POWER NEWS

FALL 2017

Connecting the people who power Ontario

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A LOOK INSIDE DARLINGTON NUCLEAR'S UNIT 2 TURBINE HALL

DARLINGTON REFURBISHMENT PROJECT SETS THE PACE AT ONE-YEAR MARK

Canada's largest clean energy project remains on time and on budget as it approaches the one-year mark.

Refurbishment of the four reactors at Darlington Nuclear Generating Station began Oct. 15, 2016, with Unit 2 being taken offline. The 10-year project will allow the power plant to continue to provide safe, clean, reliable baseload power for 30 more years.

So far, Unit 2 has been defuelled and islanded, a process by which the reactor is separated from the operating power plant and from containment.

Next, Re-tube Tooling Platforms, massive stand-alone elevating platforms that act as a hub for re-tube and feeder replacement, were installed. Each weighs in at approximately 100,000 kilograms. The platforms move around to provide access to all of the reactor's fuel channels.

All this sets the stage for reactor disassembly, which is now underway. The first phase of this meticulous process involves cutting out all 960 feeder pipes in the reactor then severing and removing end fittings and pressure tubes.

Planning for refurbishment of Unit 3, the next to undergo the mid-life update, is also in progress.

"It's been an exciting year," said Dietmar Reiner, Senior Vice President, Nuclear Projects. "We opened the Unit 2 airlock doors for the first time since plant construction was completed in the 1990s. We've removed fuel handling equipment and other items from the vault, and now we've arrived at the core of the project: removing the components that will be replaced to allow for Darlington's continued operation."

It's expected Unit 2 will take approximately 40 months in total to refurbish before re-joining the grid.

"We have a long way to go yet, but we're confident we have the right people in place to deliver this project safely and to plan," said Jeff Lyash, OPG President and CEO. "Refurbishing Darlington is about investing in one of the world's top-performing nuclear stations, ensuring a safe and reliable energy supply for Ontarians for the next 30 years."


STEPHANIE SEYMOUR

EMPLOYEE SPOTLIGHT
STEPHANIE SEYMOUR

POSITION: Management and Professional Trainee

WORK LOCATION: OPG's Kipling Office

FAVOURITE SPOT TO VISIT IN ONTARIO?
Lake Superior Provincial Park
(specifically for the pictographs)

FAVOURITE FOOD?
Cheese and cured meats

FAVOURITE WEEKEND ACTIVITY?
Enjoying the outdoors

OUR PEOPLE: STEPHANIE SEYMOUR

For the past few years, Stephanie Seymour's driving passion has been studying renewable energy replacements for fossil fuel generation in remote northern Indigenous communities.

Her work in this area as a PhD student in the Faculty of Natural Resources Management at Lakehead University was recognized in 2016 when she received OPG's John Wesley Beaver Memorial Student Award.

Now, as a newly minted OPG employee, Seymour, who is from Garden River First Nation near Sault Ste. Marie, is relishing the opportunity to make a real difference in Ontario's First Nations communities, many of which still rely on portable diesel generators for heating and electricity.

"Working with Indigenous communities to help them replace diesel generation opened up my eyes to the importance of having a solid, safe, and reliable source of electricity," said Seymour, a Management and Professional Trainee in OPG's Indigenous Relations department.

One of the renewable power sources Seymour studied as a viable alternative to diesel was biomass — wood pellets made from tree cuttings and other wood waste which are burned to produce heat and electricity.

As a student completing her Master's degree in Science and Forestry at Lakehead University, she spent time conducting research at the OPG BioEnergy Learning and Research Centre at Confederation College in Thunder Bay. The biomass facility's 150-kilowatt demonstration boiler provides heating for the campus and has greatly offset the college's natural gas usage.

"It was great to see a practical application of theory," said Seymour. "We looked at how much energy a northern community needs and we looked at wood and how much energy it could provide."

Seymour says her new role at OPG, her first full-time job, opens up many diverse opportunities to work with Indigenous communities while developing her passion for renewable energy.

UNDERWATER SAFETY IS TOP JOB FOR OPG DIVE TEAM

In his 24 years as a commercial diver working at hydroelectric sites, 11 of which have been with OPG, Richard Hayward has pretty much seen it all.

From concrete restoration to dam repairs to welding, OPG's divers take the plunge into cold, dark waters each day to keep the company's hydroelectric and nuclear stations in good condition. The team of underwater experts also offer their services to other companies through OPG's subsidiary, Canadian Nuclear Partners.

But one thing Hayward hopes to never see is an accident caused by a differential pressure hazard, also known as Delta P.

The dangerous hazard is created when water moves from an area of high pressure to one of low pressure, for instance when an opening is suddenly created on one side of a hydroelectric dam. The forces generated by this great pressure difference underwater can trap a diver against an opening, often with fatal results.

"We work with these hazards all the time, but we've been fortunate the planning and operational experience of people on the crew have been able to mitigate and control these hazards where we can do these dives safely," said Hayward, a Front Line Manager with OPG's Inspection and Maintenance dive team.

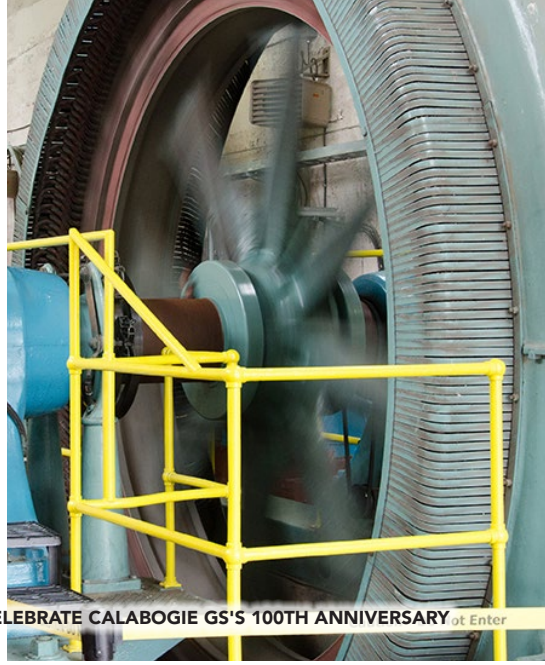
OPG's dive team exemplifies the company's commitment to safety above all else. To mitigate risks and get the job done safely, extensive safety measures are implemented and the crew of 19 divers undergoes constant, rigorous training. An operational plan detailing the scope of work is prepared before each dive and divers routinely take courses on boating and diving safety, including a special course on identifying and dealing with differential pressure hazards

Pre-dive site inspections are always conducted to visually identify any hazards from the surface. Tests are also performed underwater to detect dangers, such as a differential pressure leak, that may be hard to spot from the surface.

The team's dedication to safety has been recognized by the province's Ministry of Labour, which inspects OPG's diving operations more than 20 times a year. This fall, Hayward and his crew will be providing the Ministry's instructors a primer on common diving hazards at hydroelectric facilities and proper safety procedures.

"We are the benchmark the Ministry uses to identify good, safe practice for diving operations in Ontario," said Hayward.

OPG'S DIVE TEAM PREPARES FOR OPERATION



RESIDENTS AND OPG STAFF CELEBRATE CALABOGIE GS'S 100TH ANNIVERSARY

EASTERN HYDRO STATIONS CELEBRATE MAJOR MILESTONES

In eastern Ontario, three important hydroelectric generating stations on the Madawaska River are celebrating some big birthdays this year.

Calabogie Generating Station (GS) will be turning 100 years old in November, Barrett Chute GS marked its 75th anniversary in August, and Mountain Chute GS will be celebrating its 50th in November.

For decades, these three stations, along with Stewartville GS and Arnprior GS, have harnessed the power of the "mad river" and served as jewels in OPG's hydroelectric fleet.

The five Madawaska stations, and two control dams upstream, operate in what is called a Cascading River System. The river's waters flow down through each station, covering a distance of 225 kilometres. Together, the five plants power 615,000 homes with clean, renewable energy.

The oldest of the group, Calabogie GS, first went into service in November 1917. The four-megawatt (MW), two-unit plant was built during World War I by the Calabogie Light and Power Company and was producing power within just seven months of construction.

OPG's predecessor, the Hydro-Electric Power Commission of Ontario (HEPCO), purchased the station in 1929, taking ownership of the plant and its dam, both of which are located in the south branch of the Madawaska, about one kilometre downstream from Calabogie Lake.

Unlike Calabogie, Barrett Chute was built from the ground up by HEPCO and was the first of a series of new, correlated power developments on the Madawaska River. Named after one of the early settlers in the community, Barrett Chute's first two units went into service in August 1942, and were later augmented by two larger generating units in 1968. Together, the four units have a maximum generating capacity of 177 MW.

Located upstream of Barrett Chute, 35 km from Renfrew, sits Mountain Chute GS, the second-youngest of the five Madawaska stations. The two-unit, 170 MW plant first went into service on Nov. 11, 1967, and can produce enough electricity to power 170,000 homes.

Developed in the mid-1960s, Mountain Chute GS brought an economic boom to the Renfrew area that saw 500 people employed at the peak of construction.

Together, these three stations continue to play a vital role in reliably delivering clean, renewable power at times of heightened demand. With continued maintenance and stewardship, these facilities will be celebrating many more milestones in the future.

OPG'S TANA-LEIGH HARTY WITH CAMPER ERIK, LEFT; OPG'S DENISE HARDY READS TO THE KIDS

NURTURING A LOVE OF READING IN INDIGENOUS YOUTH

On a cool August day at Whitesand First Nation, a group of children are listening in rapt attention as Denise Hardy, Indigenous Relations Advisor with OPG, reads The Day the Crayons Came Home, a colourful book by Drew Daywalt.

It's a scene that has played out several times before at OPG-hosted "Reading is Cool" events with Frontier College. The events are an extension of OPG's support of the Lieutenant Governor's Indigenous Summer Reading Camp Program operated by Frontier College, Canada's original literacy organization.

"OPG, through its support of the camp program, is demonstrating that it cares about these children living in these remote communities where access to programs and materials can be challenging," Hardy said.

Founded in 2005 by the Hon. James Bartleman, Ontario's 27th Lieutenant Governor and a member of the Mnjikaning First Nation, the program was first held in five remote First Nations in northern Ontario. It has since grown to nurture a love of reading, writing and learning in thousands of children and youth across Canada, including youth in 24 host communities this year in Ontario.

This summer, OPG proudly supported camps in the communities of Mishkeegogamang, Wabaseemoong and Whitesand. At the OPG-hosted "Reading is Cool" events, OPG representatives hold fun activities and provide each camper with a new age-appropriate book and school supplies. They also mentor campers in their literacy activities.

"I've been doing this for eight years," said Tana-Leigh Harty, OPG's corporate relations officer in northwest Ontario. "I love every second of it. We read, we play. It's a real community event that brings everyone together."

Eighty-five per cent of teachers and educators surveyed by Frontier College on the program noted that students who attended the camp maintained or improved their literacy skills compared to students who did not take part.

"One of the Whitesand First Nation councillors noticed the improvement in literacy in the children," Harty said. "The program keeps students' minds active all summer so that when they return to school they're better prepared."

For Harty, what has been very impressive is the program's growth. "More kids have turned out and many are returning campers who bring their friends. They're all so excited to participate for the books, the learning and the fun," she said.

TAYKWA TAGAMOU NATION CHIEF DWIGHT SUTHERLAND WITH OPG'S MIKE MARTELLI AND JEFF LYASH

NORTHEAST CLEAN POWER PARTNERSHIP CELEBRATED

Peter Sutherland Sr., a respected Elder of the Taykwa Tagamou Nation (TTN), lived, hunted and fished near the New Post Creek, a tributary of the Abitibi River in northeastern Ontario.

Now, a new hydroelectric station bearing the late leader's name is harnessing the river on the community's traditional territory to generate clean, renewable power for about 25,000 homes and businesses.

In an official opening ceremony attended by OPG executives and members of the TTN, a plaque inscribed with Sutherland's face was unveiled at the Peter Sutherland Sr. Generating Station (GS), which went into service in April.

Built by OPG and Coral Rapids Power, a wholly-owned company of the TTN, the two-unit, 28-megawatt station located about 75 kilometres north of Smooth Rock Falls was completed on budget and well ahead of its 2018 target date. It was the culmination of two years of construction and eight years of planning.

"The Peter Sutherland Sr. GS is the latest example of OPG's commitment to working closely in partnership with First Nations communities," said Jeff Lyash, OPG's President and CEO. "This station will generate clean, reliable energy for Ontarians for many years to come while providing revenue to the local community."

As part of the project agreement, Coral Rapids Power has a one-third ownership in the facility and will receive a share of profits from the station for decades to come.

More than 200 people worked on the clean power project, including close to 50 Indigenous individuals. In addition, Indigenous contractors supplied $50 million worth of goods and services.

One of those involved in the construction was Michael Archibald, a member of the TTN. Working with contractor Kiewit, Archibald was part of the team responsible for constructing the station's walls and intake structures.

He now works at OPG as a Service Trades Maintainer at the nearby Abitibi Canyon work centre. Archibald and fellow technicians maintain and repair OPG's hydroelectric stations in the northeast, which now includes Peter Sutherland Sr. GS.

"It's all positive," Archibald says of the new facility. "Hopefully our First Nation can get more opportunities in the future now that this project is a success."

NANTICOKE SOLAR SET TO EXPAND OPG'S RENEWABLE ENERGY CAPABILITY

Nanticoke Generating Station (GS), which was once the largest coal-fuelled power plant in North America, will soon make way for a solar project that expands Ontario's renewable energy capability.

First brought into service in 1973, the coal plant located near Port Dover on the shores of Lake Erie produced 4,000 megawatts of power for the province at its peak. In 2013, OPG stopped generating electricity at the station, eliminating a major source of greenhouse gas emissions.

Today, the site of the old station is in the midst of a major transformation that reflects the province's move from coal to renewable, clean power. Decommissioning work has commenced, with plant equipment placed in a safe shutdown condition and de-energized. OPG is now in the process of safely removing existing equipment and buildings in preparation for the site's future use as a solar power generating facility.

"OPG is already Ontario's largest renewable energy producer and this will be an important addition to our portfolio," said Jeff Lyash, OPG's President and CEO. "This is an investment in a cleaner energy future for Ontario."

In 2016, OPG and its partner, the Six Nations of the Grand River Development Corporation, were selected by the Independent Electricity System Operator to develop a 44-megawatt solar facility on and near the Nanticoke site.

The Nanticoke Solar Project is currently in the approval phase, but construction of the facility, which will use photovoltaic panels to convert sunlight into electricity, is set to take place throughout 2018 on four land parcels, including the coal yard portion of the Nanticoke GS site. The facility is expected to be completed in early 2019.

Next spring, the station's two stacks will be demolished and the powerhouse building will be removed sometime in 2019.

"The most visible Nanticoke event in 2018 will be the demolition of the stacks," said Project Manager Joe Mateus. "They will be brought down using proven techniques by experienced contractors. Public and employee safety will be top priority."

Nanticoke Solar is OPG's fourth First Nations partnership. These partnerships have helped produce more renewable generation from the Lac Seul Generating Station (in partnership with Lac Seul First Nation), the Lower Mattagami River Project (in partnership with Moose Cree First Nation), and the recently completed Peter Sutherland Sr. Generating Station (in partnership with Taykwa Tagamou Nation).

"The Nanticoke Solar Project aligns with our community values of sustainability and environmental prosperity," said Matt Jamieson, President and CEO of Six Nations of the Grand River Development Corporation. "Investing in clean energy benefits the people of Six Nations economically without compromising our children's future."

THE NANTICOKE SOLAR FACILITY IS SET TO BE CONSTRUCTED IN 2018

OPG SET TO FUEL ELECTRIC CAR REVOLUTION WITH CLEAN POWER

The next big action to combat climate change begins in our driveway.

In Ontario, the transportation sector accounts for approximately 35 per cent of greenhouse gas (GHG) emissions. With the province's electricity sector largely decarbonized due to OPG's efforts to shut down its coal generation, the next logical action to fight climate change is taking the company's clean, virtually emissions-free power to electrify the transportation industry.

It's a paradigm shift that's happening right now in the auto industry. A recent KPMG survey of auto executives found 90 per cent of them expect battery EVs to dominate over traditional gas-powered vehicles by 2025.

"We believe using clean electrons to power cars, trains and buses is the next big climate change victory for the province," said Jeff Lyash, OPG's President and CEO.

To this end, OPG has developed a Transportation Electrification strategy which includes initiatives internal to OPG's operations as well as external initiatives aimed at capitalizing on future opportunities and potential new lines of business from the electrification of transportation.

To help spur greater adoption of EVs, OPG is leading by example as it electrifies its own fleet of cars, SUVs and minivans by replacing gas-powered vehicles with EVs and hybrids.

AT A GLANCE

- Charging an EV overnight or on weekends when electricity cost is lowest can save the average person $1,500 to $2,000 per year on fuel
- Up to $14,000 in incentives are available for new electric vehicles

OPG IS ELECTRIFYING ITS FLEET OF CARS AND SUVS

Each vehicle converted to electric provides an approximate savings of $10,000 over the five-year life of the vehicle. Converting most of the company's vehicle fleet could result in potential savings of more than $3 million.

"EVs present a significant operational cost savings by reducing and in some cases cutting out gas, and the maintenance costs are lower," said Andrea Brown, Manager, Strategic Environmental Initiatives with OPG.

To help support this new initiative, OPG will be installing EV chargers for employees and visitors at the company's various sites and offices, including the Sir Adam Beck hydro stations in the Niagara region, the Darlington Energy Complex, Kipling complex, and the Pickering and Darlington nuclear stations.

The company is also gearing up to pilot electric boats in its operations at two locations. In addition to being emissions free, electric boats eliminate the risk of fuel spills into the water and the noise of loud diesel motors.

Through all of this, educating the public on the benefits of EVs remains a challenge, Brown said. OPG is looking to inform the public through its founding partnership with Plug'n Drive, a non-profit organization that advocates for electric cars.

Plug'n Drive recently opened the first of its kind Electric Vehicle Discovery Centre in Toronto, where visitors can learn more about EVs, batteries and charging, and also test drive electric vehicles.

"Ontario has created a lot of incentives for EV purchases, but the average person doesn't necessarily know these incentives exist," said Brown. The province's Electric Vehicle Incentive Program helps make EVs more affordable for consumers by offering incentives up to $14,000 on eligible vehicles.

SALE OF HEAD OFFICE BOOSTS OPG'S SECOND QUARTER EARNINGS

Boosted by the sale of its head office, OPG reported net income attributable to the Shareholder of $303 million for the second quarter of 2017, compared to $132 million for the same period last year.

The $283 million gain on sale of the company's head office building and parking facility in Toronto helped increase the company's net income and offset the expected decline in generation revenue due to the Darlington Refurbishment outage.

The quarter also saw a marked improvement in Pickering Nuclear Generating Station's performance. The unit capability factor increased to 84.2 per cent and 81.4 per cent for the three and six month periods ended June 30, 2017, compared to 71.4 and 72.1 per cent for the same periods in 2016, respectively. So far this year, the Pickering plant has produced 1.2 terawatt hours (TWh) more than last year.

"Our Pickering Nuclear plant continues to demonstrate strong performance this year," said Jeff Lyash, OPG President and CEO. "We're executing outages as planned and generating units continue to produce the clean electricity Ontario homes and businesses rely on in a safe and reliable manner."

Overall, electricity generated during the second quarter of 2017 was 18 TWh, compared to 19.4 TWh for the same quarter in 2016. This decrease reflected lower nuclear generation due to the removal from service of Unit 2 at Darlington Nuclear and lower generation from OPG's contracted plants.

For the six months ended June 30, the unit capability factor at Darlington was 74.9 per cent compared to 86.6 per cent for the same period last year.

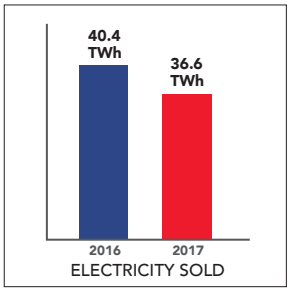
In the regulated hydroelectric segment, higher generation was attributed to higher water flows, primarily on the eastern Ontario river systems. Lower generation from the Contracted Generation Portfolio was mainly due to lower generation from the segment's hydroelectric plants.

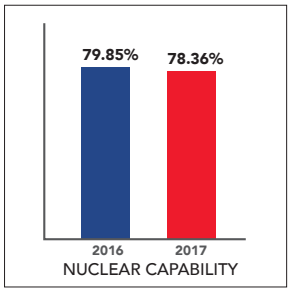
Looking forward, OPG continues to be on track with its Darlington Refurbishment project, which will extend the operating life of the station by about 30 years.

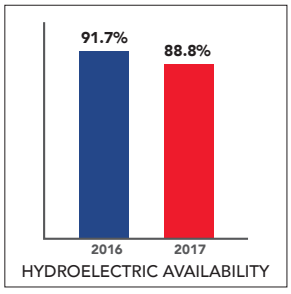
Work is also continuing at the Ranney Falls hydroelectric station, where a new 10 MW single-unit powerhouse is being built on the existing site. And construction of a 44 MW solar facility at OPG's Nanticoke Generating Station site and adjacent lands could commence as early as the fourth quarter of 2017.

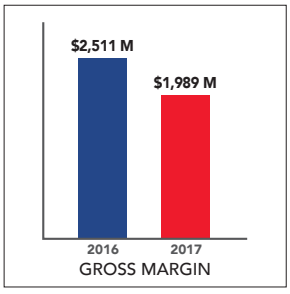
The Nanticoke Solar project is a partnership between OPG and Six Nations of the Grand River Development Corporation.

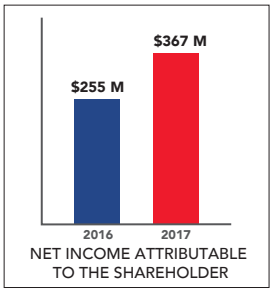
YEAR-TO-DATE JUNE 30 RESULTS











The impact of the Darlington Nuclear Refurbishment?

We all know that when it comes to the environment, the best impact is zero impact. The refurbishment of the Darlington nuclear generating station is underway. Already rated one of the world's best nuclear stations, the refurbishment will ensure an additional 30 years of safe, reliable, low-cost energy that's more than 99% free of smog and carbon emissions. To find out more and see the impact for yourself visit opg.com

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