Photo: Ontario Power Generation

Unstoppable

The COG community didn't just respond to COVID-19, it got work done despite it

Across the nuclear industry, around the world, COG members got work done despite a pandemic for the ages.

From the Ontario Power Generation Return to Service of Unit 2 at Darlington to continued leadership by Bruce Power in forwarding the nuclear isotope industry to CNNO's outage completion, as OPG so aptly put it, the industry did indeed #PowerOn.

Photos courtesy of Ontario Power Generation

Darlington Unit 2 powers *ON*

The return-to-service of OPG Darlington's refurbished Unit 2 is an achievement a decade in the making, one many across the CANDU industry helped make possible.

Said it, did it and now, celebrating it!

Ontario Power Generation (OPG), along with its project partners and vendors, completed the refurbishment of Darlington Nuclear's Unit 2 and reconnected it to the province's electricity grid at 100 per cent full power, June 4.

Its success paves the way and provides a blueprint for refurbishment of the remaining three units at Darlington.

The execution of the Unit 2 return to service began in October 2016 when the unit was taken offline following several years of planning, preparation and construction of ancillary buildings to support the four-unit refurbishment. OPG has committed to completing the four units by 2026.

The Unit 2 refurbishment project involved contributions from across the CANDU industry, and especially supply chain leadership from the EPC contractors, a joint-venture of SNC-Lavalin and Aecon.

From safely defuelling the reactor to its dismantling and reassembly the reactor, approximately 765,000 hours of training and 24 million hours of work by staff from OPG and nuclear industry suppliers went into returning the unit to service. Project partners GE Power, ES Fox, Black and McDonald Limited and BWXT Canada (a COG supplier participant) were crucial to Unit 2's construction and reconnection. They will continue to play a significant role in further planned refurbishment work at Darlington. The project was also supported by innovative technology and precision tooling delivered by hundreds of Ontario-based manufacturers.

The project included safety improvements such as the installation of a third, emergency power generator to provide multiple layers of back-up in case of power loss. The extra generator also allows existing generators to be taken off-line for maintenance, further strengthening reliability and adding new layers of safety-based redundancy.

Click here to read OPG's story on Unit 2's return-to-service and its safety enhancements.

Click here for OPG's brief history on the Unit 2 refurbishment project.

Notable milestones from the Darlington Unit 2 return-to-service

1990

Darlington Nuclear Unit 2 is constructed. Unit 2 is the first of Darlington's four reactors to come online in the 1990s.

2007

Darlington Refurbishment early scoping work gets underway.

2010

In February 2010, OPG announces it will proceed with detailed planning for the mid-life refurbishment of Darlington Nuclear.

2011

Construction of the Darlington Energy Complex gets underway in July. The facility would support training for the refurbishment project with a full-scale mock-up reactor and a tool testing centre. The complex opened in 2013.

2012

Contract awarded to the SNC-Lavalin-Aecon joint venture group for retube and feeder replacement work.

2013

Refurbishment project's environmental assessments were approved by the CNSC in March and July.

2016

OPG receives approval from Ontario government to begin the $12.8 billion Darlington refurbishment project servicing all four of its CANDU reactors – it becomes Canada's largest clean energy project. In October, Unit 2 is disconnected from the grid, safely shut down and later defueled.

2017

OPG begins removal of key components of Darlington Unit 2 reactor. Reactor disassembly gets underway in July.

2018

Darlington Unit 2 enters final phase in reactor disassembly. Disassembly work requires more than 1,600 people to complete. Workers remove the last pressure tube from Unit 2 on March 3, completing the safe removal of all 480 pressure tubes. In September, the work to rebuild Unit 2 reactor gets underway.

In February, OPG receives provincial approval to begin work on Unit 3 refurbishment.

2019

In September, OPG and project partners install upper and middle feeder tubes on Unit 2, with the installation of lower feeder tubes completed in October. By late October, OPG completes the installation of all 960 feeder tubes.

In December, OPG and BWXT Canada complete loading each of the 6,240 new fuel bundles into the reactor core. The fuel bundles needed to be loaded in the correct location and sequence within the core and the work required five-years of planning to execute.

2020

In March, construction of Unit 2 is completed and a month later, first criticality is achieved.
In June, the unit returned-to-service at 100 per cent full power.

2024

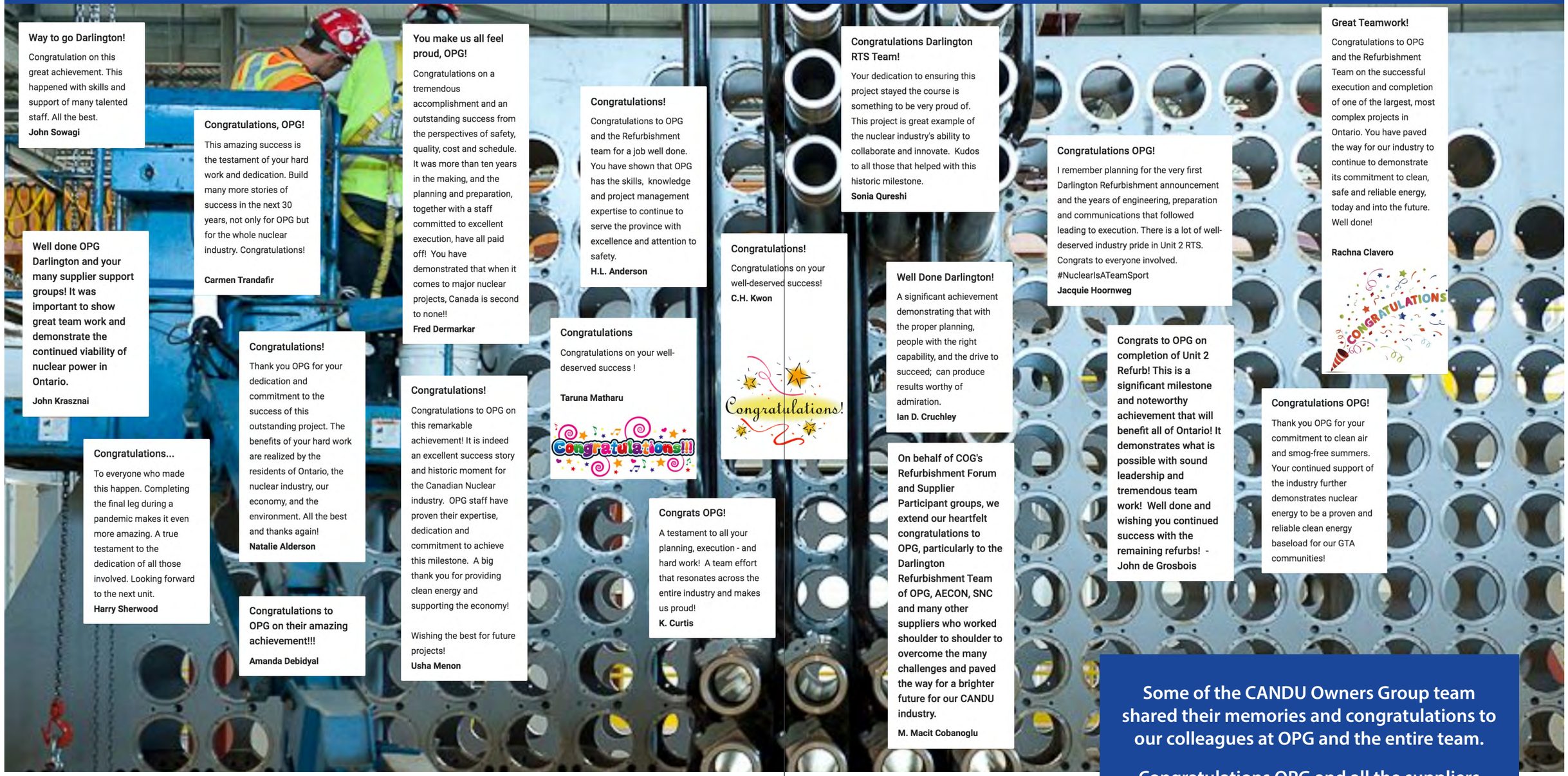
Expected completion of Darlington Unit 3 refurbishment project.

2026

Expected completion of refurbishment of all four Darlington reactor units.

Congratulations OPG on Unit 2 Success!

From CANDU Owners Group to everyone involved, we congratulate you.



Way to go Darlington!

Congratulation on this great achievement. This happened with skills and support of many talented staff. All the best.

John Sowagi

Congratulations, OPG!

This amazing success is the testament of your hard work and dedication. Build many more stories of success in the next 30 years, not only for OPG but for the whole nuclear industry. Congratulations!

Carmen Trandafir

You make us all feel proud, OPG!

Congratulations on a tremendous accomplishment and an outstanding success from the perspectives of safety, quality, cost and schedule. It was more than ten years in the making, and the planning and preparation, together with a staff committed to excellent execution, have all paid off! You have demonstrated that when it comes to major nuclear projects, Canada is second to none!!

Fred Dermarkar

Congratulations!

Congratulations to OPG and the Refurbishment team for a job well done. You have shown that OPG has the skills, knowledge and project management expertise to continue to serve the province with excellence and attention to safety.

H.L. Anderson

Congratulations!

Congratulations on your well-deserved success!

C.H. Kwon

Congratulations Darlington RTS Team!

Your dedication to ensuring this project stayed the course is something to be very proud of. This project is great example of the nuclear industry's ability to collaborate and innovate. Kudos to all those that helped with this historic milestone.

Sonia Qureshi

Congratulations OPG!

I remember planning for the very first Darlington Refurbishment announcement and the years of engineering, preparation and communications that followed leading to execution. There is a lot of well-deserved industry pride in Unit 2 RTS. Congrats to everyone involved. #NuclearIsATeamSport

Jacquie Hoornweg

Great Teamwork!

Congratulations to OPG and the Refurbishment Team on the successful execution and completion of one of the largest, most complex projects in Ontario. You have paved the way for our industry to continue to demonstrate its commitment to clean, safe and reliable energy, today and into the future. Well done!

Rachna Clavero

Well done OPG Darlington and your many supplier support groups! It was important to show great team work and demonstrate the continued viability of nuclear power in Ontario.

John Krasznai

Congratulations!

Thank you OPG for your dedication and commitment to the success of this outstanding project. The benefits of your hard work are realized by the residents of Ontario, the nuclear industry, our economy, and the environment. All the best and thanks again!

Natalie Alderson

Congratulations!

Congratulations to OPG on this remarkable achievement! It is indeed an excellent success story and historic moment for the Canadian Nuclear industry. OPG staff have proven their expertise, dedication and commitment to achieve this milestone. A big thank you for providing clean energy and supporting the economy!

Wishing the best for future projects!

Usha Menon

Congratulations

Congratulations on your well-deserved success !

Taruna Matharu

Congrats OPG!

A testament to all your planning, execution - and hard work! A team effort that resonates across the entire industry and makes us proud!

K. Curtis

Well Done Darlington!

A significant achievement demonstrating that with the proper planning, people with the right capability, and the drive to succeed; can produce results worthy of admiration.

Ian D. Cruchley

On behalf of COG's Refurbishment Forum and Supplier Participant groups, we extend our heartfelt congratulations to OPG, particularly to the Darlington Refurbishment Team of OPG, AECON, SNC and many other suppliers who worked shoulder to shoulder to overcome the many challenges and paved the way for a brighter future for our CANDU industry.

M. Macit Cobanoglu

Congrats to OPG on completion of Unit 2 Refurb! This is a significant milestone and noteworthy achievement that will benefit all of Ontario! It demonstrates what is possible with sound leadership and tremendous team work! Well done and wishing you continued success with the remaining refurbs! - John de Grosbois

Congratulations OPG!

Thank you OPG for your commitment to clean air and smog-free summers. Your continued support of the industry further demonstrates nuclear energy to be a proven and reliable clean energy baseload for our GTA communities!

Congratulations...

To everyone who made this happen. Completing the final leg during a pandemic makes it even more amazing. A true testament to the dedication of all those involved. Looking forward to the next unit.

Harry Sherwood

Congratulations to OPG on their amazing achievement!!!

Amanda Debidyal

Some of the CANDU Owners Group team shared their memories and congratulations to our colleagues at OPG and the entire team.

Congratulations OPG and all the suppliers who made Unit 2 RTS a reality!

From rebuilding reactor chambers to installations of storage vessels, conduits and cooling systems, Ontario's Boilermakers and other skilled tradespeople, within the nuclear supply chain, played a significant role in the Darlington Unit 2 Refurbishment. Photos courtesy of Ontario Power Generation.

Nuclear is a #TeamSport

Darlington Unit 2's refurbishment journey is a story of industry and supplier excellence through collaboration

Ontario Power Generation (OPG) President and CEO Ken Hartwick had many people on his thank you list when he announced Darlington Unit 2's return-to-service, June 4.

The milestone didn't just belong to OPG and its nuclear team, but reflected millions of hours of work, 24 million to be exact, by suppliers and vendors whose contributions made this achievement possible. From defuelling to fuel loading to rebuilding Unit 2, many runners helped pass the baton in this relay race, bringing the first phase of the Darlington Refurbishment Project to the finish line.

The nuclear supply chain played an integral part in that race, which got underway in October 2016, when the reactor was shutdown and defuelling got underway. But the planning and work by the nuclear supplier community began long before that.

Organization of Canadian Nuclear Industries (OCNI) President and CEO Ron Oberth worked alongside dozens of his members who had some involvement in the project.

Reflecting on the effort by the supply chain, Oberth says, "I am especially proud of the many OCNI member companies that developed innovative and reliable tooling to remove and replace complex reactor systems and that supplied precision manufactured components used in the new reactor core."

One unanticipated challenge came in the final days as the team ramped up to return to service as the COVID-19 pandemic hit. "I would like to acknowledge the hard work and dedication of workers who, despite the current COVID-19 challenges, kept this vital project on track," he says.

Leading the way

There were hundreds of award-winning performances by suppliers across the supply chain who contributed to the success of Unit 2 RTS. Many of those belong to the CANDU Owners Group Supplier Participant (SP) program. The program ramped up significantly starting in 2015 as a venue for the suppliers to share and build best practices in nuclear and conventional safety and quality performance. It also provides a way for the supply chain/contract companies and utilities to stay connected on expectations and needs in the plant and in the suppliers' own facilities. The SP program representatives take back the learnings to their companies to apply on the Darlington refurbishment as well as Bruce Power's Major Component Replacement Project and project work at New Brunswick Power.

Read the story about this unique, globally-recognized program in this issue of COGnizant starting on page 40.

And the award for best supporting player goes to…

There are hundreds of companies that have contributed to the Darlington project. Here are a few of the key players whose work has been integral to project success.

Darlington Refurbishment Supplier Highlights

SNC-Lavalin and Aecon joint venture EPC contractor

In March 2012, SNC-Lavalin and Aecon were awarded a joint venture contract by OPG to handle the definition and execution phases of the Darlington Refurbishment Project. Under the joint venture agreement, Aecon provided construction and fabrication services while SNC focussed on specialty tooling and engineering. Project management was shared by both organizations.

This initial contract included a provision for the construction of a mock-up and training facility which was built at the Darlington Energy Complex in 2013. More than 750,000 hours of training and preparation, involving OPG staff and suppliers, took place at this site in support of the Unit 2 refurbishment.

In January 2016, SNC and Aecon were awarded a $2.75 billion contract to complete the execution phase of the Darlington Refurbishment, including the rebuilding of reactor cores and replacement of critical components.

BWXT Canada

OPG worked with its long-time design agents for fuel handling at Darlington, BWXT Canada on the defuelling portion of the refurbishment project.

BWXT was involved in the defuelling initiative since 2013, with as many as 200 staff members working on the project. The company's work has included engineering and manufacturing components used in defuelling, as well as overseeing software changes needed to modify programs for the type of fuel removal involved. Their work helped ensure the defuelling portion of the project was completed ahead of schedule.

E.S. Fox

E.S. Fox set up a team of workers on-site at Darlington to support refurbishment processes and procedures, integrating with OPG and joint venture staff to strengthen project collaboration and provide support as efficiently as possible. The company fabricated thermal insulation cabinets for the project to protect the refurbished reactor vault's concrete walls and feeder header frames from excess temperatures as well as reduce the load on the reactor vault cooling system.

Workers celebrate the successful installation of Darlington Unit 2's 960 feeder tubes in October 2019. This was followed in December by the loading of 6,240 new fuel bundles into the reactor core.

Above, a workshop with COG supplier participants at the Darlington Energy Centre in 2016 was one of many visits COG supplier participants made to the site as part of on-going collaborative development, undertaken through COG. At right, Hatch's Ian Trotman, who served as the COG Supplier Participant Project Manager in 2016, now serves as the program's chair.

E.S. Fox supplied 654 carbon steel support frames and 3,792 stainless steel panels as part of the Darlington Unit 2 refurbishment.

Black and McDonald

Black and McDonald Nuclear, which is headquartered in Clarington, Ontario near the Darlington plant, has long acted as an OPG vendor. It was also responsible for inspecting and maintaining 1,200 valves for the Darlington Refurbishment.

Approximately, 80 per cent of the nuclear project work the company does is focussed on Darlington with about 450 staff located on-site at the plant.

The company also worked on heat exchangers and piping modifications built at Black and McDonald's Scarborough facility for just-in-time delivery to Darlington. In 2017, its contributions were recognized by OCNI.

GE Power

OPG appointed General Electric as the project leader for the refurbishment of the steam turbines, generators, automation and controls for all four Darlington units.

GE Power manufactured a 350-tonne stator for Unit 3, a stationary part of a generator that converts the rotating magnetic field into electric current. It shipped the stator from its Poland factory to Darlington in May 2019.

Canadian Nuclear Isotope Council members Bruce Power, Framatome and Kinectrics join Ontario Premier Doug Ford to show off their socks which promote the life-saving power of medical isotopes in November 2019.

More than electricity

CANDU utilities continue their international leadership in medical isotope production

Nuclear plants are, not surprisingly, well associated with electricity production. But nuclear's essential service goes beyond keeping the lights on to saving lives through production of the materials used for live-saving drugs, medical diagnostics and treatments as well as food safety, worldwide.

In June, Bruce Power continued its medical isotope leadership announcing the launch of a Medical Isotope Advisory Panel consisting of experts and medical professionals to provide the company with an external perspective in the development of its isotope program and share emerging trends and solutions for a range of global health challenges. The panel will meet at an annual symposium with the first one scheduled later this year.

Bruce Power and OPG, along with New Brunswick Power and Canadian Nuclear Laboratories, are members of the Canadian Nuclear Isotope Council (CNIC), which seeks to strengthen Canada's leadership position on global medical isotope production and development. CNIC also has representatives from other industry organizations and various levels within the Canadian health-care sector as well as academic research bodies.

Bruce Power and Ontario Power Generation (OPG) produce approximately 50 per cent of the world's Cobalt-60 medical isotopes. Cobalt-60 is responsible for sterilizing approximately 40 per cent of the world's single-use medical devices, including syringes, gloves, implants and surgical instruments. This medical equipment continues to be in high-demand as the second wave of COVID-19 impacts various countries.

Given that high demand, the need for irradiation increased during the COVID crisis and remains strong. Gamma irradiation technology can sterilize materials within a day, far faster than other methods.

OPG has been producing Cobalt-60 at Pickering Nuclear since the 1970s and last year announced it would expand production to Darlington as Pickering operations wind down.

OPG is also involved in an innovative collaboration between its subsidiary, Laurentis Energy Partners, and BWX Technologies (BWXT) which will see another medical isotope, Molybdenum-99, harvested at Darlington.

Molybdenum-99 is used in over 30 million diagnostic and medical imaging treatments around the world each year, helping to detect illnesses like cancer and heart disease. Darlington will be the only source of Molybdenum-99 in North America, ensuring a stable domestic supply of this critical product.

On July 10, the Canadian Nuclear Isotope Council (CNIC) released a video focused on how isotopes have played a critical role during the COVID-19 pandemic helping to keep hospitals clean and safe. Watch it here.

Read more from this issue of COGnizant

Join us online for more content and access to the information you need to stay connected and innovate in your own program area.

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