Ontario Nuclear Collaboration

2021 REPORT

Bruce Power™
Innovation at work

ONTARIO POWER GENERATION

We're in this together

Bruce Power and Ontario Power Generation (OPG) are committed to working together with each other and with our many stakeholders to provide a safe, stable and reliable source of electricity to the Province now and for decades to come.

We are a key component of the electrical system in Ontario, not only providing stable baseload power supply but also helping the Province reach its climate change goals, powering economic recovery, and producing life-saving medical isotopes to a global market.

As you will see in this report, our joint efforts to provide safe, clean and affordable power to the people, businesses and hospitals in Ontario are sustainable and we're growing toward the future together. We continue to leverage our proud history and look forward with a focus on technical innovation and groundbreaking advances in the world of nuclear medicine.

We are immensely proud and appreciative of the tens of thousands of people who directly or indirectly support our industry, to keep the lights on, support the economy and protect the environment.

We are in this together and we are part of the fabric of this Province.

Ken Hartwick
OPG
President and
Chief Executive Officer

Michael W. Rencheck
Bruce Power
President and
Chief Executive Officer

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OUR SHARED CONNECTIONS

On the cover and throughout this report, imagery is used to symbolize the interconnectedness of Bruce Power and OPG. Whether it's bringing essential power to our connected grid system or collaborating on our nuclear refurbishment projects, Ontario is stronger because of the work we are doing together.

Ontario's Nuclear Fleet

STATUS UPDATE

Bruce Power

Bruce Power is Canada's only private nuclear operator, providing Ontario residences and businesses with cleaner, reliable electricity, along with production of life-saving medical isotopes. **We produce 30% of Ontario's electrical needs at 30% below the average cost of residential electricity**.

A Canadian-owned company, Bruce Power is a public-private partnership of TC Energy, Ontario Municipal Employees Retirement Systems (OMERS), the Power Workers' Union and The Society of United Professionals. The company employs more than 4,000 people and currently has more than 3,500 additional contractors and vendors assisting with the Major Component Replacement (MCR) Program to extend the life of Bruce Power's nuclear fleet to help secure site operation and low-cost electricity to the Province to 2064.

MCR Program

In December 2015, Bruce Power reached an agreement with the Independent Electricity System Operator (IESO) to advance a long-term investment program to help secure the operation of Bruce Power's site until 2064. This investment was named the Life Extension Program and involves maintenance work, asset management projects and the large MCR Program, which focuses on the refurbishment of six of the company's eight nuclear reactors. Bruce Power invested more than $2 billion in the Life Extension Program, which **sustains 22,000 jobs annually and contributes more than $10 billion per year in economic activity**.

The Unit 6 MCR project began in 2020. It will remove and replace large nuclear components like steam generators, all reactor internals and the vault pipework. During this four-year campaign, upgrades will be made to electrical, the cooling water system, steam turbines, and safety systems among others. The Unit 3 MCR campaign is the second on the Bruce site and will start in 2023.

The MCR Program is being completed in partnership with many experienced vendors including: ATS, BWXT, ES Fox, Makwa-Cahill, Shoreline Power Group, AECON, SNC-Lavalin, Framatome, United Engineers and Constructors, Eclipse, Kinectrics, many building Trades partners and hundreds of suppliers. A key factor in the vendor selection is localization to rural Ontario. This promotes inclusion in the community, boosts equity, the local economy and means the vendors have a higher level of commitment and social responsibility.

With 90 per cent of Bruce Power's spend on the project in Ontario and 98 per cent in Canada, the MCR Program is truly a Canadian-led infrastructure project featuring a robust network of over 250 supply chain companies and suppliers from across the Province and hundreds more from across the nation.

Ontario Power Generation

Ontario Power Generation (OPG) produces about half of the electricity Ontarians rely on every day. Our power comes primarily from 66 hydroelectric stations and two nuclear stations. Other assets include a solar facility, biomass facility, a dual-fuelled oil and natural gas station and four combined cycle gas turbine stations. Our power is clean, reliable and about a third less than the average price paid to other generators in the Province. From Cornwall to Kenora, our operations span the Province, putting the safety and health of our communities and 9,000+ employees above all else.

Darlington Refurbishment Project

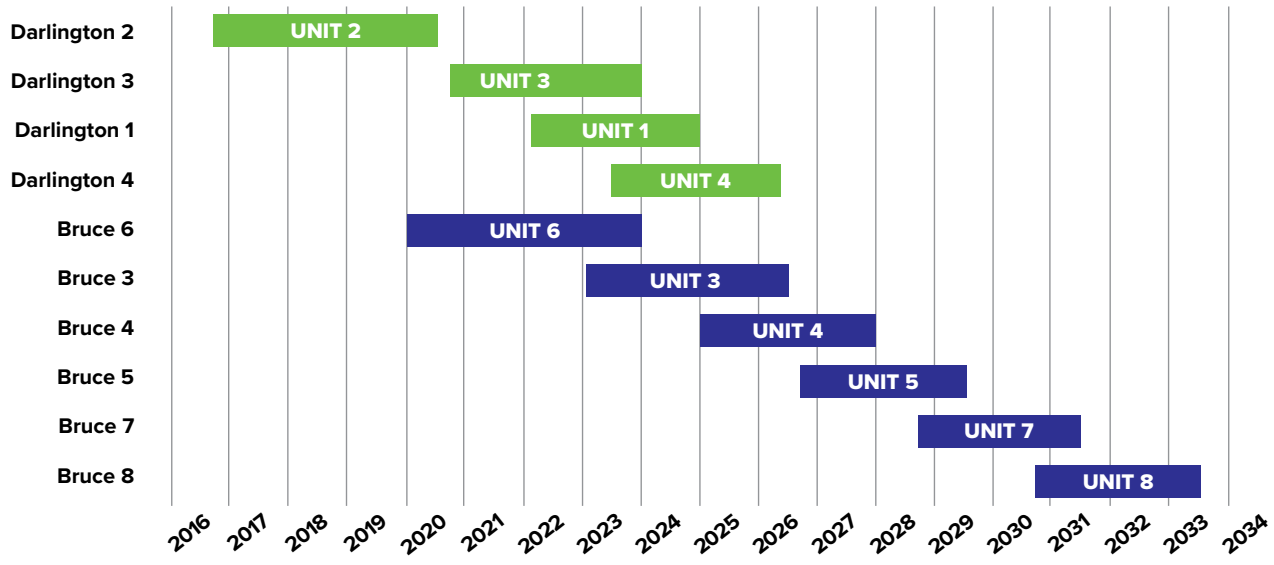
One of Canada's largest clean energy projects, the Darlington Refurbishment Project will extend the operating life of the four-unit station and generate another 30-plus years of clean energy for the Province. **The refurbishment is a $12.8 billion project that is expected to generate nearly $90 billion in economic benefits for Ontario by its completion in 2026**.

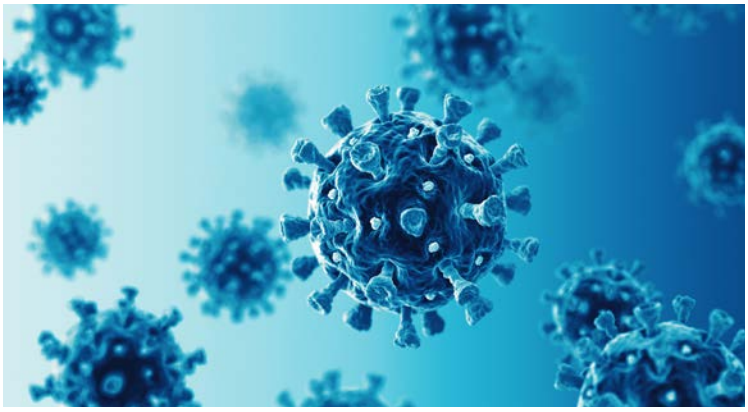
In October 2016, after ten full years of preparation and planning, OPG shut down Unit 2, refurbished the reactor and returned it to commercial service in June 2020. Following a brief delay due to the global pandemic, Unit 3 was next to come offline for refurbishment in September 2020. With reactor disassembly complete, the first stages of re-assembly commenced in October 2021. The Darlington Refurbishment Project is on schedule thanks to the commitment and team work of everyone involved and our culture of continuous improvement

Thanks to the collective efforts of Darlington employees, our vendor partners and thousands of skill trades workers on Units 3 and 2, the OPG Board of Directors granted the necessary approvals and funds required to proceed with Unit 1 refurbishment on February 15, 2022. The approvals include planning, pre-requisite work and procurement for the refurbishment of Unit 4.

We expect and plan to improve our overall performance and create efficiencies with each subsequent unit as the team continues to incorporate Lessons Learned and looks for ways to improve schedule, cost, quality and safety, preparing us for the overlapping of Units 3, 1 and 4. More than 4,000 lessons from Units 2 and 3 refurbishments have been collected and evaluated. These are being incorporated into the execution plans for Units 1 and 4.

Nuclear Refurbishment Timeline for OPG and Bruce Power Units





Pandemic Response

Since the onset of the pandemic and as an essential service, we have maintained a proactive posture in the face of this challenge. We help the Province manage risk while ensuring we provide a steady and reliable source of electricity to the people of Ontario. Both OPG and Bruce Power continue to work closely with Public Health to ensure our standards and expectations at our facilities are aligned with the latest directives. We have also had a significant role in local and provincial efforts to educate and vaccinate.

Bruce Power and OPG have been part of the Ontario Vaccination Support Council (OVSC), formed by the Ontario Chamber of Commerce in 2020. The council leverages over 250 organizations from across the Province to provide support for Ontario's COVID-19 vaccination effort. An online portal was created in 2021 to further advance its efforts which include:

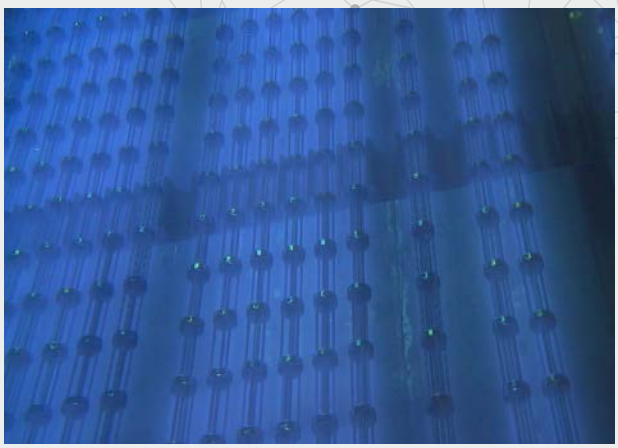
- Two-way communication between the private sector and public health units so organizations, universities, colleges, associations and labour unions can volunteer time or resources to the Province's vaccination efforts;
- Resources for the general public by way of links to key public health information and resources; and
- Support employee vaccination efforts through shared policies and best practices with government to ensure maximum participation.
- Innovations such as the "Hockey Hub" mass vaccination centres.

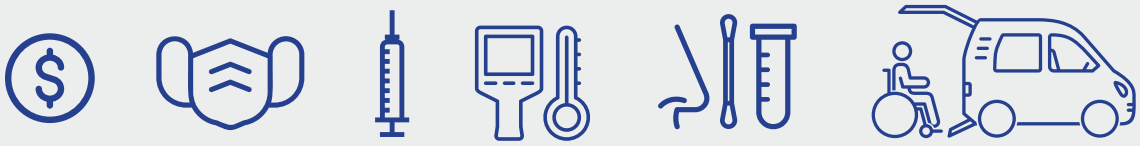
In the past year, the Premier, Solicitor General, Government and public health officials across the Province have recognized Bruce Power and OPG's role in vaccination efforts and the fight against the COVID-19.

Our organizations have, and continue to respond with many community outreach initiatives to support vaccination efforts, public safety and other challenges as a result of the pandemic throughout the Province and beyond.

Both Bruce Power and OPG create and harvest Cobalt-60, a medical isotope used extensively worldwide to sterilize billions of one-time-use medical equipment like gloves, masks, syringes, and swabs.

Below are some examples of other significant contributions made by our companies to support Ontario's pandemic response.





OPG

- **$785,000 donated to Feed Ontario, Feed the Need and the Regional Food Distribution Association** for food relief to buy and distribute food through provincial food banks, and to support northern and remote First Nation communities.
- Procurement of **200,000 surgical masks** from DENT-X Canada in partnership with Wiikwemkoong Unceded Territory and First Nations Procurement Inc. (a new facility located on Manitoulin Island).
- **$50,000 in donations to organizations in Durham region** for approximately **1,500 free trips** for seniors and mobility-challenged residents traveling to-and-from vaccination sites hot spot communities.
- **$80,000 to Jack.org to promote Be There**, a digital mental health resource that teaches young people the skills they need to be there for someone through mental health struggles. The second year of the partnership will help ensure more young people in Ontario, including Indigenous youth, are better equipped to take care of themselves and others.
- **OPG proudly sponsored the "This is Our Shot" campaign**, a national initiative to inspire and educate Canadians about vaccines with a goal of replacing vaccine hesitancy with vaccine confidence, providing individuals who are hesitant with the facts to make informed decisions.

Bruce Power

- More than **3 million pieces of Personal Protective Equipment** donated to frontline workers, businesses, Indigenous communities and schools - the largest announced donation from a private-sector business in Canada.
- More than **47,000 vaccines administered at a Bruce Power sponsored hockey hub vaccination centre** in Brampton during only 19 clinic days (daily average >2,500).
- **$60,000 in funding to support hockey hub clinics in Haldimand-Norfolk, Hamilton, and Toronto.**
- **Financial and logistical support for vaccination clinics** in Lambton County and logistical support for clinics in Waterloo Region and Halton Region.
- Set up a **36-bed recovery centre** in partnership with Saugeen First Nation in response to a community outbreak.
- **50 thermal monitors** donated to recreation facilities and Indigenous communities to assist with pre-entry screening.
- **$15,000 to Huron Chamber of Commerce for rapid test distribution.**

Areas of Collaboration

Our working relationships ramped up in 2015 as long-term agreements were made to embark on a massive revitalization of Ontario's nuclear fleet to provide decades of carbon-free, baseload electricity. We rely on each other to succeed and complete this important work. Coordinating with the IESO, we developed a long-term schedule for the start and finish of each Unit outage to ensure the Province has the power it needs to get through to the completion of Bruce Power's six MCRs and OPG's four-unit refurbishment at Darlington.

Availability of skilled trades is a key concern, so timing of major work activities remains an ongoing area of focus for both organizations.

From the top of both organizations at the executive level, to the workers with their hands on the tools, continuous improvement and process efficiencies are essential as we lean on each other to plan, learn, troubleshoot and innovate.

With OPG completing its first refurbishment ahead of Bruce Power, there has been significant collaboration between the two teams to ensure that subsequent refurbishments are implementing the lessons learned from preceding work. This back-and-forth exchange of information has led to productivity gains through shared best practices, tooling enhancements, improved efficiency and more streamlined workflows.

OPG and Bruce Power also benefit from their shared vendor partners who have been able to provide immediate support during project challenges. This includes vendor assistance to loan or quickly develop contingency tooling (sometimes in as little as 48-hours) when the as-found conditions of the reactor did not match what was expected. This approach to problem solving has allowed both OPG and Bruce Power's refurbishments to progress on-schedule.

Here are some examples of the reciprocal relationship and collaboration between our companies:

- Weekly Executive calls to address and mitigate concerns or risks to each project and schedules;
- Accountability information and metrics are shared on a daily basis to leverage one another's strengths to improve efficiencies;
- Bruce Power's Life Extension team meets bi-weekly with the Darlington Return to Service (RTS) team to share best practices with the integration of daily Operations and RTS challenges;
- Monthly Lessons Learned meetings to share best practices and detailed information for challenging evolutions such as: feeder removal, bulkhead installation, calandria tube installation, wrench time analysis and launderable Personal Protective Equipment;
- Quarterly meetings to review vendor performance, quality and supply challenges; and
- Quarterly meetings with the CANDU / Refurbishment Forum Group to share lessons learned and other experiences across the international fleet of CANDU owners.

The Re-Tube and Feeder Replacement Mock-Up Training Facility, a full-scale replica of a Darlington reactor and reactor vault, located at the Darlington Energy Complex (DEC) in Courtice, Ontario.

To date, 18 qualifications are transferrable between OPG and Bruce Power including: respirator use, fire safety, fork lift operation, electrical worker safety, working at heights, and first aid. More are being considered.

Transferable credits started in 2019 with 1,700 completed in the first year. In 2021, more than 2,300 transferable credits were completed for an estimated savings of 13-million dollars. More than 3,000 people are expected to participate in this program over the next 15 years.

Training and qualifications

The timing of Bruce Power's MCR campaign and OPGs refurbishment are staggered to accommodate a shortage of Boilermakers and Millwrights. As skilled trades workers move from one site to another for extended periods of time, onboarding supplemental workers typically means they must requalify and retrain on site-specific qualifications in order to access the site and perform work. To alleviate redundancies, Bruce Power and OPG have completed an overhaul of their training and qualifications processes to ensure credits and knowledge are more standardized and allow workers to carry credits from one site to another.

This alignment helps to maximize use of common training while minimizing redesign of existing training programs and qualifications. This effort not only supports the MCR and Refurbishment, it creates a growing pool of knowledgeable, skilled supplemental workers who can move efficiently from one site to the other to support large outage campaigns.

In 2021, these efficiencies saved $13 million dollars in redundant training costs.

Labour and trades

As part of ongoing energy sector collaboration, OPG, Bruce Power and the Electrical Power Systems Construction Association (EPSCA) continually review the industry-wide demand for trades and work with Building Trade Unions to ensure skilled tradespeople are available for nuclear work programs, including Refurbishment and MCR. To date, work has largely focused on ensuring Boilermaker capacity, as this group is considered the skilled trade in highest demand. To assist with Boilermaker supply, OPG and Bruce Power utilized a Boilermaker Helper program in 2021 for reactor disassembly work which saw over 200 recruits become security cleared to help augment work in the field. In addition, OPG and Bruce Power collaborated with the United Association of Plumbers and Pipefitters (UA) and the Canadian Welding Bureau Foundation to build new welding booths within the Grey/Bruce County School system and with the Durham Catholic District School Board. This collaboration also included having youth take part in hands-on training with the UA at their union training halls in the Toronto and Bruce area and is helping build welding resources for the future.

OPG and Bruce Power are also part of the Buildforce Labour Market Information Committee to better understand current and projected trades demand. We are driving initiatives to review skilled trades resource demand and help build capacity now and for the future of nuclear.

The nuclear supply chain creates positive economic impacts throughout the Province. Left, John Henry, Chair and CEO of the Region of Durham with Mayor of Clarington, Adrian Foster, point to their regions on a map of Ontario.

Supply chain

Ontario's nuclear supply chain has gone through extensive revitalization, growth, and transformation since the start of the refurbishments of the 10 CANDU reactors in the province (4 at Darlington and 6 at Bruce Power). With nearly **$26 billion dollars of investment** within the province, the companies that support our industry have grown from a handful of businesses providing primarily maintenance services, to hundreds of successful companies providing engineering, manufacturing, construction, project management and other specialized products and services. Businesses across Ontario have benefited from long-term, stable contracts, and the province has become an international centre of excellence for nuclear innovation and expertise.

KEY FACTS

Canada's nuclear industry is among the **safest** and most strictly regulated industries in the world.

Nuclear power directly or indirectly supports **76,000 jobs** in Canada alone.

Canada has begun the process of **refurbishing 10 of its 19 nuclear reactors** to extend their lives for another **30 years**.

Source: 2021 CNA factbook

Generation by-products

OPG stores, manages and transports various nuclear by-products from Bruce Power. Interim storage occurs in the the Nuclear Sustainability Services – Western facility on the Bruce Power site. Generation by-products include:

- Used fuel for interim storage;
- Intermediate-level waste for storage;
- Low-level waste for storage (mop heads, rags, coveralls);
- Used reactor components for interim storage;
- Large metal objects from MCR, such as steam generators and heat exchangers; and
- OPG also transports Bruce Power's D_2O to Darlington Nuclear, where it is cleaned at the Tritium Removal Facility, then transports the heavy water back to the Bruce site.

KEY FACTS

The nuclear industry tracks and manages all of its generation by-products.

All of the used nuclear fuel produced in Canada since the 1960s would fit inside one hockey rink stacked up to 30 feet, or less than the height of a telephone pole.

Scientists and experts from around the world visit our Canadian sites to learn from our processes which are built on more than six decades of experience.

Segmented steam drum — *A steam generator from Unit 6 at Bruce Power is severed to divert the upper steam drum portion to metal recycling. Only the lower half has radioactive metal tubes that require long-term storage. In recent years, Bruce Power and OPG have worked together to improve packaging of radioactive components, to minimize the volume of materials going into storage. OPG is also investigating other innovative solutions.*

A new storage building was constructed in 2021 on the Bruce Site at OPG's Western facility to store used fuel from Bruce A and B.

Cost savings

- **$8 million dollars will be saved in long-term storage costs** of the steam generators by cutting them in two pieces and recycling the non-radioactive upper steam drum.
- **$3 million dollars was saved through volume reduction and optimized packaging** of feeder tube segments during the Unit 6 removal series.
- OPG and Bruce power are investigating other opportunities and innovations to reduce the volume of material stored and the associated costs during MCR6 and the next five reactor refurbishments on the Bruce site.

Indigenous Relations

Bruce Power and OPG are committed to fostering long-term, mutually beneficial working relationships with neighbouring Indigenous communities.

A common focus is to promote careers in skilled trades where the demand is highest and to support other employment and entrepreneurial efforts in the nuclear industry. The Millwright Regional Council of Ontario (MRCO) collaborated with OPG and Bruce Power to create an Introduction to Millwright program, where Indigenous candidates received training to become apprentices. All new apprentices are currently working at both OPG and Bruce Power.

Since the start of OPG's Indigenous Opportunities Network (ION) program in 2018, the company, in partnership with Kagita Mikam (an Indigenous training and employment agency), has placed 69 Indigenous workers in various roles at OPG. OPG will continue to collaborate with Indigenous communities to support the education and capacity development needed to take on current and anticipated jobs of the cleaner energy future. Bruce Power regularly participates in ION quarterly meetings where ideas and strategies about recruitment and retention are exchanged. Through this partnership and in recognition of the achievements of the program to date, OPG is sharing the ION framework with Bruce Power to support their efforts to implement a similar program in their region.

In September 2021, OPG received a Gold designation in the Canadian Council for Aboriginal Business (CCAB) Progressive Aboriginal Relations (PAR) program. This certification was based on strengths such as equity partnerships OPG recently developed with five First Nations on power development projects, Indigenous participation in OPG's supply chain activities and ongoing, strong community engagement. In October 2021, OPG released its Reconciliation Action Plan (RAP), which serves as a road map for how it intends to work with Indigenous communities, businesses and organizations to advance reconciliation. Key to the plan are two major commitments that include:

- **growing economic impact for Indigenous communities and businesses to $1 billion**; and
- increasing Indigenous representation across all areas of the business by 2031. The RAP is a living document that will continuously evolve as new initiatives and opportunities emerge.

Eight Indigenous candidates are now millwright apprentices after graduating the Introduction to Millwrighting training program created by the Millwright Regional Council of Ontario and sponsored by OPG.

Bruce Power launched the Indigenous Relations Supplier Network (IRSN) in 2017 to focus on Indigenous engagement across employment, procurement, and community relations. The spirit of the program is to drive meaningful engagement with Indigenous communities by leveraging CCAB's engagement model. Bruce Power is also recognized as a Gold designated company in the PAR program.

Examples of strong collaboration with Indigenous communities and community partners include:

- Building homes with Habitat for Humanity in Nawash
- Supporting food bank and toy drives in communities
- The development of an Indigenous supplier via a partnership with Makwa Developments and IRSN member Makwa Cahill to open a fabrication facility in Owen Sound
- Indigenous Career Expo
- Industry Days/Supplier Days
- Support and promotion of Indigenous People's Day, Indigenous History Month and Cultural Awareness events on site through lunch and learn sessions

Supporting Training to Employment Pathways

The Supporting Training to Employment Pathways (STTEP) partnership is a collaborative effort that includes Bruce Power, OPG, Indigenous Skills and Employment Training program delivery organizations, Huronia Area Aboriginal Management Board, Metis Nation of Ontario, Apatsiwin, and the Aboriginal Apprenticeship Board of Ontario. They meet monthly with the Building Trade Unions and the Indigenous Relations Supplier Network (IRSN) to assess demand, skillsets, employment and training opportunities for Indigenous candidates seeking employment within the Nuclear Industry. This group continues to develop the Terms of Reference with a vision of increasing employment and training opportunities for Indigenous candidates with Bruce Power and industry suppliers.

Bruce Power and its partners collaborated with Georgian College Owen Sound to develop a pre-apprenticeship program to give participants an introduction to construction and maintenance fundamentals focused on electrical and welding techniques.

Bruce Power employees and IRSN members have volunteered countless days working with Habitat for Humanity over the past three years and contributed to the building of 10 homes in Nawash.

Innovation and Looking Forward

GROWING DEMAND AND SUPPLY CHALLENGES

Bruce Power Project 2030

Reaching new heights in generation

Bruce Power's Project 2030 will support the Province and Canada's climate change goals by producing upwards of 7,000 MW by the end of the decade. Using asset optimization, upgrades and new technology, we'll be able to increase the site output without making any adjustments to reactor power. To date, we've made gains from 6,300 MW of output to 6,550 MW and when complete, these innovations will net approximately 700 MW in additional power. That's comparable to adding another reactor to the fleet.

Canada's first Small Modular Reactor (SMR)

In 2021, OPG advanced the Darlington New Nuclear Project by completing its analysis of SMR technology options, and partnering with GE-Hitachi on the BWRX-300 design. The Canadian Nuclear Safety Commission (CNSC) also renewed OPG's Site Preparation licence for an additional 10 years, and OPG continues its work to develop, foster, and sustain Indigenous partnerships in support of this project. In 2022, OPG will advance the project planning, engineering, early site preparation and will submit a construction licence application to the CNSC.

Micro-Reactors energize climate change goals

Bruce Power and Westinghouse have teamed up to pursue applications of the eVinci micro reactor which could replace diesel generation in remote communities and industries such as the mining sector. The federal government recently committed $27.2 million dollars in funding to support its ongoing development.

OPG also continues to advance the Global First Power micro-SMR project in partnership with Ultra Safe Nuclear Corporation (USNC), to build, own and operate a proposed Micro Modular Reactor™ at the Chalk River Laboratories site, northwest of Ottawa.

KEY FACTS

SMRs are relatively small reactors designed to be built economically in factory-like conditions with **capacities ranging from 1 to 300 MW**.

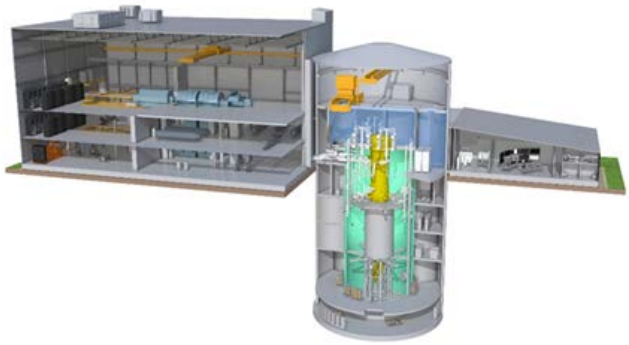
Potential application for SMRs in Canada include providing **electricity to smaller and more remote communities**, such as Ontario's Ring of Fire mining and Alberta's oil sands, as well as **contributing to existing power grids**.

The deployment of SMRs in Canada would **reduce greenhouse gas emissions drastically** by replacing fossil fuel generation.

About **50 SMR** designs are now in development, and three SMRs are already under construction in places like Argentina and China.

Canada is recognized internationally as a favourable market and regulatory environment for SMRs — an early leadership position could secure a significant share of the projected **$400 to $600 billion global market** for SMR technology.

Conceptual rendering of GE-Hitachi's BWRX-300 power plant design.



GE-Hitachi's BWRX-300 is a tenth generation of BWR designs - the most advanced, yet simplest design since GE started commercially developing nuclear reactors in the 1950s.

Ken Hartwick CEO of OPG announcing the new plans to build an SMR on the Darlington Site to help fight climate change.

Once Co-60 rods are harvested from a reactor at Bruce B, they are separated into individual bundles underwater and loaded into specialized shipping containers for transport to Nordion for further processing before heading to an international market.

Net Zero needs nuclear

Nuclear power produces emission-free electricity every day. Our industry is a leader in the fight against climate change and will help Canada meet its Net Zero 2050 target.

In 2021, Bruce Power launched several initiatives, including launching the Carbon Offset Coalition. This is a Net Zero carbon reduction community partnership program to focus on projects that are complementary to the core business, such as storage, carbon offsets, renewables, hydrogen and electrified transportation. Bruce Power also issued $500 million in Green Bonds and has committed to reach Net Zero for site operations by 2027.

OPG released its strategy in December in its first digital edition of Climate Change Plan, with a goal to become a net-zero carbon company by 2040 and a catalyst for the broader economy to achieve net-zero carbon economy by 2050. Key activities include, electrifying all TTC buses in conjunction with the Toronto Transit Commission (TTC), and Toronto Hydro, as well as an extensive 20-year plan to overhaul all OPG hydroelectric generation units throughout the Province.

Isotope production and nuclear medicine

Millions of people in Ontario and around the world enjoy a healthier, safer and higher quality of life because of the isotopes generated from Ontario's CANDU fleet. Many stable and radioactive isotopes play an enormous role in medical treatments, medical imaging, medical device sterilization, new drug development, neutron research, border security, food preservation and much more.

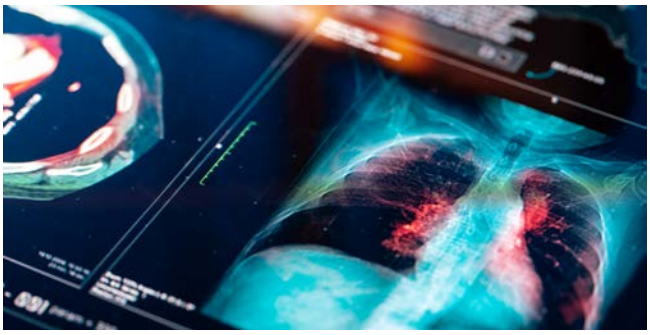
COBALT-60 (Co-60)

Together, OPG and Bruce Power work with Ottawa-based health science company Nordion to supply more than half of the world's Co-60. With increased demand for single-use medical equipment, such as syringes, gloves, implants, and surgical instruments the supply of Co-60 has become crucial. While other sterilization methods take up to seven days before products are available for use, gamma irradiation technology with Co-60 can process large amounts of material in a single day. Like an x-ray beam, the products irradiated by Co-60 do not retain any radiation after the exposure.

In Canada alone, nuclear power helps **avoid 80 million tonnes of carbon** emissions per year – equivalent to removing **15 million cars** from the road.

The smaller land-use footprint and longevity of nuclear stations mean that **nuclear power has among the lowest lifecycle carbon footprints** of any clean energy source.

The Restart of all four units at Bruce A after an extended layup in the mid-'90s, helped OPG successfully **phase out coal in Ontario**, resulting in the largest single greenhouse gas reduction in North America.



As a medical isotope, He-3 is used to produce highly detailed Magnetic Resonance Imaging (MRI) of airways in the lung.

Bruce B's Unit 7 will be the first commercial reactor in the world able to produce Lu-177 and potentially other short lived medical isotopes. Operators train on a pneumatic system which delivers and retrieves the pencil-sized targets to the core of the reactor.

Approximately 10 per cent of the cobalt harvested at Bruce B is the form of a tiny pellet known as High Specific Activity (HSA) cobalt. These tiny pellets are used in gamma knife cancer fighting technology that targets and shrinks brain tumours in a non-surgical procedure. OPG also creates and harvests Co-60 at Pickering Nuclear. Production will expand to Darlington Nuclear in 2026.

HELIUM-3 (He-3)

Laurentis Energy Partners, a subsidiary of OPG, is now producing He-3, a rare isotope used in quantum computing, neutron research, border security and medical imaging. He-3 is obtained from tritium that is removed from heavy water and stored at the Darlington station. Production of the valuable isotope began in late 2021, making Laurentis the first civilian, non-military source of He-3.

LUTETIUM-177

In 2021, Bruce Power received approval from the CNSC to begin commissioning of a Lutetium-177 production system. Lutetium-177 is a breakthrough therapeutic isotope used in the treatment of prostate cancer and neuroendocrine tumours.

Through a newly formed partnership with Isogen, the Isotope Production System (IPS) will produce urgently needed medical isotopes that will help address a global shortage in a rapidly growing field of nuclear medicine. The first IPS system was installed in Unit 7 at the end of 2021. Commissioning is underway and production will begin later this year. Bruce Power will be the first commercial power reactor in the world to produce Lutetium-177.

MOLYBDENUM-99 (Mo-99)

Laurentis Energy Partners and BWXT will soon begin production of Mo-99, commonly called Moly-99, which is considered the gold standard for diagnostic testing for many conditions. Its decay product, Technetium-99m (Tc-99m), remains radioactive long enough to complete medical examinations and procedures, and short enough to not cause harm to human organs. Tc-99m is used in 30 million medical treatments around the world each year, helping to detect illnesses like cancer and heart disease. When productions begins at OPG's Darlington station, this will be the only source of Moly-99 in North America and will ensure a stable domestic and international supply of this critical product.

Nuclear technology is used extensively in medicine, helping to **diagnose and treat** many different diseases including cancer.

In Canada alone, over **1.5 million diagnostic scans** and **15,000 radiation therapy treatments** happen every year.

CoaIt-60 is also used to **sterilize** a wide range of medical instruments and equipment such as heart valves.

Bruce Power
Innovation at work

ONTARIO POWER GENERATION

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