 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 a range of activities from completing the installation work to achieving 100 per cent reactor power.

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