2021 Annual Review and Energy Report



BrucePower





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Powering Ontario Forward

Proud past Bright future



Powering Ontario Forward

+20yrs

Bruce Power is formed in 2001

U1-4

Units restarted in Bruce Power's first 11 years

U3-8

Units to be refurbished to extend reactor life and produce medical isotopes for years to come

Canada's clean energy future

A message from Mike Rencheck, President and Chief Executive Officer

Since becoming Canada's only private nuclear operator in 2001, providing Ontario residents and businesses with clean, reliable and affordable energy, Bruce Power has established a solid footing and is looking forward to a dynamic future.

The first 11 years of the company's operation was dedicated to restarting Units 1-4, which increased the lifespan of the eight-unit site from 2018 to 2035 and provided the province with 70 per cent of the carbon-free energy it needed to shut down coal plants. In December 2015, the company signed an amended agreement with the Independent Electricity System Operator (IESO) to extend the life of Units 3-8 over the next two decades, securing the long-term future of the site through 2064.

We are not resting on our laurels as one of the largest operating nuclear sites in the world and we're stepping up our commitment to performance excellence and innovation, as well as our value of social responsibility. We're expanding our reach

into medical isotopes, which are used to sterilize medical equipment and treat cancer, improving the lives of millions of people around the world.

We're also excited about our role in helping Ontario meet its climate change and economic recovery goals.

On behalf of everyone at Bruce Power, I am proud to share our vision with you. Our 2021 Annual Review and Energy Report will provide you with insights on how we're powering Ontario forward.

Mithael W. Ruch

Electric outlook for Ontario



Major Component Replacement project by the numbers:

40

Years of site operation following Unit 6
Major Component Replacement

60+

Suppliers that have opened offices or warehouses in Bruce, Grey and Huron counties

145t

Weight of each of the eight steam generators replaced in Unit 6

"MCR will allow us to continue providing people and businesses across Ontario with reliable, low-cost, clean electricity for decades to come."

Eric Chassard, Executive Vice-President, Projects and Engineering, Bruce Power

MCR projects provide power for the people

Extending the operational life of the Bruce Power units will ensure the people of Ontario have a safe and reliable supply of electricity at a stable price for decades to come.

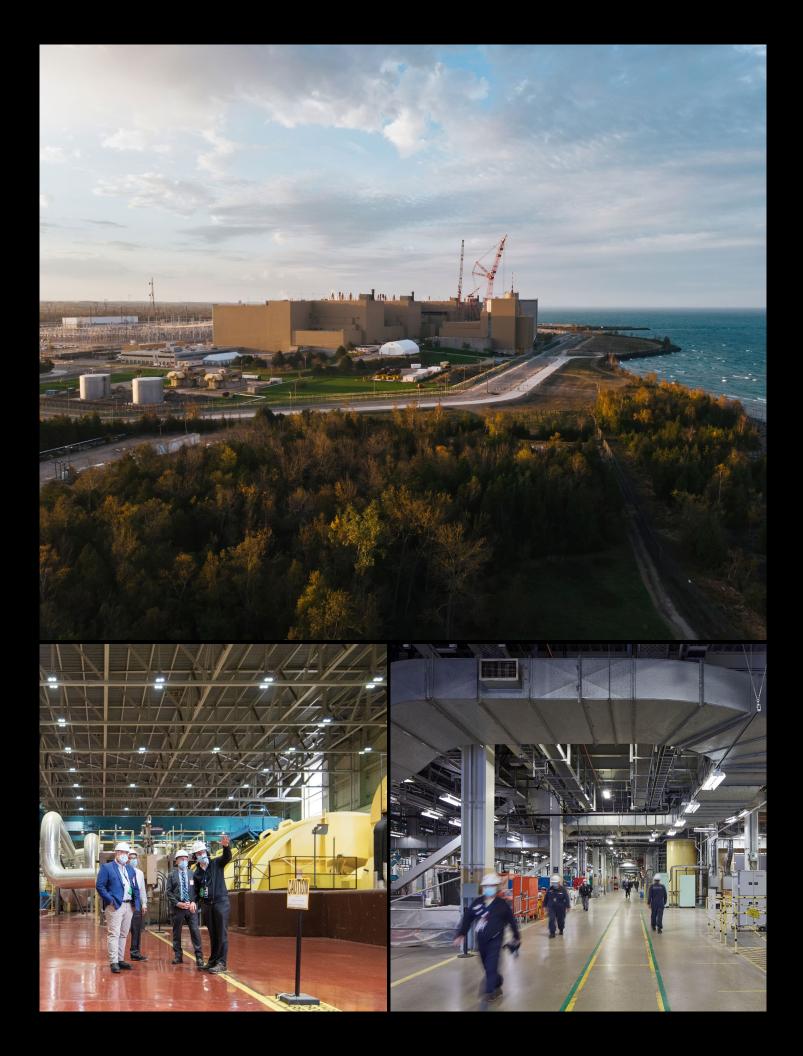
One of Canada's largest infrastructure projects will see Units 3-8 refurbished over the next several years. The Unit 6 Major Component Replacement (MCR) Project, which began in January 2020, reached several critical milestones in 2021 and planning is well under way for the Unit 3 MCR, scheduled to begin in 2023.

The reactor removal work in Unit 6 was completed in July. Bruce Power's MCR team, along with vendor partners, spent about 10 months removing feeder tubes, pressure tubes, calandria tubes and other important internal components of the Unit 6 reactor in preparation for the installation of new parts that will extend the life of the unit for 40 years.

A huge effort has gone into the removal and replacement of the Unit 6 steam generators. Unit 6 contains eight steam generators, arranged vertically in two columns of four on the east and west sides of the reactor. Each steam generator is lifted through the powerhouse roof using Mammoet's massive PTC-35 crane.

The installation and inspection series of the Unit 6 MCR will continue in 2022, with the unit's return-to-service scheduled for 2023.

MCR is part of Bruce Power's Life-Extension Program and will support an estimated 5,000 jobs directly and indirectly every year through 2033. The innovations and lessons learned in the Unit 6 MCR are being applied to streamline future projects.



"Ontario's electricity system is 94% emissions-free, thanks in large part to Bruce Power, which produces 30% of the province's power. **Bruce Power continues** to show leadership in developing innovative solutions to support **Ontario's emissions**reduction targets."

Hon. Todd Smith

Ontario Minister of Energy

Bruce Power commitments:

\$3B

Investment in economic recovery over next 18 months

7,000+

Target megawatt output of Bruce Power site as part of Project 2030

250,000

More Ontario homes, businesses and hospitals powered by megawatt uprate

"Project 2030 is an impressive goal and one that I know will be reached by Bruce Power. Their commitment to expanding the supply of affordable energy while also meeting climate change targets is commendable and I congratulate everyone involved."

Hon. Lisa Thompson, Minister of Agriculture, Food and Rural Affairs, and Member of Provincial Parliament for Huron-Bruce

Reaching new heights in generation

Through innovation and investment into its facilities, Bruce Power has been able to increase its site generation peak to 6,550 megawatts (MW).

Along with Major Component Replacement (MCR) and asset management and optimization initiatives, Project 2030 will see Bruce Power support the province's and country's climate change targets and future clean energy needs by producing upwards of 7,000 MW by 2030. This increase in Bruce Power's generation peak is equivalent to adding an entire full nuclear plant capacity through optimization of existing assets, without the need to build new infrastructure.

Project 2030 will focus on continued asset optimization, innovations, and leveraging new

technologies, which could include integration with storage and other forms of energy to increase the site peak output at Bruce Power.

"Ontario's nuclear industry is well prepared to support the creation of new opportunities for growth, jobs and drive emissions reductions," said Hon. Todd Smith, Minister of Energy. "By increasing its energy output, Bruce Power is leading the way, providing clean energy to hundreds of thousands of additional homes, while at the same time harvesting medical isotopes that will save lives through sterilization of medical equipment and fighting cancer."

Doing OUI part for climate change

"Creating our Green Financing Framework is a meaningful and concrete next step toward ensuring the highest Green standards are reflected in our financing initiatives. Through this framework, Bruce Power will continue investing in life extension and increasing the output of our units, which promotes environmental sustainability."

Kevin Kelly, Executive Vice-President, Finance, and Chief Financial Officer, Bruce Power



Bruce Power commitments:

2027

Bruce Power's commitment to become a Net Zero site

2050

Helping Ontario and Canada meet Net Zero goals

\$500M

Amount in Green Bonds issued in 2021

"Canada is a Tier-1 nuclear nation and will reach net-zero emissions by 2050. Ambitious leadership like that being shown here by Bruce Power will get us there."

Hon. Seamus O'Regan, Minister of Natural Resources for the Government of Canada

Canada needs nuclear to achieve Net Zero

In 2021, Bruce Power launched a number of initiatives, including a commitment to Net Zero from site operations by 2027 and unveiling the Carbon Off-set Coalition, a Net Zero carbon reduction community partnership program. Bruce Power has made the commitment to help positively affect climate change by setting tangible goals in support of our communities, the province and the country.

The nuclear industry has the opportunity to play a leadership role in the fight against climate change and the push towards Canada's Net Zero 2050 target.

In April, Bruce Power formally announced its commitment to be a Net Zero company by 2027, becoming the first nuclear operator in the North America to set such an ambitious target.

Bruce Power Net Zero Inc. will focus on projects that are complementary to leverage Bruce Power nuclear, including storage, carbon off-sets, renewables, hydrogen, and electrified transportation. Starting from this position of strength, Bruce Power Net Zero Inc. will leverage investments to generate pathways to achieve Net Zero by 2027.

In 2021, Bruce Power announced the issuance of \$500 million in Green Bonds, which is a global first for nuclear power and recognition of the critical role the technology plays in fighting climate change and enabling a Net Zero future.







"Nuclear is a clean energy source that provides reliable, affordable electricity — 24/7 without emitting any greenhouse gases in its operation. The world needs nuclear power to achieve Net Zero emissions."

Mike Rencheck

President and Chief Executive Officer. Bruce Power

Lifesaving medica sotopes



Advancements over the past year:

25B

Pairs of gloves or COVID-19 swabs that could be sterilized from two Cobalt-60 harvests

40%

The world's single-use medical equipment that is sterilized with Cobalt-60

1WK

Time it will take for Ytterbium-176 to be irradiated in a Bruce Power reactor to produce Lutetium-177

"Ontario is a leader in medical isotopes and the world is counting on us to keep hospitals clean and safe, and diagnose and treat cancer."

Bill Walker, Member of Provincial Parliament, Bruce-Grey-Owen Sound

Leading the way in nuclear medicine

Launching a new, innovative production system.

Already a leader in the production of medical isotopes, Bruce Power has made steps toward expanding its capabilities in supplying new life-saving isotopes to the world market.

Bruce Power conducted two Cobalt-60 harvests during planned outages at Bruce B in 2021. Through its partnership with Ottawa-based Nordion, Cobalt-60 is used in the sterilization of single-use medical equipment and in transformative cancer treatments such as the Gamma Knife®.

In September, Bruce Power received approval from the Canadian Nuclear Safety Commission (CNSC) to begin commissioning for the production of Lutetium-177, a breakthrough therapeutic isotope used in the treatment of prostate cancer and neuroendocrine tumours.

In November, a Private Member's motion asserting Ontario's global role as a leader in the supply of medical isotopes to fight COVID, keep hospitals safe, and fight cancer, received unanimous, all-party support in the Ontario Legislature.

This innovative project began in 2019, when Bruce Power announced its partnership with Isogen (a joint venture between Framatome and Kinectrics) to develop a made-in-Ontario Isotope Production System (IPS) to produce urgently needed medical isotopes, leveraging Bruce Power nuclear infrastructure as the backbone. Installation began in Unit 7 in late 2021, and, with final commissioning expected in early 2022, Bruce Power will become the first commercial power reactor in the world to produce Lutetium-177.

The advancement of the Lutetium-177 project further cements Bruce Power and Ontario as a hub of nuclear innovation and isotope production, and matures Canada's status as a leader among the international medical isotope community.



"We believe there's a leadership role for Bruce Power in working with the scientists, engineers and doctors to keep finding new ways for medical isotopes to improve the lives and health of people around the world."

James Scongack

Chief Development Officer and Executive Vice-President, Operational Services, Bruce Power







"It's very exciting times for SON as we move forward to the next phase of the isotope project with Bruce Power. We are proud to play a leadership role in the global fight against cancer, while building economic opportunities in our community."

Chief Lester Anoquot, Chippewas of Saugeen First Nation

Growing roots with Indigenous communities

Bruce Power remains committed to fostering a strong connection with Indigenous communities through meaningful partnerships, employment for skilled workers, and training opportunities.

Bruce Power's collaboration with Saugeen Ojibway Nation (SON) will see the partners jointly marketing new isotopes in support of the global fight against cancer while also working together in creating new economic opportunities within the SON by establishing new isotope infrastructure.

The partnership, which includes a revenue-sharing model for SON, is named Gamzook'aamin aakoziwin, which means 'We are Teaming up on the Sickness' in the traditional Anishinaabe language.

Bruce Power also signed a supplier agreement with Makwa-Cahill, a new partnership focused on industry fabrication and other strategic opportunities in the energy sector.

The Indigenous-owned venture will undertake fabrication activities for Bruce Power, while creating employment, training and skill development opportunities for local Indigenous peoples.

A first-of-a-kind training program between the Millwright Regional Council of Ontario (MRCO), the Organization of Canadian Nuclear Industries (OCNI), the First Nations Power Authority (FNPA), Huronia Area Aboriginal Management Board (HAAMB), the Aboriginal Apprenticeship Board of Ontario (AABO), and Bruce Power saw its first graduates in 2021.

Bruce Power continues to work and collaborate with the Métis Nation of Ontario and the Historic Saugeen Métis communities to develop customized employment and training programs that create meaningful employment jobs for Métis citizens.

Our relationship with Cameco drives Indigenous engagement across many fronts including employment and Indigenous participation in supply chains which includes the joint venture between Makwa Developments (Ontario based First Nation owned company) and TRON construction (Saskatchewan based First Nation owned company).

Helping Ontario recover & C/CW





"Bruce Power has adopted a strong commitment to diversity and inclusion and has a strategic plan in place to ensure this commitment results in meaningful action."

Cathy Sprague, Executive Vice-President, Human Resources, Bruce Power

Diversity and Inclusion

Bruce Power's skilled, diverse workforce of full-time and contract workers is committed to our value of Safety First.







Leading in the fight against COVID-19

Since the onset of the pandemic, Bruce Power has provided more than three million pieces of personal protective equipment to frontline workers, businesses, Indigenous communities and schools — the largest announced donation from a private-sector business in Canada.

The company also spent more than \$1 million on public education efforts, community protection, shop local initiatives, activities and organizations that promote mental and physical health, lending a helping hand to those in need.

In 2021, the company teamed up with health units across Ontario to establish Hockey Hub mass vaccination centres to ensure thousands of residents had easier access to life-saving vaccines.

Bruce Power provided resources and knowledge to numerous health units in some of the pandemic's hardest hit areas using the Hockey Hub model, which was developed by Dr. Ian Arra, the Grey Bruce Health Unit's Medical Officer of Health. The large-scale vaccination clinics used a streamlined flow-through process to quickly administer vaccines while requiring fewer clinical staff than traditional clinics – getting more needles in arms, and lowering the risk of COVID-19 spread across the province.

Bruce Power was able to provide full support to three vaccination hubs in Grey-Bruce, as well as the Peel and Lambton regions, while providing additional logistical and financial support to Hockey Hubs in the regions of Waterloo, Norfolk, Hamilton and Halton.

By working together with Ontario's health units, Bruce Power helped keep residents safe and healthy through the important vaccination stage of the pandemic.



Community initiatives

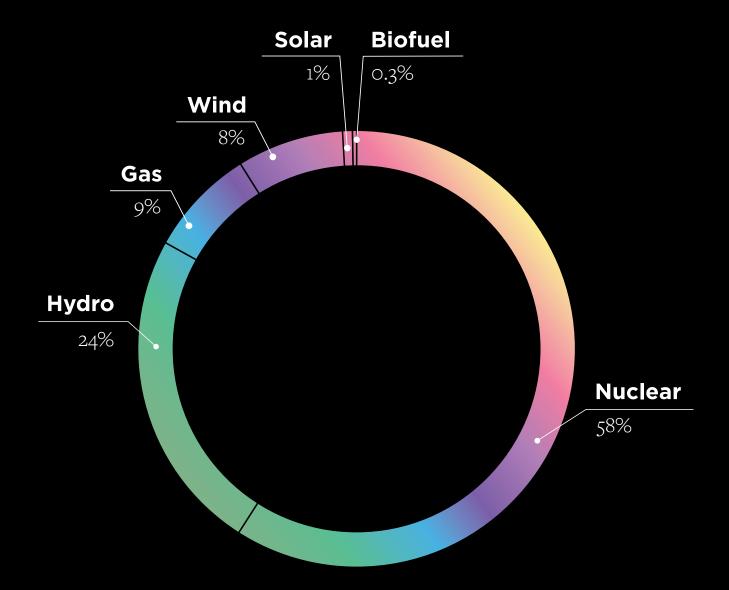
The Bruce Power Charitable Events Sponsorship Program is proud to support local, provincial and national non-profit organizations that focus on Indigenous youth, health and wellness organizations, Canadian veterans and local Legions, food banks, provincial vaccination efforts and hospital foundations. Nearly 40 suppliers supported the program, which donated more than \$570,000 to these initiatives in 2021. We thank all suppliers for their contributions, especially those at the Community Partner level, which includes Kinectrics, Nuclear Promise X, E.S. Fox Construction Ltd., Westinghouse, BWXT, and SNC-Lavalin.



Bruce Power Visitors' Centre

Though the COVID-19 pandemic has presented many challenges, it did provide an opportunity for Bruce Power to renovate its Visitors' Centre, which has been closed to the public since March 2020. When we re-open the doors, we're excited for our thousands of annual visitors to see our new displays on the nuclear electricity process, Cobalt-60 and medical isotopes, how we monitor the air, water and food surrounding our site, and so much more. Learn more at www.brucepower.com/visit.





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m fig.\,1}$ Electricity Output by Fuel Type (2021)

Ontario's energy supply mix

Ontario's energy market has undergone significant transformation over the past decade and will undergo vast transformation in the years ahead.

Over the past two years, changes in demand and usage patterns as a result of the COVID-19 pandemic brought renewed spotlight on our electricity system and the importance of reliable, clean power. Throughout the pandemic Bruce Power nuclear provided safe, reliable electricity to the people and businesses of Ontario to help keep the lights on when needed the most.

By reliably generating that power while producing zero carbon emissions, Bruce Power is proud of the role it plays in keeping Ontario's air clean and helping meet global emission reduction targets.

Bruce Power also provides the foundation Ontario needs to not only reduce emissions, but become a leader in innovation. We have been a proud and active partner of the Ontario government for many years, helping the province to explore opportunities to use nuclear power to decarbonize its economy and achieve its climate change objectives, while simultaneously maintaining a reliable and stable electricity grid.

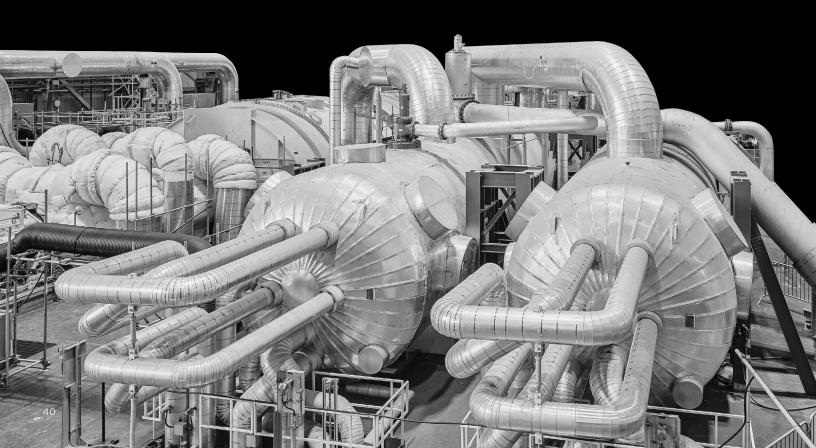
Bruce Power takes its responsibility to contributing to a Net Zero future very seriously. From our Net Zero 2050 strategy launched last year, to our Net Zero 2027 commitment for our operations, carbon reduction community initiatives, the recent issue of the first-ever nuclear Green Bond and exploration of potential opportunities to explore and develop new nuclear technologies, we are working to demonstrate strong, tangible leadership in helping Canada reach its Net Zero by 2050 objectives while creating thousands of good-paying, highly-skilled jobs in the clean energy sector.

Bruce Power stands ready to move forward with significant investments and work projects to help meet those challenges, while providing economic recovery opportunities at the same time. Our actions demonstrate our commitment to our local community, as well as our province and country.



fig. 2 Demand through 2021

Average demand in 2021 increased by 1.5 per cent year-over-year. The post-pandemic economic recovery impacted demand from commercial and retail load, while overall demand rebounded to pre-pandemic levels. Looking forward, we can expect continued recovery through 2022, as the province emerges from the pandemic and economic growth becomes the focus.



A year of global economic recovery

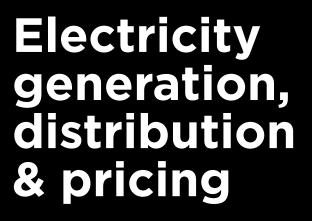
The first half of 2021 brought rising vaccination rates and the first steps to a return to normalcy for the residents and businesses of Ontario. While the new normal may still look different from our pre-COVID world, overall electricity demand rebounded to pre-pandemic levels this year.

In 2020, the pandemic created unusual and unexpected patterns in demand as it impacted all businesses in various ways. In 2021, overall demand in the province mostly stabilized, though there were some fluctuation patterns not typically seen pre-pandemic. Residential demand increased while commercial demand decreased slightly compared to pre-pandemic levels, as people continue to work from home. This has resulted in Ontario's overall electricity demand patterns being much more sensitive to weather, as individual heating and cooling loads at historically uncommon times of day put pressure on the system.

In the midst of the unrelenting heat and humidity that gripped Ontario through the second hottest August on provincial record, electricity demand was predictably high. Bruce Power's reliable power provided stability to Ontario's electricity grid as the heatwave increased air conditioning load and electricity demand across all sectors all while keeping the province's air clean with zero carbon emissions.

Frequent restrictions to importing power from Quebec during the heatwaves limited out-of-province power sourcing, while intermittent generators of electricity contributed 50 per cent less electricity in August than would be expected at other times in the year. Bruce Power and Ontario's nuclear sector once again did the heavy lifting, providing the province with clean, reliable electricity when families and businesses needed it most.

Get plugged in



Transmission

Power travels from the generator companies to the high-voltage transmission lines. 97 per cent of these lines are owned by Hydro One.

Generation

Generators include Bruce Power nuclear and other sources such as hydro, wind and solar.

Unit 3 811 MW
PARSONS
PARSONS

fig. 3

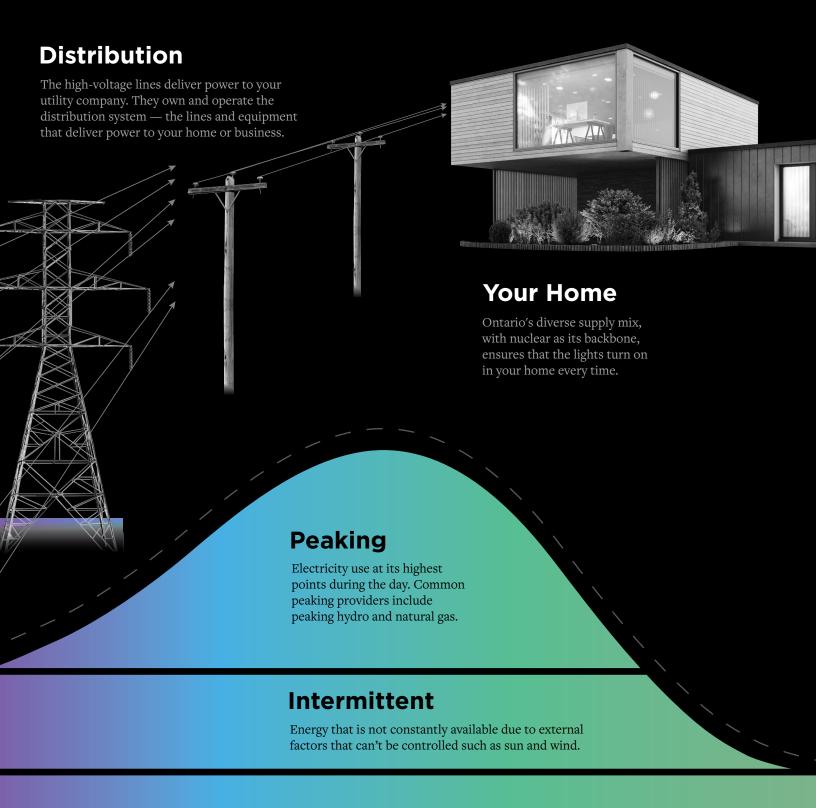
BrucePower

Market demand & generation type

42

6 a.m.

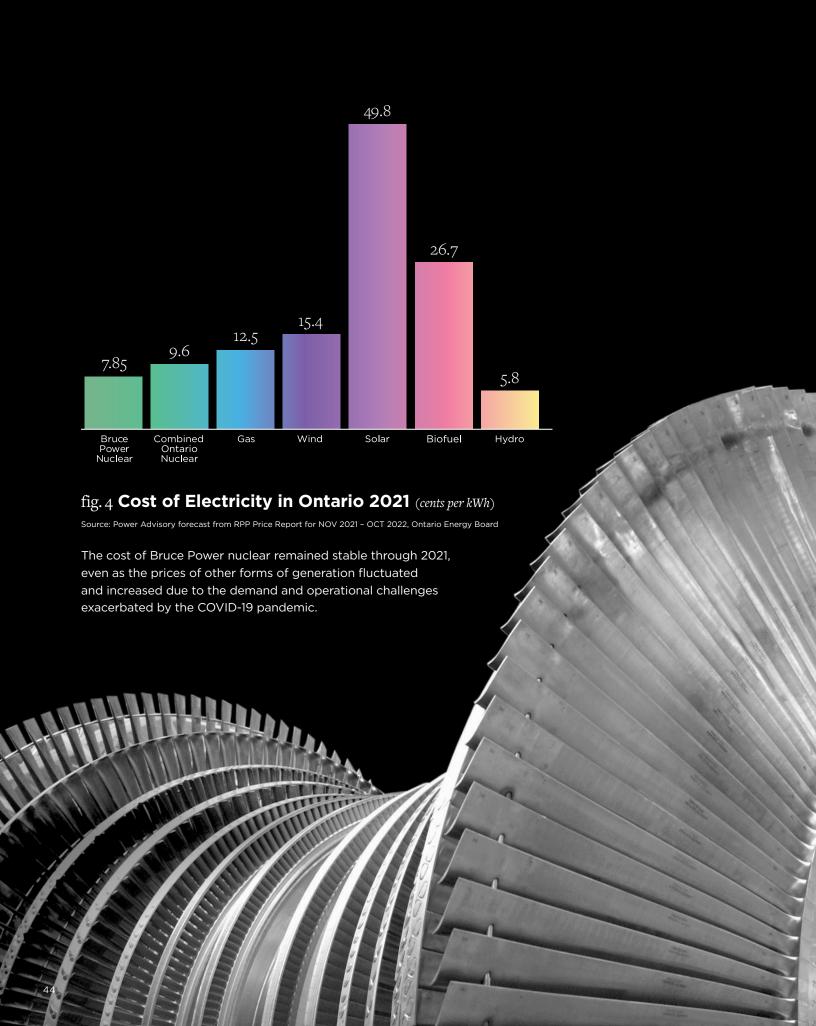
9 a.m.



Baseload

The minimum amount of power needed to be supplied to the grid at any given time. Must be supplied by a reliable, constant source of electricity such as nuclear or hydro.

on 6 p.m. 9 p.m. 43



"Bruce Power's reliable, stable nuclear power helps to ensure Ontario always has the electricity it needs to keep the lights on and the air conditioning running when Ontario businesses, industries, hospitals and families need us most."

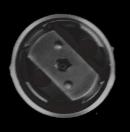
Chris Mudrick

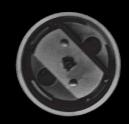
Executive Vice-President and Chief Nuclear Officer, Bruce Power The Bruce region can be a nexus for global leadership in the development of new technologies, including: Bruce Power Major Component Replacement project will provide the province with carbon-free electricity and life-saving medical isotopes through 2064;

New nuclear builds, which — if needed to meet growing electricity demand — will benefit from existing infrastructure, licenses and local expertise including Small Modular Reactors (SMRs), which are estimated to have a global market of \$400-600 billion;

Hydrogen, which can be generated cleanly from nuclear power, and used as an emissions-free fuel to decarbonize other parts of our economy. The federal government projects that hydrogen will account for 30 per cent of end-use energy by 2050;

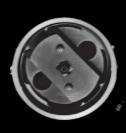
Developments in other promising technologies like batteries, storage, solar, and fusion energy.





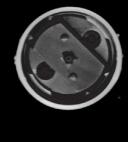


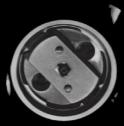


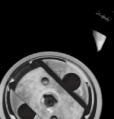




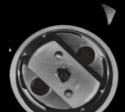












Moving energy forward

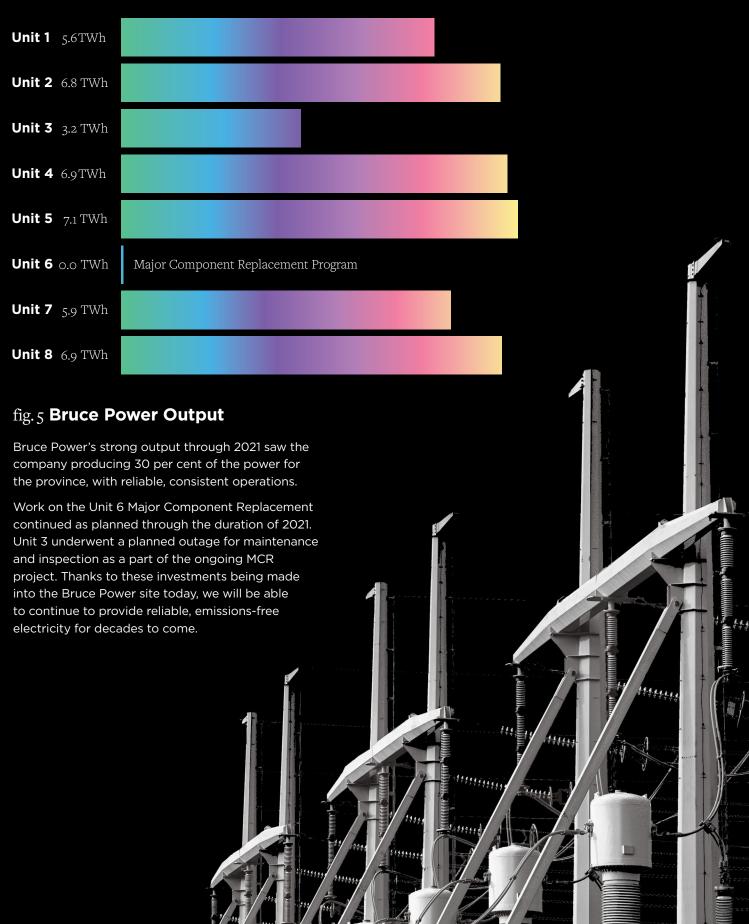
Bruce Power provides the foundation Ontario needs to not only reduce emissions, but become a leader in innovation.

Research has shown that existing technologies won't be enough to get us to net zero — we'll also need new energy innovations. The Net Zero by 2050 report from the International Energy Agency (IEA) found that nearly 50 per cent of the emissions reductions required for net zero globally will depend on technologies still under development.

As Ontario moves towards an ambitious target of net zero emissions by 2050, demand from electrification, especially from adoption of electric vehicles and electrifying heavy industry, will significantly increase the need for clean electricity. Achieving Ontario's net zero targets will require maximizing the value of our existing clean energy infrastructure to meet electrification demands, achieve efficiency gains, and encourage the adoption of new technologies.

Bruce Power and Ontario see a future as becoming global leaders in the development, testing and deployment of new technologies. The region has emerged as a Clean Energy Cluster that is driving energy innovation, with the Bruce site serving as a hub and the refurbishment program providing the stimulus to create the cluster.

Bruce Power continues to explore the potential for Small Modular Reactors (SMRs). In 2021, Bruce Power and Westinghouse completed a feasibility study with conclusive results that the Westinghouse eVinci™ micro-reactor has the potential to provide safe, reliable and low-carbon baseload power to remote, off-grid communities, mines and heavy industry and assist in Canada's efforts to combat climate change.



"Bruce Power nuclear is vital in keeping prices low for all consumers, and its Life-**Extension Program** will help provide price stability for businesses looking to invest and grow in Ontario for decades."

Rocco Rossi

President and CEO, Ontario Chamber of Commerce

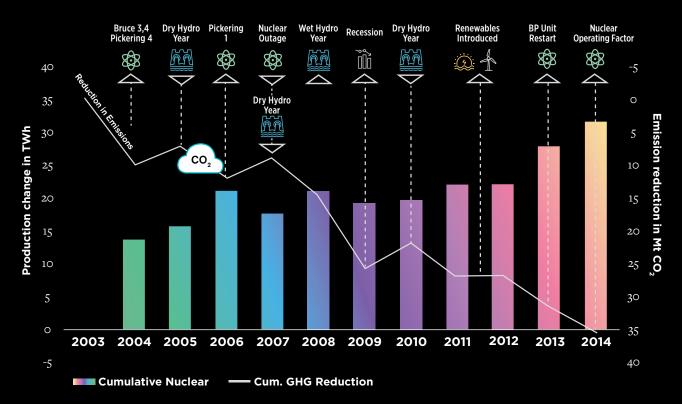


fig. 6 Changes in electricity supply and GHG emissions

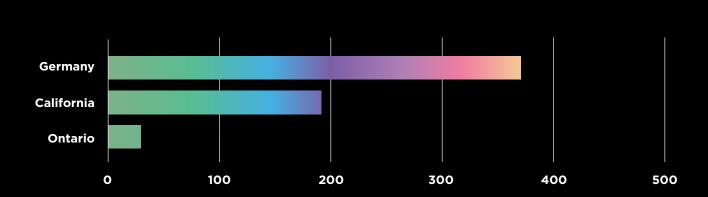


fig. 7 Emission intensity from the electricity sector by jurisdiction (gCo2e/kWh)

Source: U.S. Energy Information Administration (EIA), 2021, and Eurostat, 2021

In 2011, Germany decided to shut down its nuclear program, resulting in a power grid that is far more carbon-intensive and dependent on fossil fuels despite heavy investments in renewable generation such as wind and solar over the last decade.

California followed a similar path, abandoning nuclear power in favour of large-scale renewables, yet still seeing an uptick in emissions.

When viewed in contrast with Ontario, the results are clear: a low-emission grid powered by nuclear and hydro will retain system reliability while dramatically cutting emissions from the electricity sector.

Reducing our footprint

The decarbonization of the electrical grid is a success story on a global level.

Very few jurisdictions have been able to reduce carbon emissions from their energy system as successfully as Ontario. Bruce Power provided 70 per cent of the electricity Ontario needed to shut down its coal-fired generating plants by 2014 and today, we've set our sights on loftier goals.

Between 2003 and 2012, Bruce Power brought four nuclear reactors back to life. This revitalization generated 70 per cent of the energy needed to phase out coal in Ontario and allowed the province to shut down all coal plants. While other jurisdictions have struggled to eliminate coal-fired generation from their energy system, Ontario was able to accomplish this target thanks to the existing nuclear technology and infrastructure in the province.

Nuclear provides 60 per cent of Ontario's electricity while producing zero carbon emissions from generation, which is the equivalent of avoiding 19 million tonnes of greenhouse gases (GHGs) per year. While nuclear continues to provide the backbone of the electricity cleanenergy supply in Ontario, Bruce Power and the

nuclear industry will help the province achieve its objective of reducing emissions by 30 per cent below 2005 levels by 2030.

Bruce Power has committed to achieve Net Zero by 2027, which will account for all direct and indirect greenhouse gas (GHG) emissions that occur from sources that are owned or controlled by our company. In addition, we will account for indirect GHG emissions from the generation of purchased electricity or energy (e.g. heating steam) consumed by our company.

Bruce Power has a Net Zero partnership with the Nuclear Innovation Institute (NII) to help in the funding and development of additional carbonoffset projects in our local communities through the Carbon Offset Coalition.





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