Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 23-M27.1A

Date: 2023-09-06
File / dossier : 6.02.04
Edocs pdf : 7120883

Supplementary Information

Presentation from Bruce Power

Renseignements supplémentaires

Présentation de Bruce Power

Bruce Power

Bruce Power Mid-Term Update of Licensed Activities

Bruce Power

Rapport de mi-parcours au sujet des activités autorisées de Bruce Power

Commission Meeting

Réunion de la Commission

September 20 and 21, 2023

Le 20 et 21 septembre 2023

Canada

Bruce Power's Mid-Term Update

September 20, 2023

Bruce Power acknowledges and honours the fact that its site lies within the traditional treaty territory of the Saugeen Ojibway Nation and the traditional harvesting territory of the Métis Nation of Ontario (Region 7) and the Historic Saugeen Métis.

We continue to build relationships with our hosts as we work towards true reconciliation.

Safety First

BRUCE POWER'S NUMBER 1 VALUE

Safety First is and always will be our number one value, and it is the first step in securing our future. Together, we need to look out for our peers, our plants and our communities, using the Bruce Power Excellence Model as our guide.

Overview

MIKE RENCHECK, PRESIDENT AND CHIEF EXECUTIVE OFFICER

Opening remarks

JAMES SCONGACK, CHIEF DEVELOPMENT OFFICER AND EXECUTIVE VICE-PRESIDENT

Community engagement
Health care support
Supporting communities during COVID-19
Indigenous relations
Protecting the environment
Environment, Social and Governance oversight and performance

TERRY ROTHMAIER, SENIOR VICE-PRESIDENT, NUCLEAR OPERATIONS

Safety performance
Operational performance
Emergency preparedness
Pressure tube fitness for service

ERIC CHASSARD, EXECUTIVE VICE-PRESIDENT, PROJECTS AND ENGINEERING

Life-Extension Program and Major Component Replacement
Asset management
Project 2030

MIKE RENCHECK, PRESIDENT AND CHIEF EXECUTIVE OFFICER

Highlights of the past five years
A five-year look-ahead

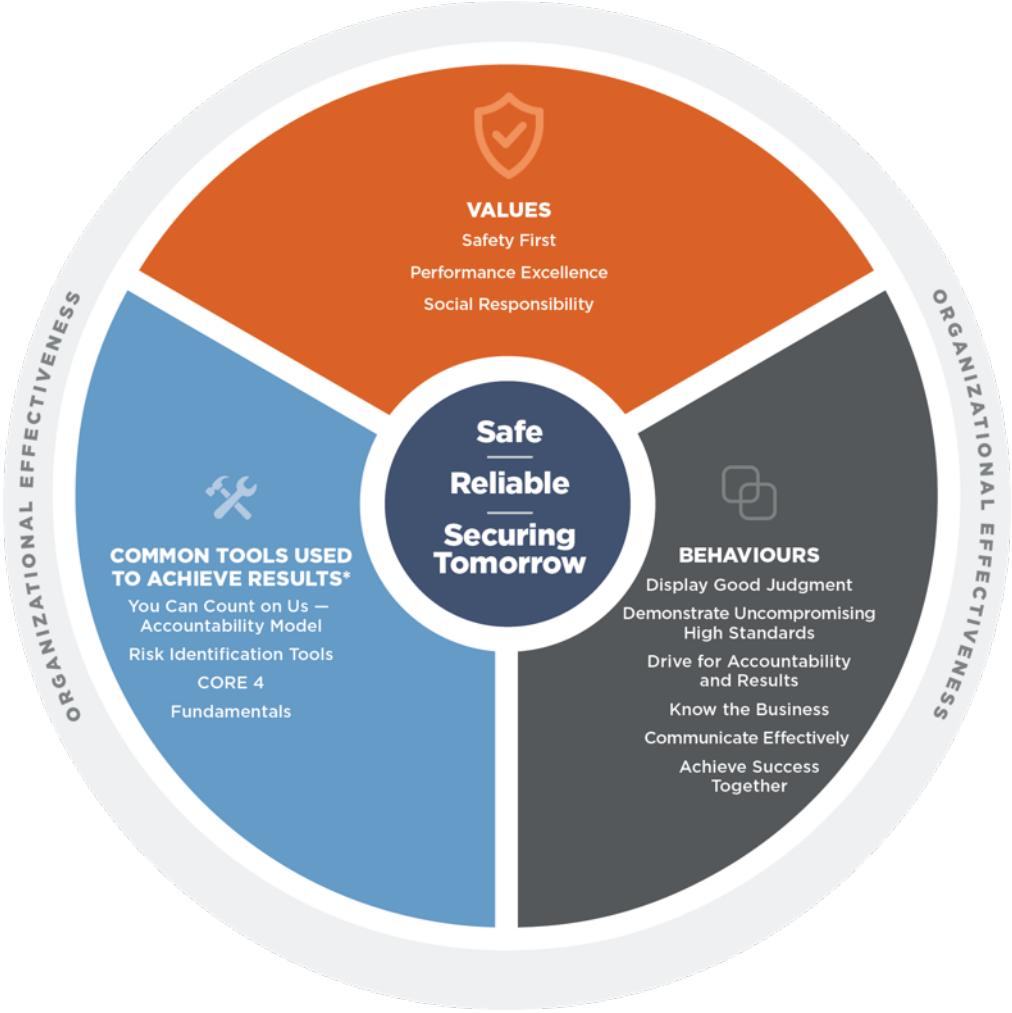
Bruce Power is driven by its vision, mission and values

Vision

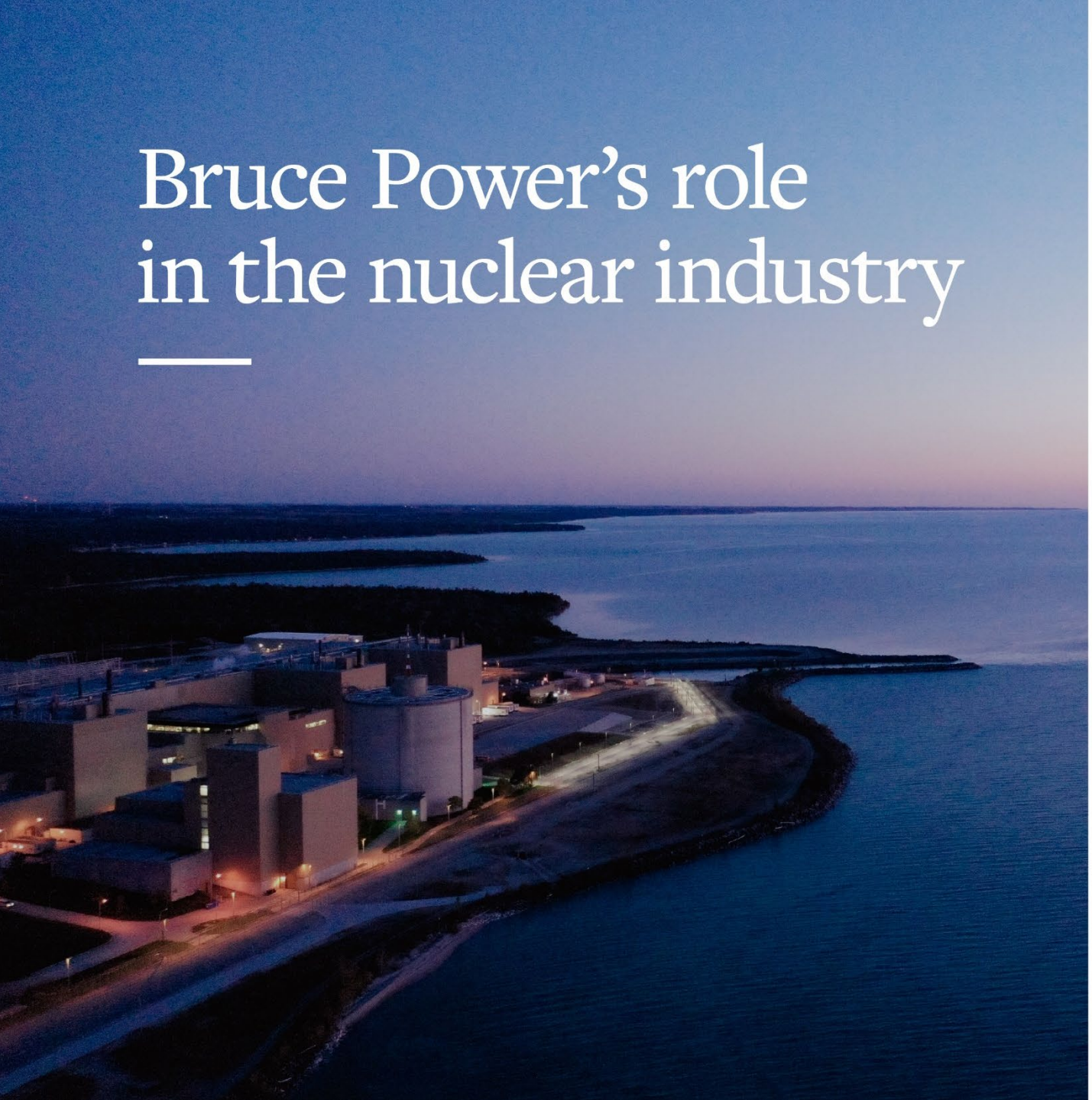
We Power the Future

Mission

To safely provide clean, affordable, reliable power and life-saving medical isotopes while strengthening our communities and protecting the environment to secure tomorrow.



BRUCE POWER EXCELLENCE MODEL



Bruce Power's role in the nuclear industry

SITE

Bruce Power is powered by its people.

ONTARIO

Providing 30 per cent of province's carbon-free, reliable, low-cost electricity.

CANADA

Maintaining Canada as a global leader in the production of cancer-fighting medical isotopes, cobalt-60 and lutetium-177.

GLOBAL

One of the world's largest operating nuclear facilities with eight CANDU reactors.

COMPANY HIGHLIGHTS

Strong operational performance – multiple units achieving record runs, improving outage performance and project performance

Healthy Nuclear Safety Culture – demonstrated through two-way feedback, corporate survey and interviews

Emergency Response – multiple provincial large-scale emergency response exercises, more than 500 drills and exercises since 2018, more than $50 million invested in post-Fukushima emergency management enhancements and fire protection upgrades

Environmental protection and sustainability – ESG Industry Top Rated – top three within sub-industry globally, Net Zero by 2027, $1 million Carbon Offset Accelerator Fund, $1.1 billion Green Bond issuance

Waste management – safely stored, fully funded for the lifetime costs. Minimize through innovation/best practice

Awards – received numerous awards, including Workplace Diversity and Inclusion Champion, Canada's Top Employers for Young People, Top Innovative Practice

James Scongack

Chief Development Officer, Executive Vice-President

Community engagement

Commitment to trust and transparency

Bruce Power is dedicated to connecting with the community in an open, transparent and meaningful way and is committed to open communications with community members, Indigenous communities and other interested parties, including local residents, government representatives, charities, non-profit and community organizations.

Health care support

$1.8 million

over five years to local hospital foundations

$1.5 million

to Kincardine hospital redevelopment campaign

$300,000

over five years to the Pediatric Oncology Group of Ontario

Cancer-fighting medical isotopes

Isotopes at Bruce Power

Lutetium-177

Produced in the Isotope Production System — a first-of-its-kind solution to produce short-lived medical isotopes in a commercial reactor.

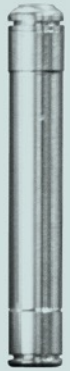
Cobalt-60

Cobalt-59 adjuster rods are inserted into the reactor and cobalt-60 is harvested during planned outages.

40+ million

nuclear medicine procedures are performed worldwide each year using isotopes, with approximately 36 million for diagnostic nuclear medicine and four million for therapy.

Cancer-fighting medical isotopes



24/7

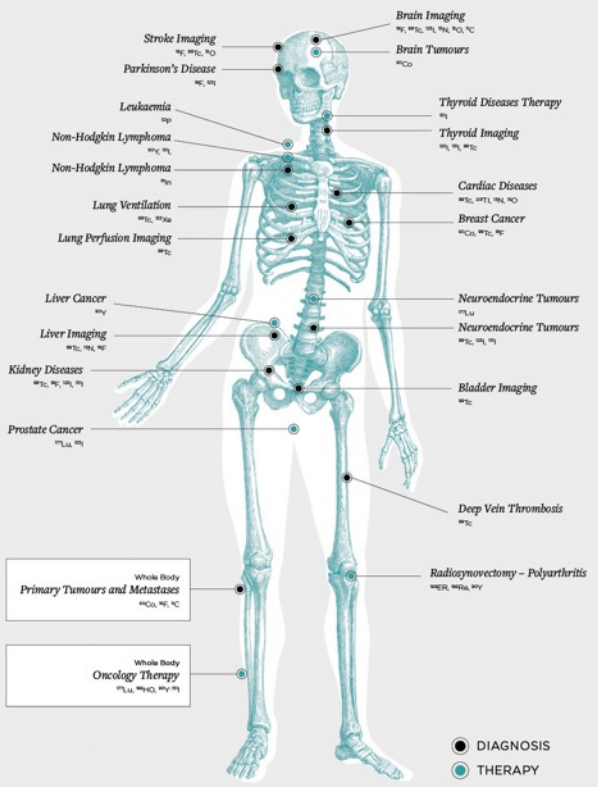
The IPS will leverage Bruce Power's continuous operation to provide a consistent and scalable supply of cancer-fighting isotopes.

Medical-grade cobalt-60 is used to treat complex brain cancers and conditions through non-invasive procedures.

Commercial production

of lutetium-177 announced October 2022, a world's first for large-scale nuclear reactor.

Isotope use for diagnosis and therapy



European Industrial Association for Nuclear Medicine and Molecular Healthcare

40%

of the world's single-use medical equipment is sterilized with cobalt-60.

Made-in-Ontario Isotope Production System (IPS) installed in Bruce Power's Unit 7 in 2022.

Supporting communities during COVID-19

- More than 2.5 million pieces of Personal Protective Equipment donated.
- 36-bed recovery centre in partnership with Saugeen First Nation.
- More than 47,000 vaccines administered at a Bruce Power sponsored hockey hub vaccination centre.
- 50 thermal monitors donated.
- Maintained close relationship with Grey-Bruce Medical Officer of Health.
- Lead the industry and communities through pandemic response. Demonstrated our ability to respond swiftly with no outbreaks on site, while maintaining safe and continual operations of Bruce A and B.

Indigenous relations

- Bruce Power is dedicated to honouring Indigenous history and culture and is committed to moving forward in the spirit of reconciliation and respect and to lead by example in this community and industry.
- Bruce Power has longstanding communication protocol agreements with the Saugeen Ojibway Nation (SON), Métis Nation of Ontario (MNO) Region 7 and the Historic Saugeen Métis (HSM) that supply the framework for continued collaboration between Bruce Power and each community function.

Fostering meaningful relationships

- Indigenous Employment Program launched to collaborate with SON, HSM, MNO (Region 7) to provide employment opportunities at all levels of the business.
- Indigenous Supplier Network established to help local Indigenous communities participate fully in the business development, procurement and economic activities taking place on site.
- Bruce Power has worked with the Saugeen Ojibway Nation, the Historic Saugeen Métis, and the Métis Nation of Ontario since 2018 on a variety of community engagement activities related to training, employment, business opportunities, sponsorships, and special projects to drive environmental protection.
- Carrying out project with **HSM** to restore fish habitat, remove phragmites.
- Drafted project plan with **MNO (Region 7)** to restore connectivity, improve fish habitat in Bothwell's Creek.
- Collaborating with the **SON** on the Coastal Waters Environmental Monitoring program.

Driving engagement and collaboration, together

Collaboration

- Maintained Gold Certification under Progressive Aboriginal Relations (PAR) for more than 10 years.
- Launched an Indigenous Employment Program.
- Developed a skilled trades training program.
- Formed an historic partnership with Saugeen Ojibway Nation (SON) to jointly market new isotopes.
- Fostered Indigenous-owned businesses including Makwa Development, E-Supply.

Kaawiijewdamin
Walking Together

Gamzook'aamin aakoziwin
FIGHTING CANCER TOGETHER

Protecting the environment

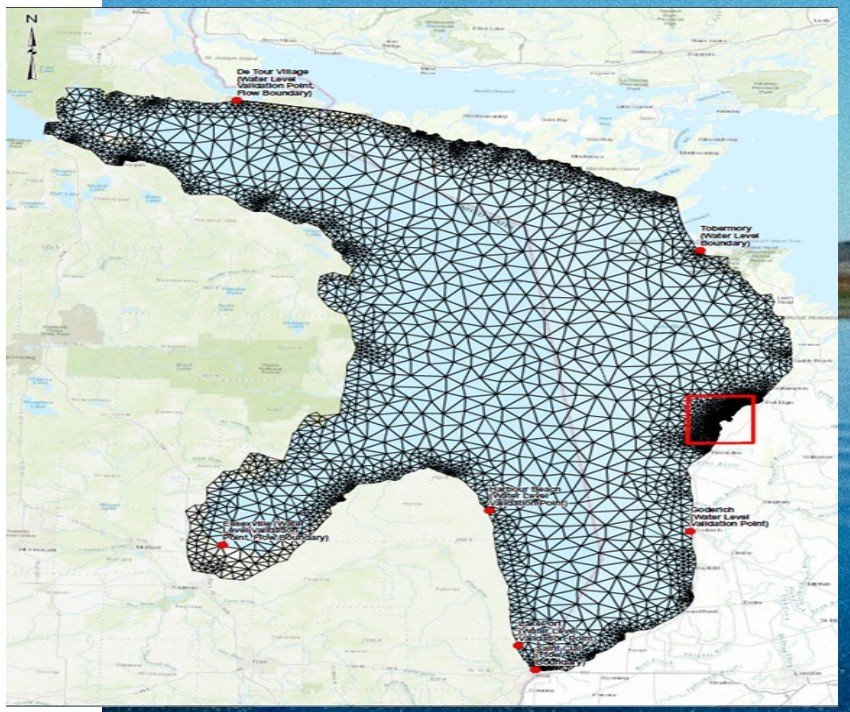
Bruce Power is committed to environmental protection, and sustainability in all areas of the business and has adopted applicable industry-best standards.

- We go beyond regulatory compliance by driving innovation and strategic research in environmental protection.
- Our knowledge sharing and learning from Indigenous communities plays a vital role in Bruce Power's Environmental Protection program.
- Maintain ISO 14001 certification – international standard for environmental management systems for more than 18 years.

Environmental protection – Climate Modelling

Bruce Power is industry leading in our lake modelling and thermal risk characterization

- Downscaled lake model grid for advanced localized projections.
- Work with multiple partners, including Climate Risk Institute and Council of the Great Lakes Region, to better understand climate change impacts and vulnerabilities on Lake Huron with a focus on the area near our facility.
- Work with Indigenous communities to improve our understanding of potential climate change effects on valued habitats and species and develop solutions to build resiliency.
- Participate in EPRI's Climate READi (Climate Resilience and Adaptation Initiative) and CHIP (Climate Hazard Information and Projection) programs.



Social stewardship

$2.06 million community donations by Bruce Power in 2022

INDIGENOUS COMMUNITY INVESTMENT FUND

$400,000 annually

ENVIRONMENT & SUSTAINABILITY FUND

$400,000 in 2022

Top rated company for ESG

COMMUNITY SUPPORT DURING COVID-19

Largest community PPE donation

Helped curb the spread through vaccination hubs

YOUTH DEVELOPMENT PROGRAMS

Youth scholarships

More than $150,000 in 2022

Mental health support

LOCAL HOSPITALS AND HEALTH CARE INITIATIVES

$3.25 million over five years

Environmental, Social and Governance overview

Bruce Power's approach to sustainability is integrated across the organization and focuses on Environment, People and Safety, Products and Services, and Community.

12.5%

net Scope 1 and Scope 2 GHG emissions reduction target was achieved in 2022

90%

of our services and materials were spent in Canada and 62% were sourced from suppliers in the Indigenous Relations Supplier Network in 2022

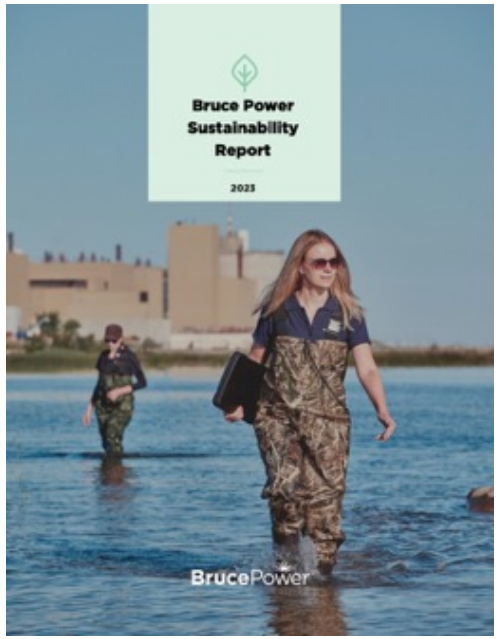
32%

of 2022 hires into non-traditional roles (trades, maintenance, and operations) were filled by women, meeting our target for this KPI

$2.06M

total value of sponsorships and donations provided by Bruce Power

Environmental, Social and Governance performance



Bruce Power's annual Sustainability Report focuses on quantitative disclosure for 28 of its ESG Key Performance Indicators.

$1M

Carbon Offset Accelerator Fund announced to support carbon offset projects in Bruce, Grey and Huron counties and throughout Ontario.

12.9

Our 2022 Environmental, Social, and Governance (ESG) risk rating, which is the best we've achieved. This maintains Bruce Power's spot in the Top 3 within its sub-industry on a global scale.

$400,000

distributed in support of local environmental initiatives in the areas of: conservation and restoration, education, awareness and research, climate change mitigation and resilience.

Safe waste management

- **Minimize and reduce** the production of waste through innovation, management and new practices.
- **Safely store it today** in existing facilities licensed by the CNSC.
- **Fully funded for the lifetime costs** when it is generated rather than leaving it as a burden for future generations.
- **Long-term disposal** through potential host community engagement, environmental studies and an open, transparent process to determine final disposal through a deep geological repository based on proven international practice and regulated by the CNSC.
- **Communicate and listen** by engaging the public and stakeholders to share the facts – our waste by-products are managed safely with a clear, long-term plan for permanent disposal.

In summary

LONGSTANDING INDIGENOUS COMMUNICATIONS PROTOCOL AGREEMENTS

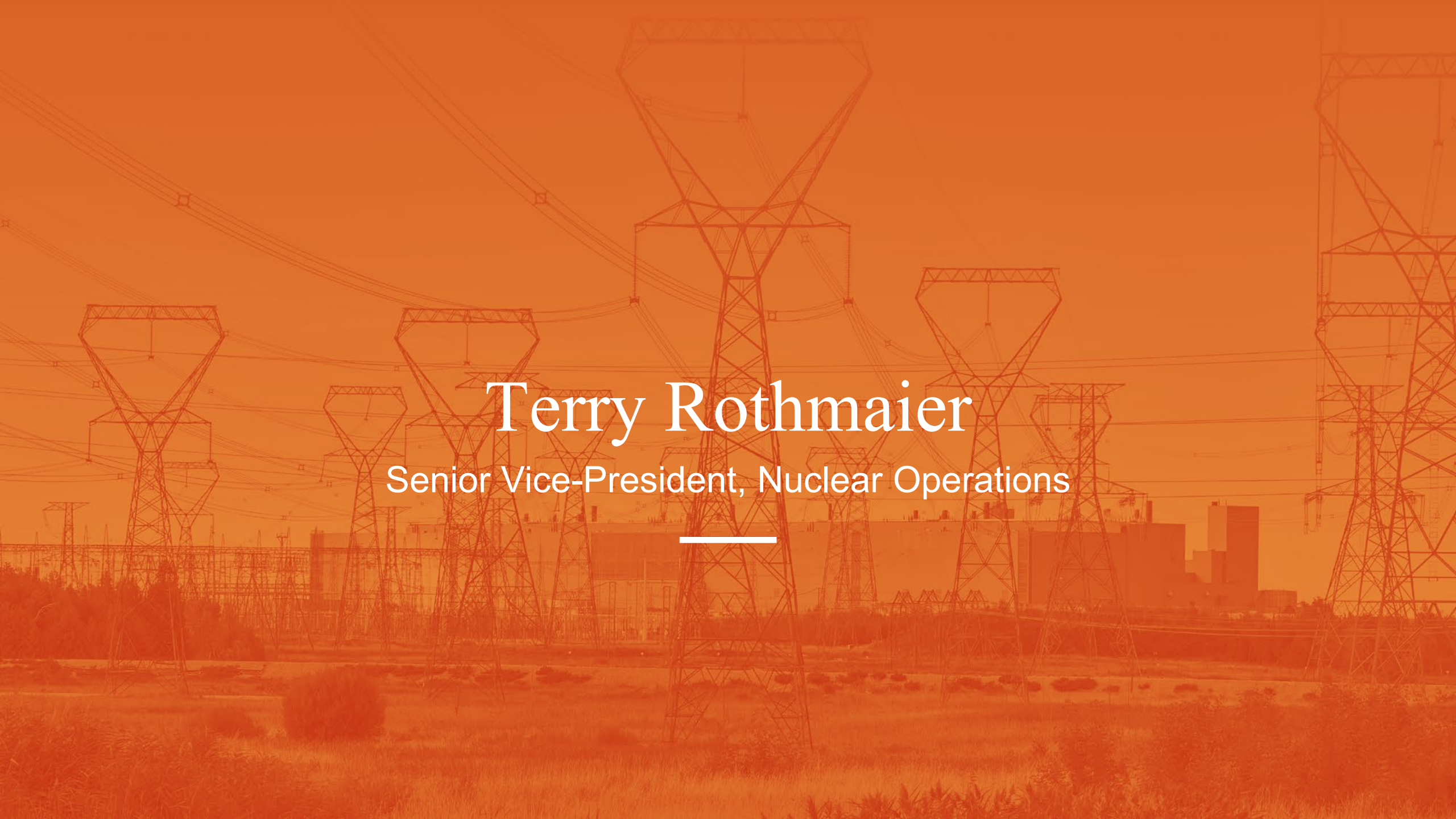
COMMITMENT TO ENVIRONMENTAL PROTECTION

STRONG COMMUNITY SUPPORT FOR ONGOING OPERATIONS, LIFE EXTENSION PROGRAM

COMMITMENT TO OPENNESS AND TRANSPARENCY

TOP RATED COMPANY FOR ESG

MORE THAN $2 MILLION IN ANNUAL COMMUNITY DONATIONS AND SPONSORSHIPS



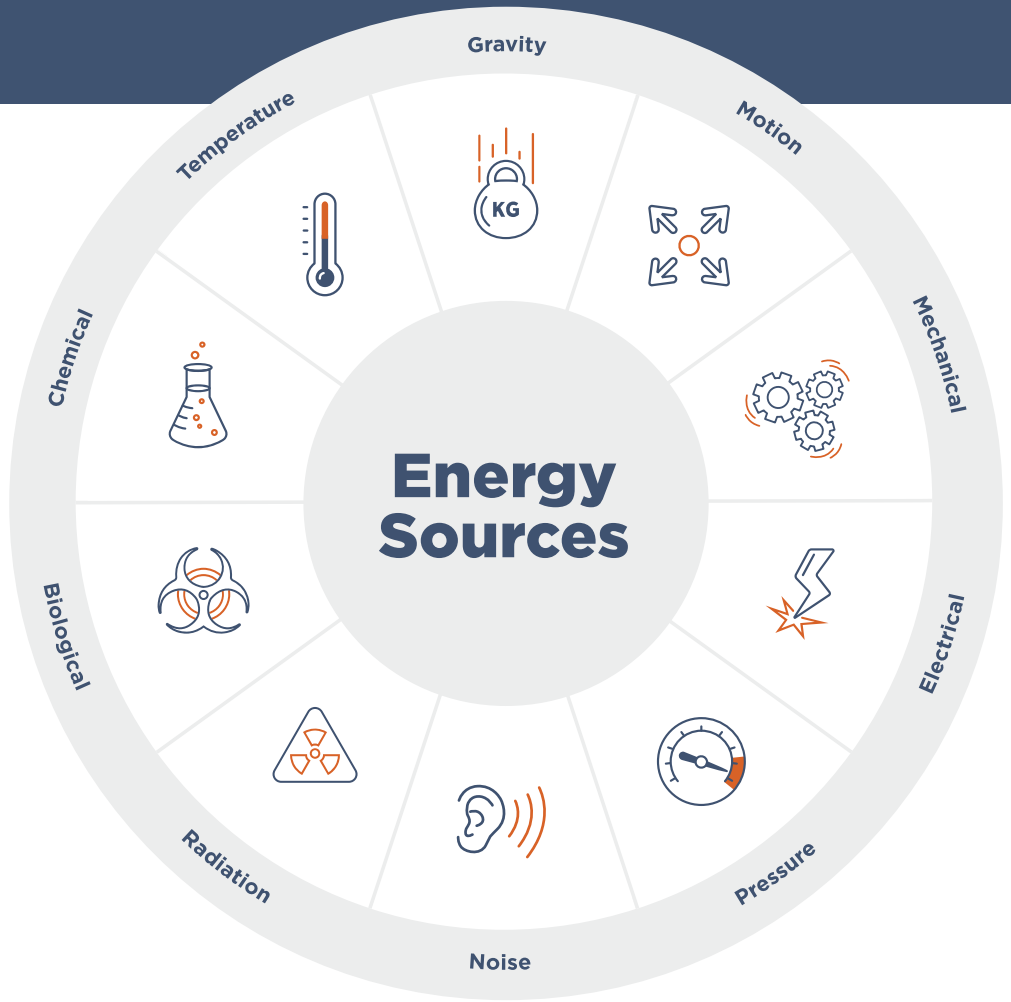
Terry Rothmaier

Senior Vice-President, Nuclear Operations

Industrial safety performance

Adopted industry standard safety model and consistency classifying events based on hazardous energies

- Over the past five years, Bruce Power has sustained strong performance in all regulatory performance measures set forth by the CNSC.
- Safety Performance measured through: Industrial Safety Accident Rate (ISAR), Accident Severity Rate (ASR) and Accident Frequency Rate (AFR) when compared to the Canadian nuclear industry.



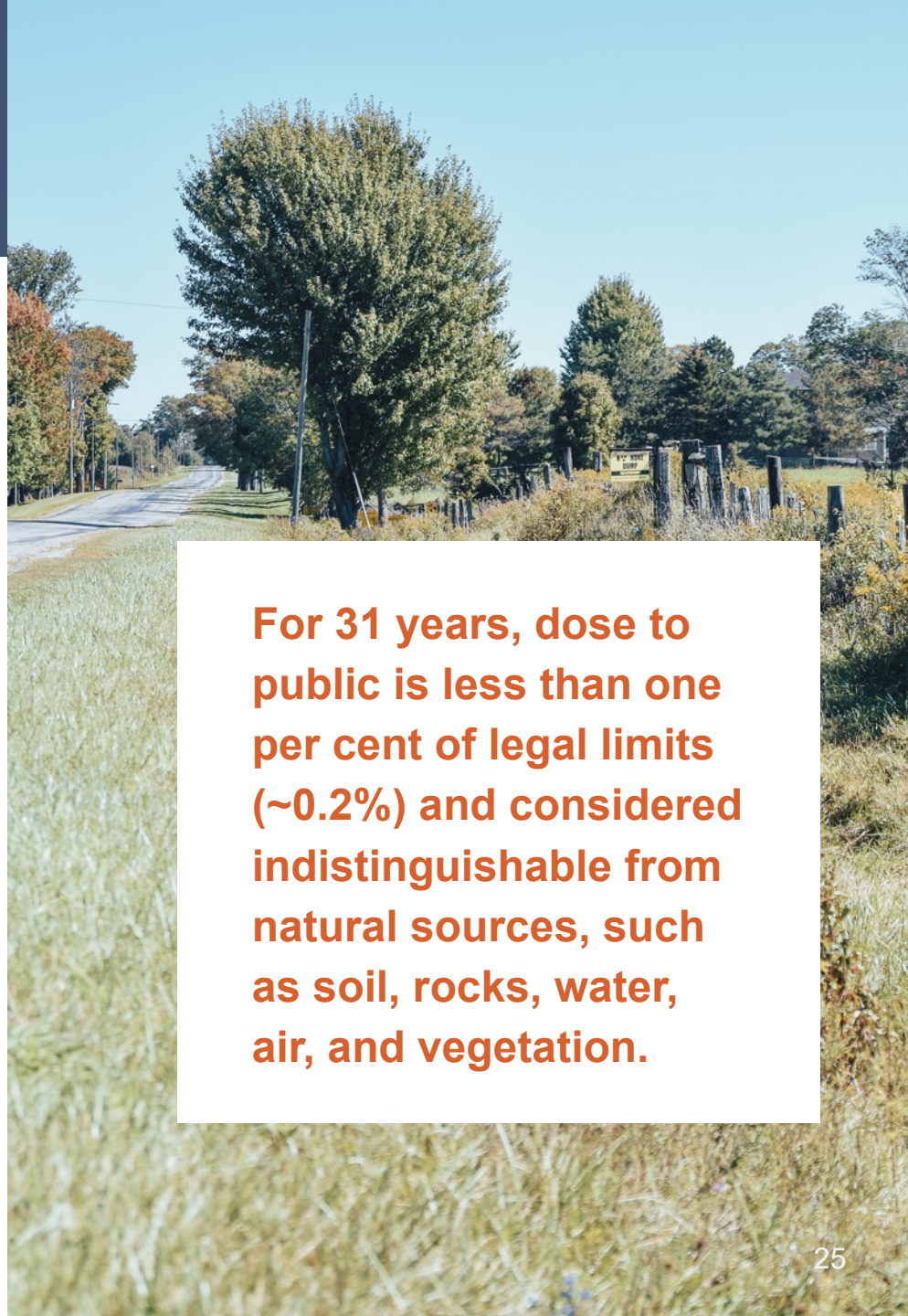
Radiation protection – minimizing dose to public

Yearly, Bruce Power gathers information to calculate the radiological dose to representative persons living near our site. This includes meteorological data, analysis of local environmental media and site radiological emissions and effluents that include all utilities near or within the Bruce Power site boundary.

Assessments and monitoring include:

- Environmental Risk Assessment
- Emissions and Effluent monitoring
- Environmental (including ground water, waste management) monitoring

First-of-a-kind Containment Filtered Venting System at both stations installed as another layer of defence against any radiological release.



For 31 years, dose to public is less than one per cent of legal limits (~0.2%) and considered indistinguishable from natural sources, such as soil, rocks, water, air, and vegetation.

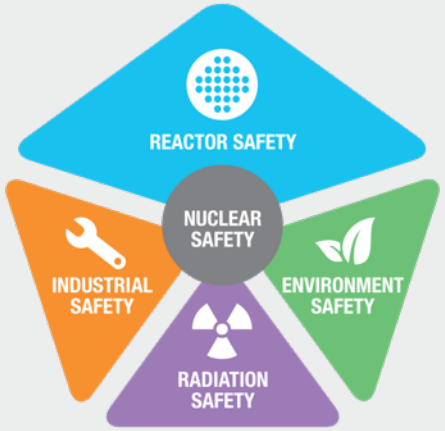
Radiation protection – operational optimization

Critical component to our safety program – As Low As Reasonably Achievable (ALARA)

- Standards regulated through Nuclear Safety and Control Act.
- Bruce Power sets more restrictive dose limits to keep risk low and works to optimize dose exposure in the stations.
- Strong day-to-day radiation protection practices in the area of contamination control.
- Rezoning efforts underway to optimize movement and monitoring without compromising radiological safety pillar.
- Dose reduction initiates; chemical decontamination (first of its kind), ultrasound equipment used and expansion of robotics.

Strong operational performance

- Strong industrial safety performance over last five years which continues to be maintained through increased site activities and worker volume.
- Past five years, stations have operated to industry-notable performance. Improvement to forced loss rate, as a result focus on asset management and human performance. Bruce A achieved 512 days with no station-level clock reset in 2022 – longest period for that station in 10 years.
- Record runs on multiple units, a testament to our fleet reliability.
- 7,000 sq. foot addition added to our Learning Centre in 2019 to support a new Bruce B simulator. Integral to maintaining qualifications of certified operations staff.
- Technology enhancements include Maximo and DevonWay.



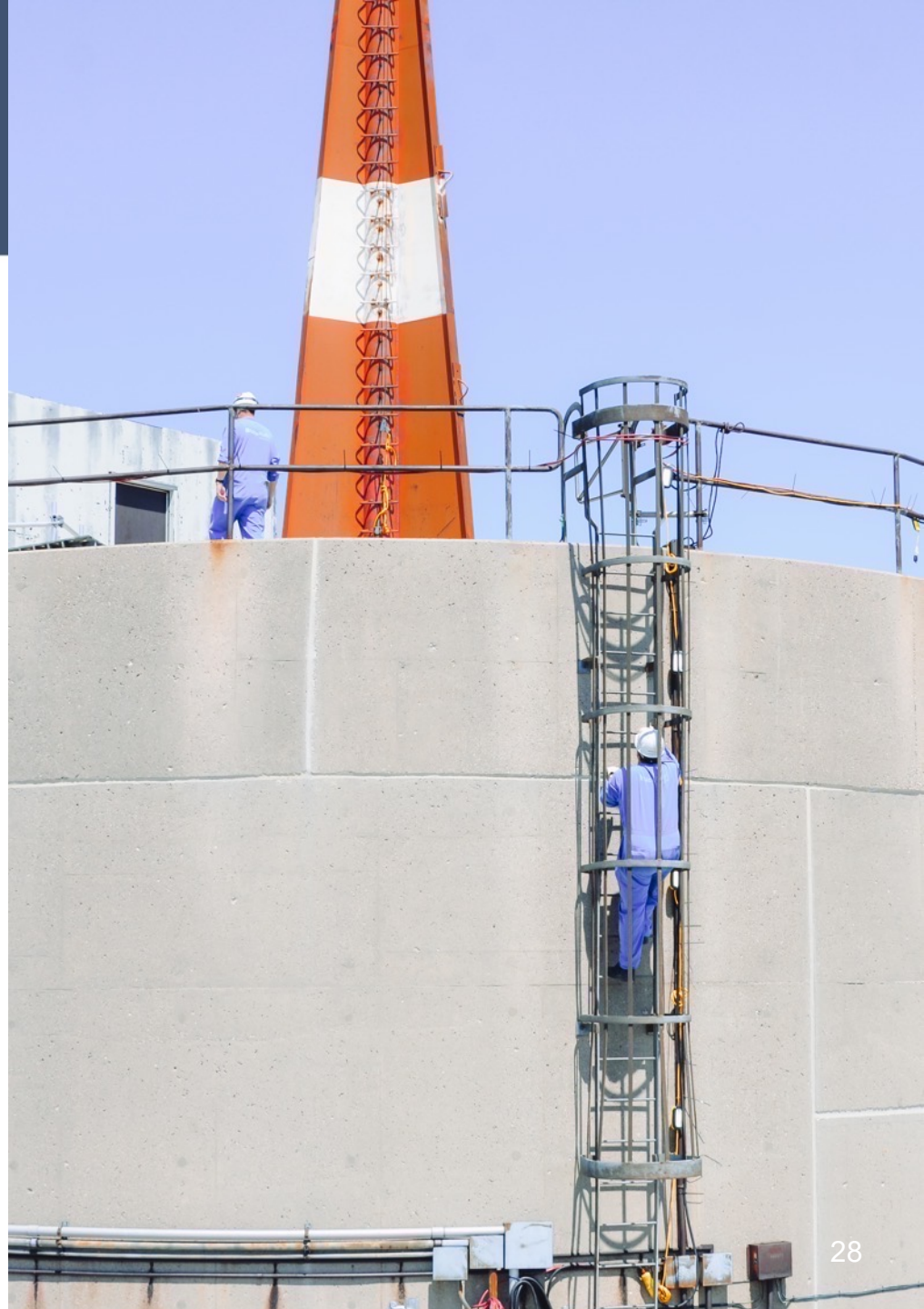
In 2022, Bruce A marked 108 days of continuous four-unit operation

Unit 5 exceeded its own record run of 591 days

Operational performance – successful Vacuum Building Outage

Bruce A safely completed Vacuum Building Outage in 2022

- Requires removal of all four units from service for inspection and maintenance activities.
- Careful planning, preparation, adherence to standards and rigorous oversight enabled record performance and all units returned to service ahead of schedule.
- Containment Filtered Venting System installed at Bruce A and Bruce B – recognized and awarded Top Innovative Proactive (TIP) from the Nuclear Energy Institute.



Containment Filtered Venting System

- Recognized through the Nuclear Energy Institute as a top innovation in 2022.
- The new system, which has been added to the vacuum buildings at both the Bruce A and B stations, would filter radioactive materials, effectively preventing release to the environment.
- Acts as a final barrier to mitigate environment releases if primary safety systems and backup systems fail to operate.

$50M

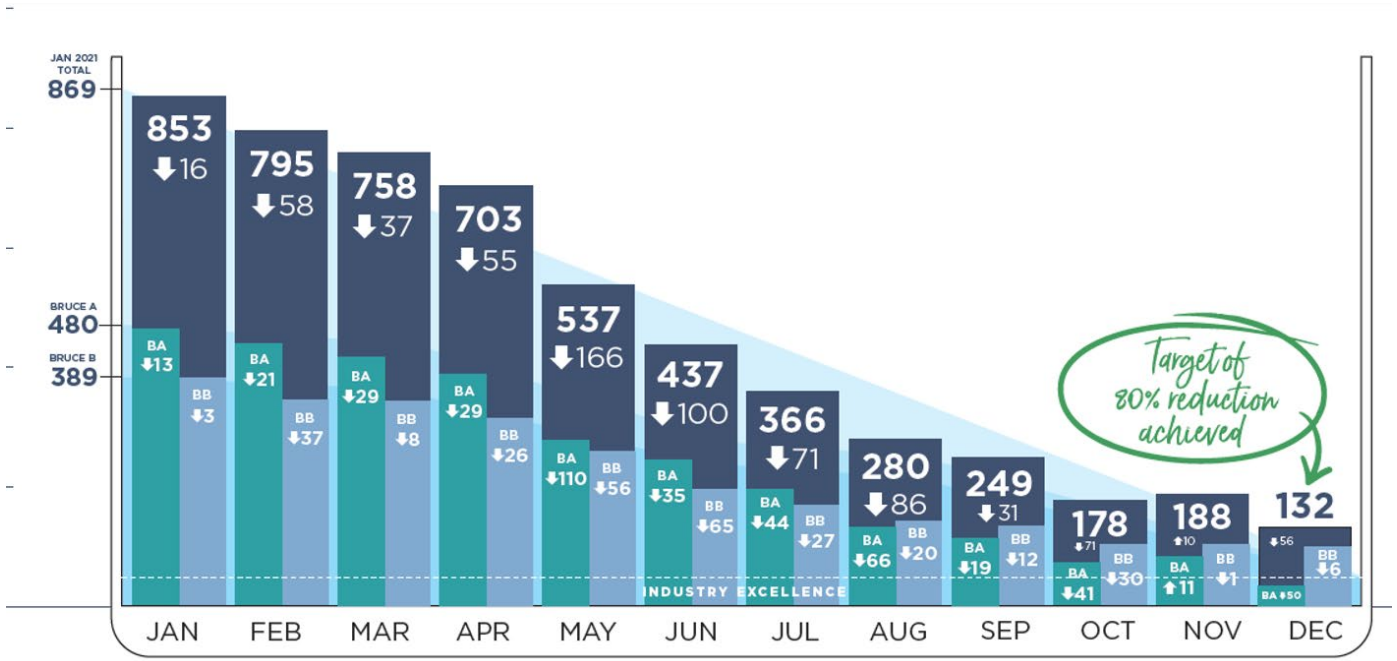
Bruce Power has invested to enhance its emergency response over the last decade

Continuous improvement – operational performance

Key focus is to sustain high levels of equipment reliability and improve our operating margins.

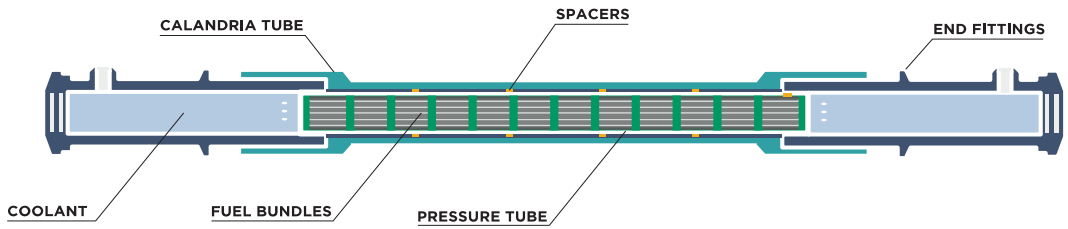
This has been demonstrated through:

- Reduction of work backlogs – improves the material condition of our station, equipment reliability and allows maintenance and operations to focus on critical tasks
- Reduction of single point vulnerabilities – leading cause of forced outages



Pressure tube fitness for service

- Safety and integrity of pressure tubes demonstrated through measurements, inspections, defense in depth and various operational safety reviews.
- Pressure tube fitness for service confirmed and units safe to operate as per Reasons for Decision (Dec. 21-H113), the Commissions concluded that ‘Bruce Power demonstrated our pressure tube fracture toughness is sufficient for safe operation’.
- Ongoing research and development work continues to ensure pressure tubes remain fit for service.
- Proactively and transparently shared developments with the CNSC staff, industry peers and openly communicated the facts with the public. Continue to provide updates on our website.



brucepower.com/safety-first/pressure-tube-integrity/

Emergency preparedness

- Robust and multi-faceted emergency response program:
  - ✓ Award-winning security service
  - ✓ Fully equipped on-site fire department - $25 million investment on a fire training facility (agreement in place for local fire departments to use facility free of charge).
  - ✓ Around-the-clock emergency response organization
- Emergency preparations and response capabilities are routinely assessed and continuously improved through drills and exercises. Close to 50 drills completed every year.
- Provincial large-scale response exercises completed every three years. Most recent Huron Endeavour exercise completed in 2022 .
- Business continuity planning advancements using lessons learned from the COVID-19 pandemic response.

Emergency preparedness – post-Fukushima enhancements

Invested more than $50 million to enhance our emergency response:

- Modernized our Emergency Management Centre.
- Procured emergency equipment and an offsite storage facility.
- Plant modifications to provide alternate emergency cooling water and power supplies, additional electrical tie-in connections to connect large portable generators.
- Automated radiological monitoring with remote capability.

Fire protection – investments and upgrades

$48 million invested on fire protection upgrades at Bruce A and B over the last five years

- New fire detection installations.
- Fire barrier wraps on all vulnerable cable trays.
- Hot Work Process updates to enhance fire safety during refurbishment projects.
- Fire Sensitive areas identified - associated procedures updated for maintaining them as combustible free zones.
- Improvements to signs and permits for extended storage areas to better control material stored in the stations.
- High standards for fire prevention through procedural adherence, rigorous oversight and performance monitoring.

Fire hazards Assessment and Fire Safe Shutdown Analysis for Bruce A and B are updated on a five-year period, last updated in 2023.

Cyber security

Strong cyber security program in place to protect the stations while ensuring strong regulatory performance to CSA N290.7-14 standard

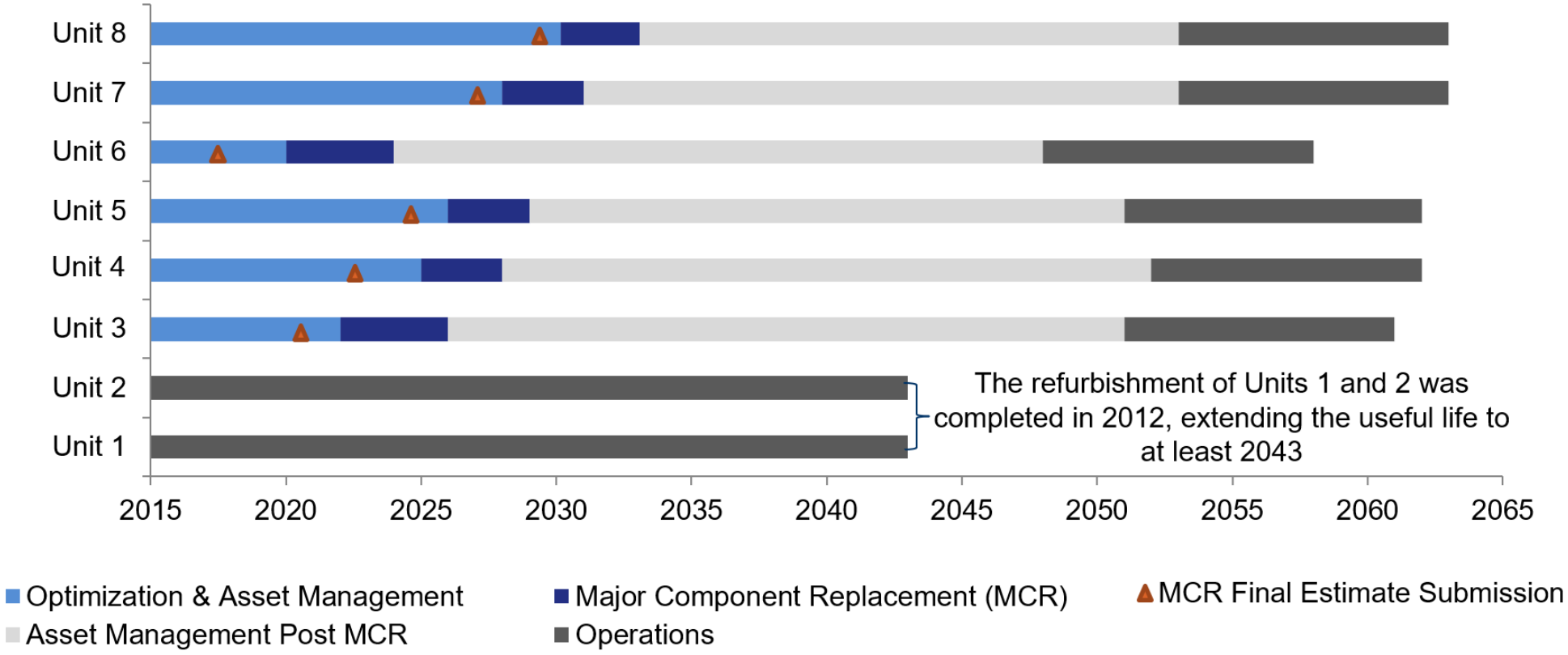
- Implementation of defence-in-depth cyber security architecture for station and corporate assets.
- Program and procedural integration across the organization to drive cyber security requirements across asset lifecycle.
- Cyber and information security awareness training across entire workforce to bolster awareness and drive action to protect the enterprise.

Security controls are fundamental to nuclear safety to reduce the risk of a cyber-attack and ensure the safe operations of the plant, workers and the public.

Eric Chassard

Executive Vice-President, Projects and Engineering

Life-Extension Program



Optimization of Inspection activities, Asset Management and MCR will secure Bruce Power generating assets through 2064

We will continuously improve delivery of each MCR by applying lessons learned, our commitment to quality, adherence to high standards and by leveraging innovation and automated tooling.

Investing in, and managing, our assets

Investment of $7 billion into safe operation of our facilities over the life of the assets

- Continue to make significant investments in managing asset life.
- Comprehensive Plan-Do-Check-Act cycle utilized to identify, assess, scope, design and execute asset management plans.
- Asset plans are reviewed at a minimum three-year frequency and reaffirmed at executive level.

Major Component Replacement – tooling and innovation

Innovations and lessons learned will continually be applied to each MCR

- Fully automated calandria tubes install series to ensure workers dose reduction, quality and critical path savings.
- First ever chemical decontamination completed in Unit 3 – dose reduction to staff by 80%.
- Proof of concepts underway for tooling automation – inspections using robotics techniques, 3D digital twin for plant modelling and training, advanced feeder Greyloc gap measurement tooling.

Unit 6 – Return to Service

- Commenced January 2020.
- 138-day impact by COVID – March 2020.
- Unit 6 returned to service in September, ahead of schedule.
- 5,760 fuel bundles defueled and refueled.
- 1,800-tonne crane used to remove and replace eight steam generators through the station roof, all carefully executed event-free.
- 480 fuel channels, inlet and outlet feeders replaced.
- Regulatory Hold Points established by Commission continue to be met and advanced.

Project 2030

Helping meet future energy demand

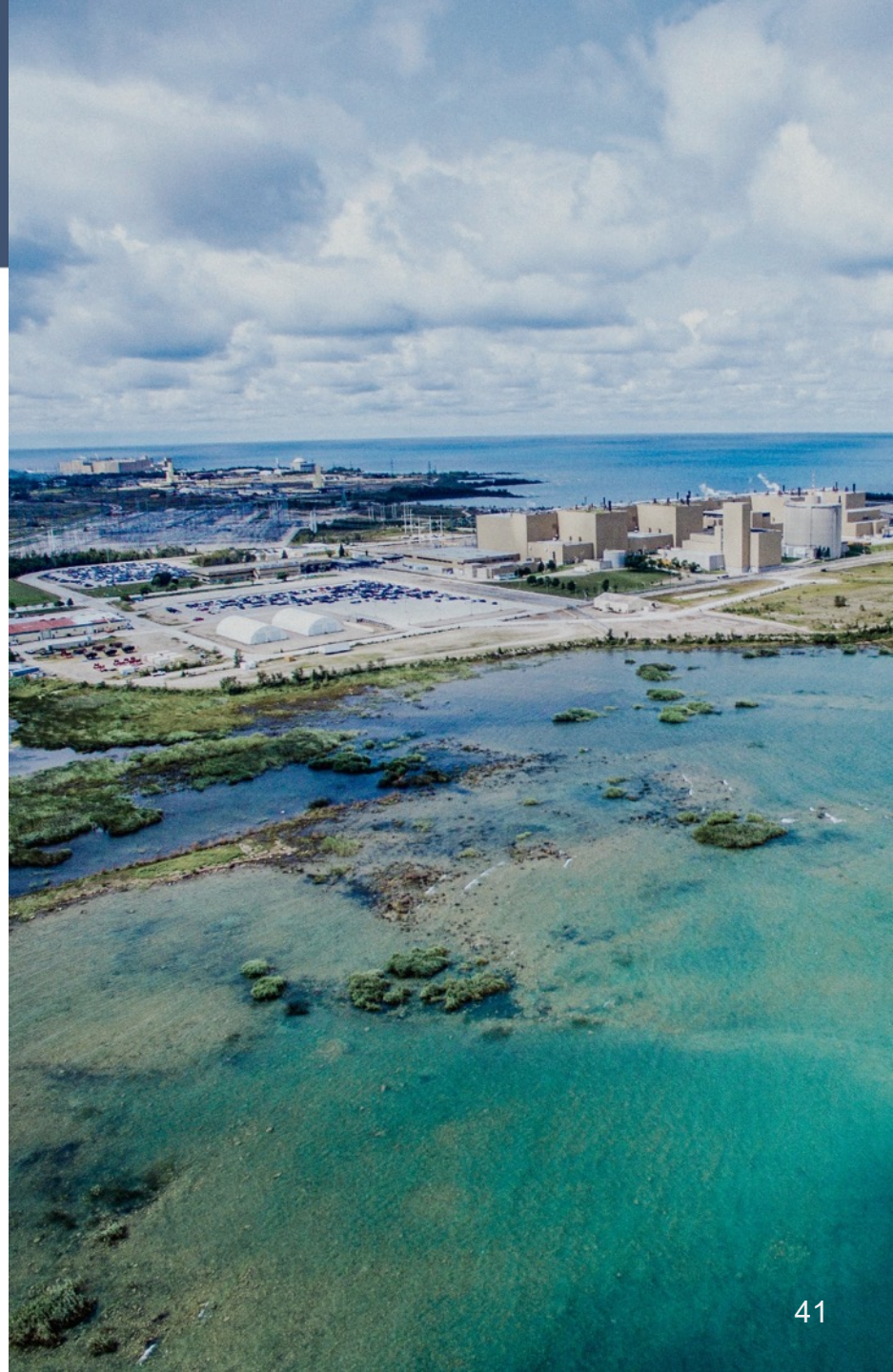
Additional generation is nearly equivalent to adding a large-scale reactor to our site without building new infrastructure

2016
6,300 MW
site net peak

2018
6,430 MW
site net peak
(start of Project 2030)

2022
6,550 MW
site net peak

Early 2030s
7,000 MW+
target site net peak



Mike Rencheck

President and Chief Executive Officer

Highlights of the past five years

- Industry recognized strong operational performance.
- $7 billion in Projects safely delivered on time and on budget.
- Ongoing production of lutetium-177 and cobalt-60 medical isotopes.
- Completed three provincial large-scale emergency response exercises since 2016.
- Ongoing environmental monitoring and risk.
- Recognized for numerous awards including Workplace Diversity & Inclusion Champion Award, Canada's Top Employers, ESG Top Industry.
- More than $2 million donated yearly to support surrounding communities.
- Launched Pathways to Training Program with a focus on skilled trades for Indigenous communities.

The next five years

- MCR – Return Unit 6 to Ontario grid, progress Units 3, 4 and 5 MCRs.
- Project 2030 – upwards of 7,000 MWe by 2030s through asset management, innovation, new efficient technology.
- Medical isotopes – explore production of new cancer-fighting medical isotopes.
- Advancing environment and Net Zero outcomes.
- Community and Indigenous engagement, economic development.
- Taking a targeted approach in assessing new nuclear opportunities.

Bruce Power™

Innovation at work