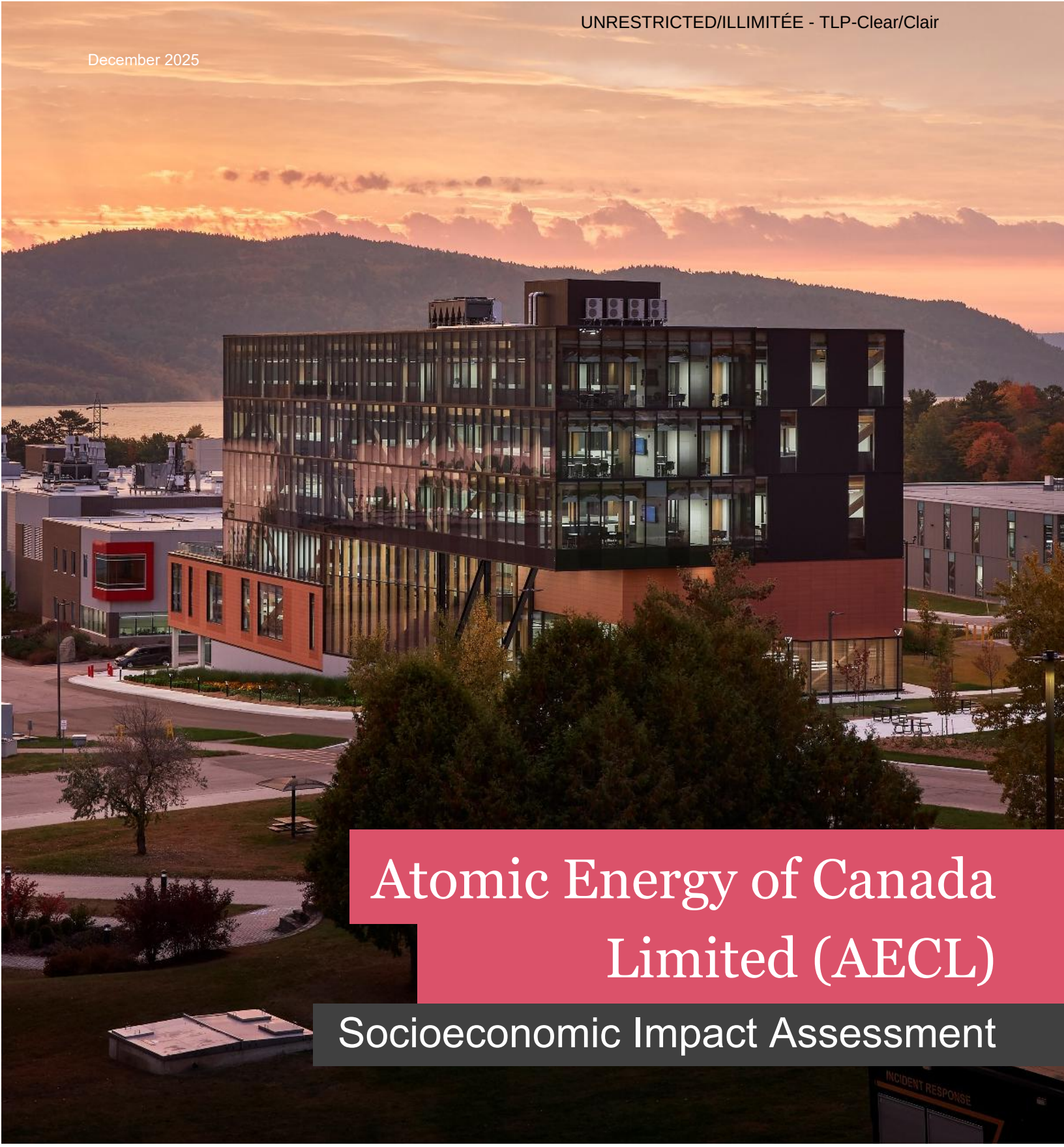
December 2025



Atomic Energy of Canada Limited (AECL)

Socioeconomic Impact Assessment

pwc

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1. Foreword

1.1 About this study

Atomic Energy of Canada Limited (AECL) has engaged PricewaterhouseCoopers LLP (PwC, we, us, or our) to conduct an independent study that explores the organization's economic and social impacts across Canada. The structure of this report is as follows:

- Section 2 Executive Summary: Presents key findings from the economic and social impact assessments.
- Section 3 About AECL: Provides a summary of AECL's history and the key activities that were undertaken as a part of that history to build Canada's nuclear ecosystem.
- Section 4 Canadian Nuclear Laboratories: Provides a summary of Canadian Nuclear Laboratories (CNL), including their key missions and three main sites which are the focus of this study: the Chalk River Laboratories, the Port Hope Area Initiative, and the Whiteshell Laboratories.
- Sections 5-7 include a brief history of the three main sites identified for this study. The quantitative analysis of the economic impact of spending at these sites is presented, in addition to analysis of the social impact generated by the activities conducted at each location.
- Section 8 Sustainable Development Goals: Provides a summary of how CNL activities are aligned to several of the United Nations Sustainable Development Goals (SDGs).

We also include five appendices:

- Appendix 1: Assumptions and Limitations
- Appendix 2: Summary of the social impact themes
- Appendix 3: Project approach is a summary of our project approach, including key sources consulted and stakeholders interviewed.
- Appendix 4: Economic impact approach has details on the modelling approach we took in calculating the economic impacts of AECL's operations.
- Appendix 5: Academic partnerships, training and upskilling

To estimate the economic impacts of AECL's operations we used an input-output model to quantify the direct, indirect, and induced economic impacts attributable to AECL's core missions and key sites. This modelling provided insights into Gross Domestic Product (GDP), jobs, and labour income created, as well as tax revenues generated. For a more detailed description of the input-output modelling approach, please refer to Appendix 3.

In parallel, we assessed the social impacts to understand the impacts that AECL's operations have on Canadians, the economy and environment more broadly. This assessment was conducted largely through secondary research and was supplemented with key stakeholder interviews. The qualitative and quantitative insights gathered from our secondary research and stakeholder interviews were compiled and assessed through the conceptual framework of a logic model to map AECL and CNL's activities to social impacts. For a more detailed description of our approach to assessing social impacts, please refer to Appendix 3.

1.2 Relationship between AECL and CNL

Since 2015, AECL has operated under a Government-owned, Contractor-operated (GoCo) model. Under this model, AECL owns the sites, facilities, assets, intellectual property (IP), and is responsible for setting annual performance plans and overseeing CNL's operations. The day-to-day operations are managed by CNL, a privately owned organization, which is responsible for the planning and execution of projects, labour relations, and maintaining necessary licences, permits, and other regulatory approvals. The GoCo model aims to reduce costs and risks for Canadian taxpayers while enhancing the capabilities and resources of CNL for the benefit of Canadians.

With this arrangement, both AECL (Owner) and CNL (Operator) are enduring entities with the Contractor (currently Canadian National Energy Alliance) being either renewed or replaced through a competitive process. This allows AECL to leverage private-sector expertise to advance its programs, while transforming the Chalk River Laboratories into a modern and world-class national laboratory.[1]

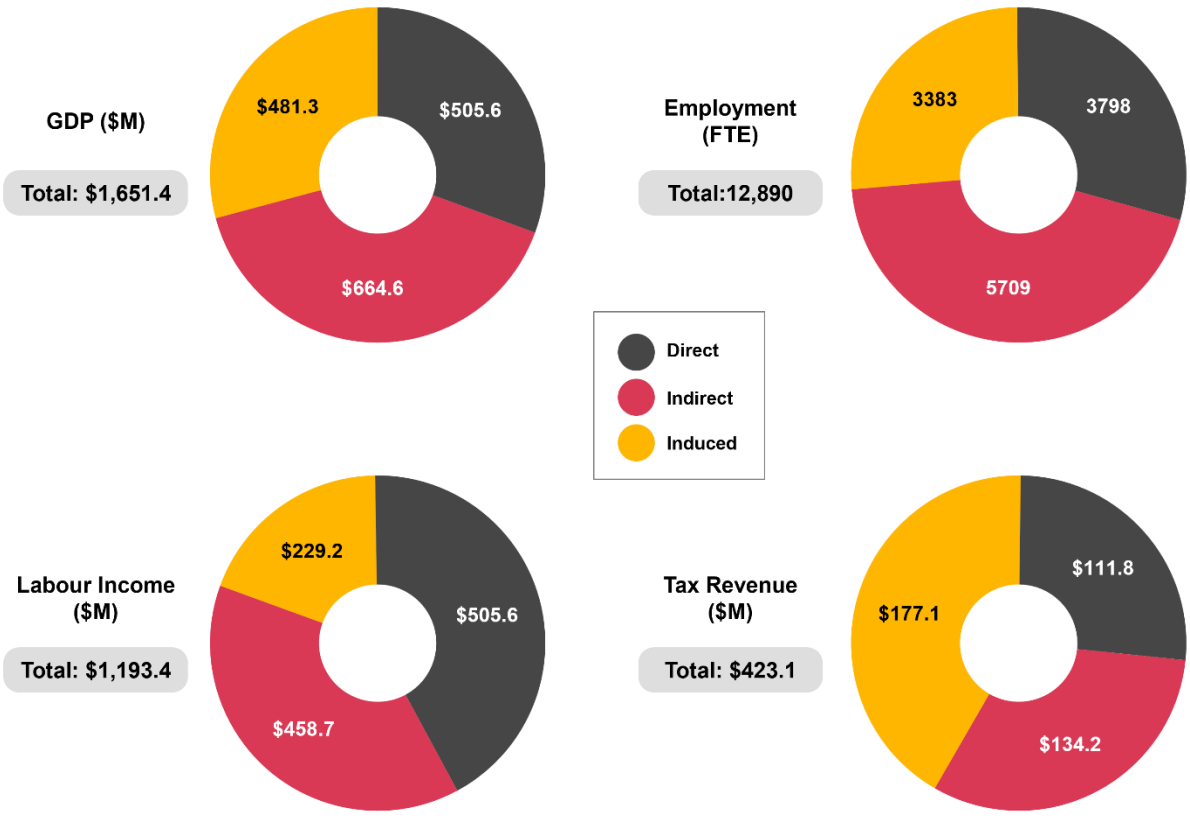
[1] AECL website, *about AECL – GoCo model*

2. Executive summary

AECL, primarily through the activities of CNL, generates economic activity in Canada via employment and spending on suppliers at sites across the country. This report estimates the economic footprint created and supported including direct, indirect, and induced impacts. Direct impacts arise from CNL's spending on suppliers and employees, indirect impacts are created along the value chain of CNL's suppliers (i.e. the suppliers of its suppliers), and induced impacts result from consumer spending of direct and indirect employees.

The figure below details the economic footprint of AECL's operations across Canada. We calculated that in the 2023-24 fiscal year, AECL supported approximately $1.7 billion to national GDP; employment of almost 13,000 people; approximately $1.2 billion in labour income and approximately $423 million in tax revenues across personal income tax (PIT), corporate income tax (CIT), and taxes on products and production.

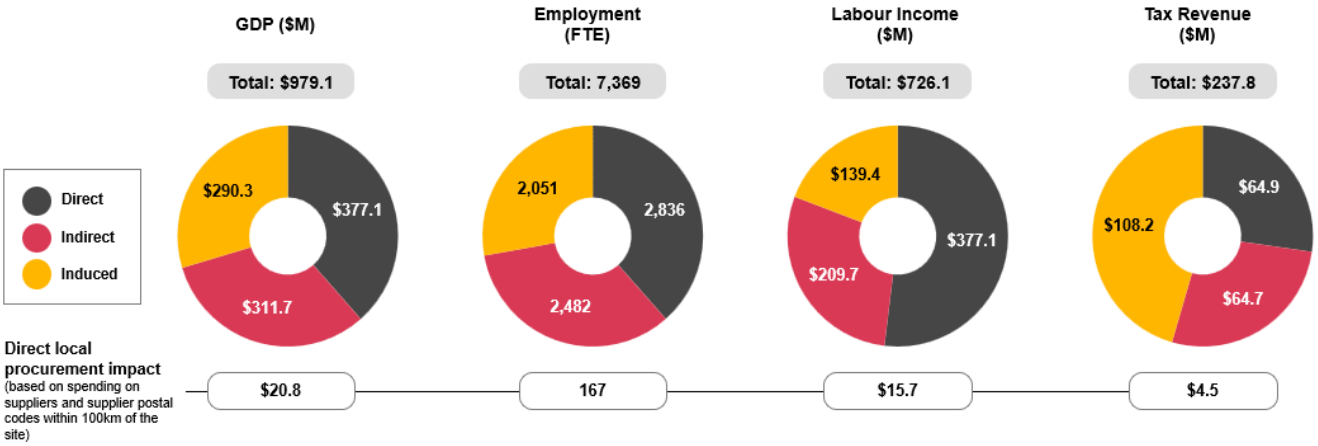
AECL and CNL total economic footprint[2]



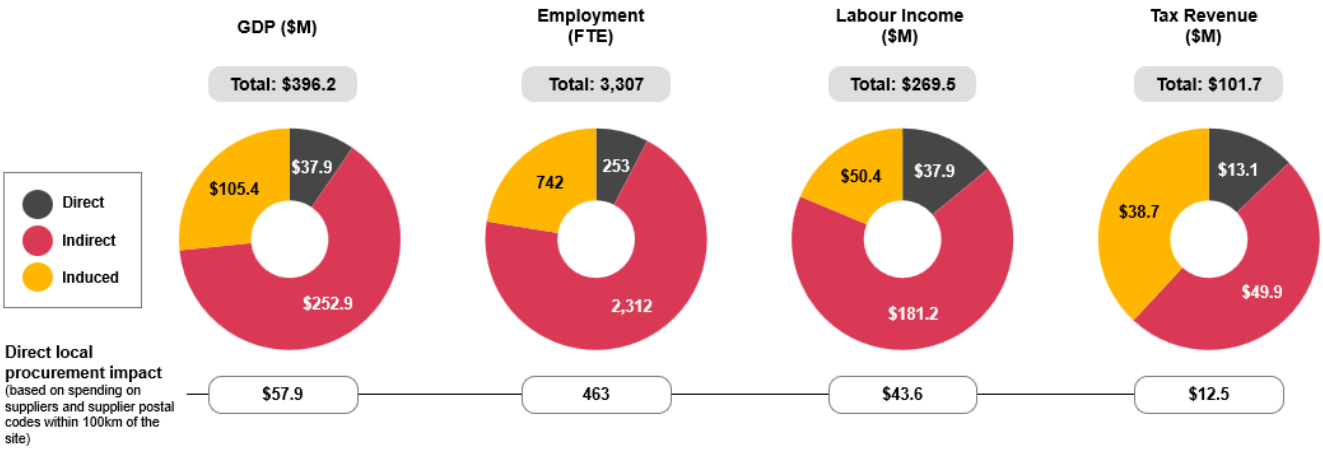
These impacts include spending across all the sites owned by AECL, as well as general services that support these operations across the country. The impacts by site are presented below.

[2] **Note:** The total economic footprint does not equal the sum of the three sites as it does not include spending at other AECL sites that are not the focus of this study.

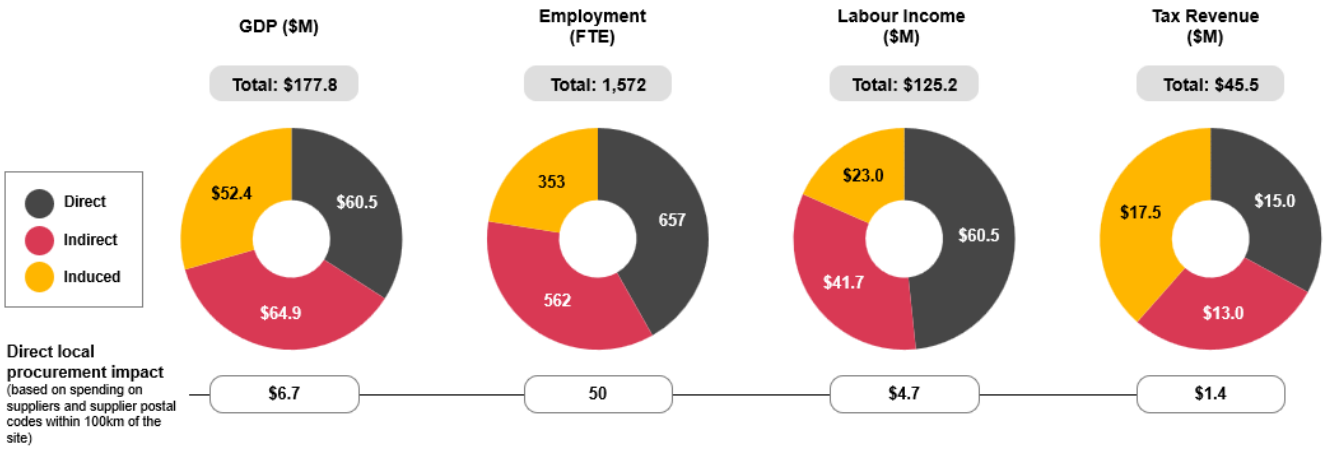
Economic footprint of Chalk River Laboratories[3]



Economic footprint of the Port Hope Area Initiative



Economic footprint of the Whiteshell Laboratories



[3] Direct local procurement impact is based on spending on suppliers with postal codes within 100 kilometers of site operations.

In delivering on their missions, AECL and CNL are focused on developing nuclear technology for peaceful and innovative applications, making a considerable contribution to Canada's status as a Tier 1 responsible nuclear nation. As a result, in addition to the economic impacts generated by spending, we identified, through interviews and secondary research, how activities undertaken at their sites deliver social impact across six broad themes:

 **Improving the health of Canadians**	Enabling diagnostics and cancer treatments through research on medical isotopes, conducting research to understand the impact of exposure to ionizing radiation on the health of Canadians and improving regulation surrounding radiation exposure.
 **Tackling climate change**	Supporting the existing fleet and advancing research, development and commercialization of nuclear technology and related clean energy technology sectors, such as fusion, to facilitate decarbonization of energy production in Canada.
 **Threat reduction**	Developing innovative approaches in detecting radiation, promoting non-proliferation, supporting emergency preparedness, and enhancing physical and cyber security.
 **Protecting the environment**	Developing and applying leading practices in decommissioning, responsible waste management, environmental remediation, and safety.
 **Growing the nuclear talent pipeline**	Promoting nuclear careers through outreach, partnerships, employment opportunities, and enriching university curricular.
 **Enhancing trust**	Building relationships with local communities and rightsholders to increase trust and transparency and advancing reconciliation with Indigenous Nations and communities through partnership and collaboration.

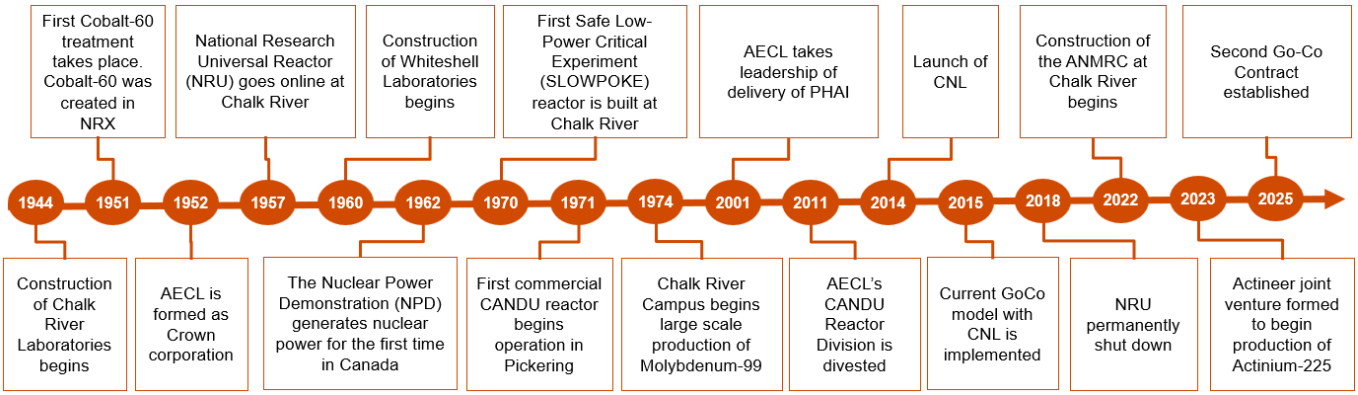
3. About AECL

3.1 Historical context

AECL is a Canadian Crown corporation that was founded in 1952 with the mandate to define, direct, and build the nuclear industry for Canada. Headquartered in Chalk River, Ontario, today AECL remains the owner of the largest nuclear science and technology laboratory in Canada, with a mission to ensure that both Canadians and the world benefit from nuclear science and technology, with a strong emphasis on nuclear safety, security, and environmental stewardship.

Over the past 70+ years, AECL's efforts to advance nuclear science have created a foundation for Canada's current nuclear ecosystem and underpinned Canada's position as a globally recognized nuclear player. As previously mentioned, AECL delivers its mandate through a GoCo model. As such, CNL is responsible for the operations of AECL's sites across the country, and has been since the GoCo model was introduced in 2014, before being formally implemented in 2015. A brief, non-exhaustive history is illustrated and described below.

Summary timeline for AECL



3.2 Bringing us to the present day

Since its establishment in 1952, AECL has played a substantial role in advancing nuclear technology and its contribution to improving health and Canada's clean energy goals. Two key pieces of AECL's history include the development of the CANDU® reactor technology and their experience in the research and production of medical radioisotopes. These are described in more detail below.

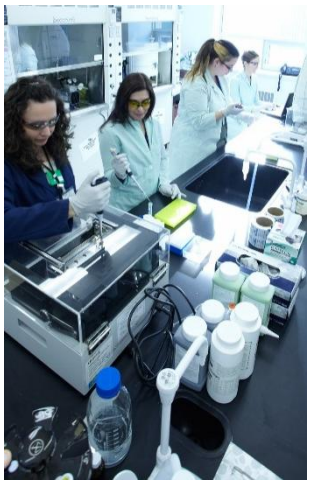
The CANDU® Reactor

Among AECL's major historical achievements is the development of the CANDU® (Canada Deuterium Uranium) reactor technology, which to this day makes a significant contribution to the global nuclear energy landscape. The reactor was developed throughout the 1950s and 1960s, advancing a unique design that uses natural uranium as fuel and heavy water as a moderator, removing the need for uranium enrichment. The first CANDU® reactor – NPD (Nuclear Power Demonstration) – became operational in 1962, demonstrating the feasibility of this innovative technology. Following this, a second prototype was developed at Douglas Point, Ontario, further proving the feasibility of this technology by delivering power to Ontario's hydro grid starting in 1966. In 1971, the first commercial CANDU® unit began operation in Pickering, Ontario.[4] In the following decades, AECL, as the owner of the CANDU® IP on behalf of the Government of Canada, successfully marketed and built CANDU® reactors in Canada and internationally, including reactors in India, South Korea, Argentina, Romania, and China. In 2011, AECL underwent a significant transformation when it sold the assets of its CANDU® reactor division to Candu

[4] Gord L. Brooks, former AECL Vice President and Chief Engineer, *A Short History of the CANDU® Nuclear Power System*.

Energy, a subsidiary of AtkinsRéalis (formerly SNC-Lavalin). AECL retained ownership of the intellectual property for the CANDU® technology and today is working with AtkinsRéalis, as its technology licensee under a recently announced Memorandum of Understanding, to further efforts for an optimized CANDU® model to position CANDU® for the next generation of large nuclear reactors in Canada and abroad. This move allowed AECL to refocus on a new set of priorities established by government including nuclear research, development, decommissioning and waste management.

Health and nuclear medicine



AECL has also been a key player in the research and development of radioisotopes for medical use, with one of the original core tenets of AECL being improving the health of Canadians. Radioisotopes are notably used in cancer treatments, beginning with the first Cobalt-60 treatment in 1951. AECL has also historically been a producer of Cerium 141, Iodine-131 and 125, and Molybdenum-99, with the National Research Experimental Reactor (NRX) producing Iodine-131 starting in 1948, and then producing Iodine-125 starting in 1966.[5] In 1957, the National Research Universal (NRU) reactor came online in Chalk River and positioned Canada as a major producer of isotopes globally. The NRU reactor primarily produced Molybdenum-99, with its daughter isotope Technetium-99m being used in diagnostic imaging and treatment for millions of people internationally each year until the NRU reactor was shut down permanently in 2018. The NRU also produced a variety of other isotopes, including Cobalt-60 for use in radiation therapy machines to treat cancer; Carbon-14, for use in chemistry, bioscience and environmental laboratories as a tracer; Iridium-192, for use as the inspection of welds and other metal components across industries; and Xenon-133, Iodine-131 and Iodine-125, all of which were used in a variety of clinically important diagnostic and therapeutic applications. More broadly, the NRU became a centerpiece to a scientific community including Canadian universities, government departments, and foreign institutions. It enabled Canada to become a world leader in neutron spectroscopy. Bertram Brockhouse was awarded the 1994 Nobel Prize in Physics for research in neutron spectroscopy, which was largely made possible by his access to the NRU and made advances across a range of industrial sectors.

In addition to nuclear medicine, to this day AECL (now represented by CNL) remains a pioneer in low-dose radiation research. The Permissible Doses Conference, hosted in 1949 at the Chalk River Laboratories with members from Canada, the United States, and the United Kingdom, established the first set of internationally agreed radioprotection standards. Since this conference, AECL has continued to conduct research and collaborate with organizations from around the world. These institutions include US national laboratories, as well as national and international authorities from Japan, the United Kingdom, South Korea, and the United Nations International Atomic Energy Agency (IAEA). There have also been more than 50 university collaborations in this field, including universities in the United States and the United Kingdom. This continues to make an important contribution to public safety as policymakers are better equipped with knowledge surrounding the impact of low-dose radiation and improves safety for workers dealing with or working in environments with low-dose radiation hazards on a routine basis.

Responsible waste management

Decades of research, design and development of nuclear technology has created a diverse legacy of nuclear waste that needs to be processed, managed and disposed of responsibly. According to interviewees, AECL is a global leader in waste management with over 70 years of experience as a responsible steward of nuclear waste. AECL's work established and continues to contribute to a knowledge base around the implications of nuclear waste management. Today, a large portion of AECL's funding to CNL is used to advance the environmental remediation and management of legacy waste to reduce AECL's liability. CNL also accepts small amounts of nuclear waste from hospitals, universities, and research institutions to ensure the waste is dealt with in a safe manner, an activity that also supports nuclear innovation.

[5] CNL website, *Over 75 years of industry leadership in radioisotope development and production* timeline.

4. Canadian Nuclear Laboratories

Since the establishment of the GoCo model in 2015, CNL has been responsible for day-to-day operations of AECL's sites. CNL's activities build on the knowledge base historically developed by AECL to advance Canada's nuclear ecosystem into the future. CNL's operations are focused around three key missions:

- Environmental Remediation Management (ERM)
- Science and Technology (S&T)
- Infrastructure (also known as Capital)

4.1 Environmental Remediation Management

The Environmental Remediation Management (ERM) mission is focused on reducing the risk and liability from past science and technology activities which created radioactive waste, and accounts for the majority of spending by AECL. In carrying out this mission, CNL actively remediates land and decommissions redundant buildings with the appropriate safety measures and monitoring. The key activities included in the ERM mission include those at Chalk River Laboratories (CRL), the Port Hope Area Initiative (PHAI) and at Whiteshell Laboratories (WL), as well as the Historic Waste Program, which is addressing the Northern Transportation Route, and the Historical Artefacts Recovery Program.

ERM encompasses a wide range of activities, including the decommissioning of aging facilities at CRL, such as buildings used for legacy reactor fuel research, and preparing hot cells and other structures for demolition. These efforts are part of a broader hazard reduction strategy aimed at reducing long-term environmental and safety risks. The program also includes the management of stored liquid waste, legacy solid waste, and used nuclear fuel, with ongoing upgrades to critical infrastructure like the Waste Treatment Centre and the development of new facilities such as the Sorting and Segregation Facility. In addition to infrastructure decommissioning, the program supports the processing, sorting, and storage of low-, intermediate- and high-level radioactive waste, as well as clearance/conventional nuclear waste. This includes enhancements to the Waste Analysis Facility, the Waste Data Tracking System, and the implementation of new technologies for waste characterization and reduction. These capabilities are essential for supporting both current and future remediation and site revitalization initiatives.

4.2 Science and Technology

The Science and Technology (S&T) mission supports CNL's objectives as a national nuclear laboratory with a key responsibility of underpinning the policy priorities of the Government of Canada and driving nuclear innovation to further advance the Canadian nuclear industry, including through the provision of technical services. Through this mission, CNL uses unique and specialized infrastructure to perform R&D in partnership with both academia and industry to advance new technologies and the development of products and services to be brought to market. The majority of spending in the S&T mission consists of activities conducted as part of the Federal Nuclear Science and Technology (FNST) Work Plan, Commercial S&T portfolio, or Lab-directed S&T (LDST) initiatives, with the vast majority of these activities taking place at CRL.

Case Study: The FNST supporting Federal Government research priorities

As a federal Crown corporation, AECL receives funding from the Government of Canada to enable nuclear science and technology to be undertaken at CNL that benefits both the government and the broader nuclear industry. The FNST Work Plan supports the priorities of the Federal Government and directly supports the needs of fifteen federal departments and agencies, and contributes to the maintenance of capabilities at the laboratory.

The fifteen departments and agencies are listed below.

- Canadian Border Services Agency
- Canadian Coast Guard
- Canadian Nuclear Safety Commission
- Canadian Space Agency
- Communications Security Establishment
- Defense Research and Development Canada
- Department of National Defence
- Environment and Climate Change Canada
- Global Affairs Canada
- Health Canada
- Innovation, Science and Economic Development Canada
- National Research Council of Canada
- Natural Resources Canada
- Public Safety Canada
- Royal Canadian Mounted Police

The research efforts are structured around four thematic areas. Each of these themes is aligned with the strategic needs of the Government of Canada and coordinated through interdepartmental committees led by AECL. More specifically, the research through the FNST program is focused on the following areas:

Supporting the development of biological applications and understanding the implications of radiation on living things	This includes studying the health effects of radiation exposure and enhancing Canada's ability to treat radiation-related diseases.
Enhancing national and global security by supporting non-proliferation and counter-terrorism	Research in this area focuses on developing technologies to monitor, track, and characterize nuclear materials, as well as advancing cyber security and nuclear forensics.
Supporting safe, secure, and responsible use and development of nuclear technologies	This includes advancing technologies that contribute to decarbonization, developing Canadian nuclear resources such as uranium and thorium, and improving regulatory and licensing frameworks.
Supporting environmental stewardship and radioactive waste management	Research in this area aims to improve our understanding of how radiation interacts with environmental systems, and enhance the efficiency and effectiveness of waste management techniques.

CNL's Commercial S&T program generates revenue through commercial research

The Commercial S&T program at CNL provides support to the Canadian and international nuclear industry, generating revenues through providing specialized research and technical services to third party clients. A key focus of this program is to maintain the sustainability of the existing fleet of CANDU® reactors, leveraging decades of expertise and unique R&D infrastructure located at the CRL site. More widely, CNL provides technical products and services in support of sectors such as health (e.g. low dose research, radiopharmaceuticals and Actinium-225 production), nuclear safety and security (e.g. cyber training and emergency response), advanced reactors and SMRs, hydrogen and tritium technologies, and environmental remediation.

Lab-directed science and technology (LDST) supports government and commercial priorities

LDST is an internal investment initiative that supports innovation and capability development aligned with CNL's strategic goals. Funded through margins on commercial revenues, LDST enables projects that build future scientific capacity and respond to emerging federal and commercial needs. Strategic projects over the study year included the S&T Isotope Production Project seeking the development and scale up of a promising new approach to the production of Actinium-225 for targeted alpha therapy, and the SMR Invitation for Demonstration initiative.

4.3 Infrastructure

The Infrastructure mission, also referred to as the "Capital mission," represents the government's commitment to invest in the revitalization of the Chalk River Laboratories site, and involves spending to improve the existing site infrastructure as well as new facilities to maintain and grow its position as a leading science and technology campus in support of nuclear programs going forward. This includes the development of research buildings, laboratories, and supporting utilities that are essential for delivering on AECL's and CNL's long-term strategic goals. These investments are designed to create a modern and world-class campus fit for the future, reducing carbon emissions and providing workspaces that are accessible and attractive to a new generation of skilled workforce[6].

The program is structured into four areas:

- **New Builds:** Focuses on constructing new facilities primarily designed to enable the success of the ongoing science and technology mission, and doing so with a focus on sustainability and accessibility. CNL plan to reduce the embodied carbon of the structural materials used in major construction projects by 30%, and intends to begin reporting on this reduction in their 2025-26 Sustainability Report.
- **Revitalization:** Upgrades to existing mission-critical infrastructure. Work in this area includes maintaining current capabilities while new buildings and facilities are designed and constructed. This also includes the acquisition of stand-alone equipment, which is part of normal asset management practices in order to preserve CNL's capabilities. Capital purchases are in support of equipment replacement in the areas of science and technology, health, safety, security and environmental programs, and fleet and facilities. Other work includes the completion of the site-wide fire hazard upgrades on numerous fire systems, the installation of new, modern fume hoods in many S&T facilities, and ongoing architectural and electrical upgrades to facilities to improve reliability.
- **Services and Utilities:** Maintains, upgrades and replaces essential site systems such as roads, energy, and IT. Recently, upgrades have been done with a focus on sustainability and achieving net-zero goals, with a long-term goal of achieving carbon neutrality by 2040. This includes the electrification of CNL's vehicle fleet as well as adoption of energy performance improvements such as the adoption of electric heating and conservation measures. As of 2023, 6.5% of CNL's light duty fleet was zero-emission vehicles, with a target of 80% by 2030. Overall, CNL has achieved emissions reductions of 51% from 2005 levels at the Chalk River site.
- **Bridging:** Maintains serviceable assets until they are replaced or decommissioned.

[6] AECL Website, *Chalk River Revitalization*

CNL's operations span across Canada, illustrated in the map below. The largest site by spending is the Chalk River Laboratories, CNL's headquarters and the focal point of the S&T and infrastructure missions, while also accounting for a significant portion of ERM-related spending. Other major sites include the Port Hope Area Initiative and the Whiteshell Laboratories, both of which are major remediation projects.

5. Chalk River Laboratories

5.1 Description of site and region

Located in the municipality of Deep River in the Ottawa Valley and a part of Renfrew County, the Chalk River Laboratories campus serves as the primary hub for CNL's scientific and technical operations. This site, the largest single complex within Canada's science and technology infrastructure, includes numerous nuclear facilities and more than 50 unique laboratories. It plays a vital role in maintaining the safe operations of the CANDU® reactor fleet, as well as conducting commercial and government-funded research on a wide range of nuclear technology from new reactor system development, to managing environmental impacts, to human health. This research plays a crucial role in underpinning much of what the Canadian nuclear sector achieves, or hopes to achieve, domestically and globally.

The economic and social impact derived from nuclear operations is well established in the region. The town of Deep River was founded in 1944 following the decision to locate a pilot plant to produce plutonium in Canada. The site was chosen by Defense Industries Limited (DIL, a federally owned and privately operated company) and construction began in 1944. To quickly increase the supply of housing to meet the needs of the research personnel moving to Chalk River and Deep River, "Wartime Houses" (surplus housing that was created at munitions facilities for the war effort) were deconstructed, transported to Chalk River and Deep River via truck and train, and reconstructed for use. The town began as a "company town" with no private ownership of housing, and with DIL responsible for the operation of the town until they transferred responsibility to the National Research Council (NRC) in 1950. In 1952, AECL was formed and took responsibility for both the laboratories and the town[7].

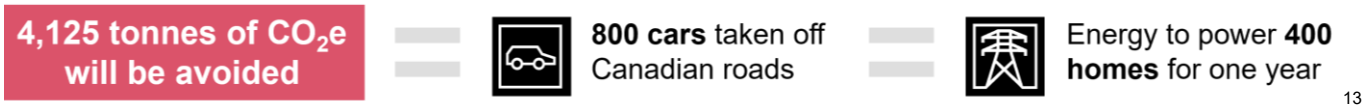
Renfrew County is characterized by a predominantly rural population with a low population density of approximately 14.5 people per square kilometers.[8] As of the 2021 Census, the county had a population of 106,365, showing growth of 3.9% since 2016. The demographic profile reveals an aging population, with over 23% aged 65 and older, and a median age of 45.2 years. Economically, Renfrew County has a strong agricultural presence, with over 296,000 acres of farmland spread across roughly 1,000 farms, primarily in the southern portion of the county.[9] According to the 2021 Census, the median after-tax income for individuals aged 15 and over was $38,000, which is below the Ontario median of $41,800. The prevalence of low income was 10.7%, slightly lower than the provincial average of 11.6%. Employment indicators show an employment rate of 54.6% and an unemployment rate of 6.9%, both close to provincial norms.

Today, the Chalk River Laboratories site is undergoing a major revitalization into a world-class nuclear science and technology campus to meet both government policy priorities and enable the continued success of the Canadian nuclear industry[10]. Between 2015 and 2025, more than 120 outdated buildings (totaling 330,000 square feet) were safely decommissioned[11], and in their place new state-of-the-art research facilities and support buildings, including the Advanced Nuclear Materials Research Centre (ANMRC) are being constructed. AECL has stated that the ANMRC will be "one of the largest nuclear research facilities in Canada once completed" with

7 The Society for the Preservation of Canada's Nuclear Heritage – *the Early History of Deep River and "the Plant"*
8 Statistics Canada, 2021 Census Profile
9 Ontario Ministry of Agriculture, Food, and Rural Affairs, *Local Economic Snapshot – Renfrew Country 2021*
10 AECL website, *Chalk River Revitalization*
11 CNL website, *Chalk River Decommissioning and Environmental Remediation*.

around 100,000 square feet and 23 laboratories to accommodate 160 employees.[12] The ANMRC will provide Canada with a hot cell facility with the unique capability to handle, manage and investigate challenging nuclear materials, supporting the existing nuclear sector as well as enabling R&D for future innovations. In 2023, CNL completed construction of its flagship Science Collaboration Centre (SCC).

CNL seeks to create a campus for the future of nuclear research, in doing so maintaining a focus on sustainability and accessibility. As such these buildings are being constructed utilizing innovative materials, such as mass timber products sourced from within Canada. Mass timber is a renewable resource that reduces the carbon footprint of these buildings. Infrastructure improvements, such as IT investments and utility upgrades, are also part of the revitalization efforts.Between the SCC, Minwamon building, and the Support Facility, CNL estimates that:

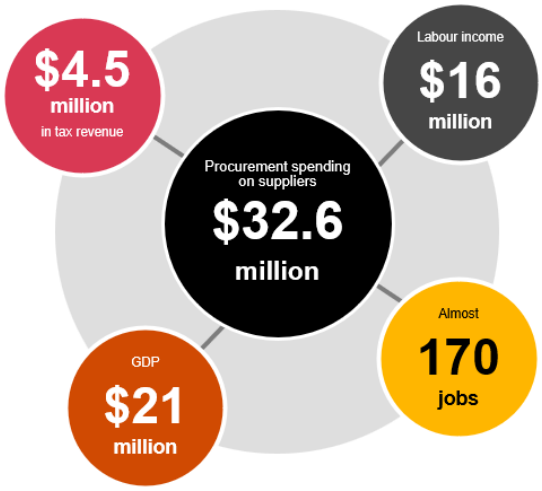


[13]

5.2 Economic impact

To this day, the Chalk River Laboratories generate significant economic benefit for the local community through being one of the largest local employers and a major purchaser of goods and services from surrounding areas. We estimate that in the 2024 fiscal year, the Chalk River Laboratories site supported approximately $979 million in national GDP, 7,369 jobs, $726 million in labour income and $238 million in tax revenues.

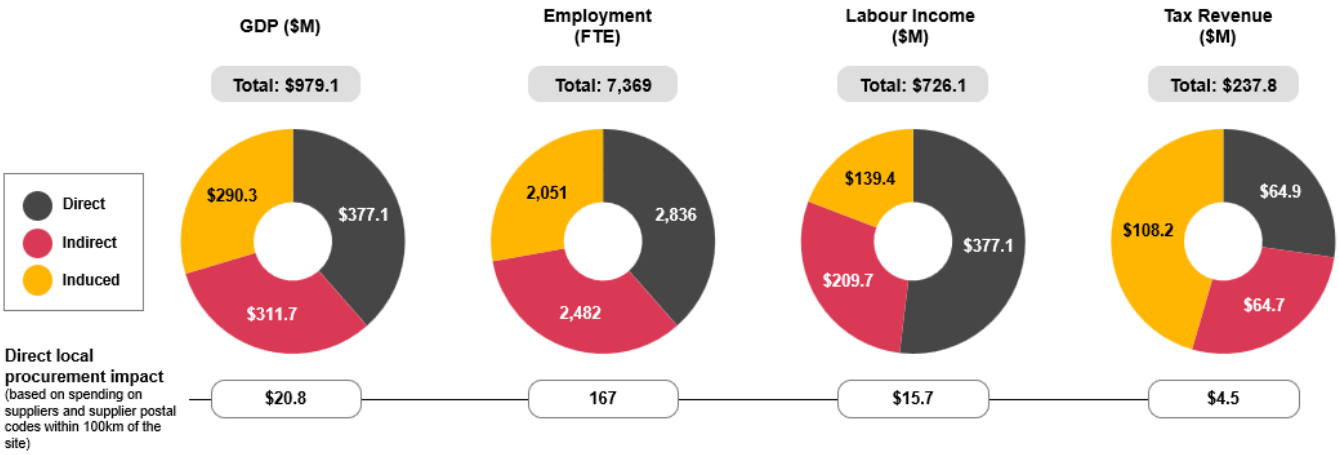
CNL's procurement spending on suppliers within 100 kilometers of the Chalk River Laboratories was approximately $32.6 million.



[12] CNL website, *AECL and CNL break ground on new nuclear research facility*.

[13] CNL website, *Revitalizing the Chalk River Laboratories Campus*

Economic footprint of the Chalk River Laboratories



AECL and CNL directly employ over 2,800 employees at the Chalk River site, and support further employment since many of the indirect and induced impacts are likely occurring locally. This represents a significant regional impact on Renfrew County, including the towns of Chalk River, Deep River, Petawawa, and Pembroke.

5.3 Social impact

Chalk River Laboratories helps to keep the lights on and advances decarbonization by providing support to the current fleet of Canadian reactors

Case Study: CNL's role in the success of the CANDU® fleet

There are currently 19 CANDU® reactors operating across Canada and 30 CANDU® or CANDU®-derivative reactors installed internationally[14] out of a total 440 reactors around the world.[15] The global reach of this technology developed by AECL has generated financial return for the Government of Canada and continues to drive economic and social benefits.

The use of AECL's CANDU® Intellectual Property (IP) continues to have significant economic benefits for Canada through the export of the technology as well as continued development of engineering expertise to build and operate the reactors. CANDU® Energy Inc. announced that in 2024 they issued more than $1 billion in purchase orders into the CANDU® supply chain across more than 350 companies.[16] Furthermore, 97% of this spending was for goods and services from Canadian companies, suggesting the vast majority of economic benefit from the CANDU® supply chain is being retained in Canada.

The operation of CANDU® reactors avoids CO_2 emissions. The World Nuclear Association states that across Canada in 2024, CANDU® reactors generated 81.2 TWh of nuclear electricity, accounting for 15% of Canada's electricity. The World Nuclear Association also finds that the life cycle grams of CO_2 equivalent emitted per kWh of nuclear power is approximately 478 gCO_2/kWh lower than natural gas. This suggests that in 2024, relative to natural gas, almost 39 million tonnes of CO_2 were avoided in Canada. This is the equivalent to the carbon emissions from 12 million cars or the energy use of 9 million homes according to Natural Resources Canada Greenhouse Gas Equivalencies Calculator.

14 AECL 2024 Annual Report

15 World Nuclear Association website, *Nuclear Power in the World Today*.

16 AtkinsRéalis website, *Candu Energy, an AtkinsRéalis company, books over $1 billion in Canadian CANDU® supply chain contracts*.

CNL continues to provide support for the existing CANDU® fleet drawing on the research and expertise at the Chalk River Laboratories. CNL hosts a broad range of specialized services across six expert branches that are deployed to underpin the continued safe and efficient operation of CANDU® reactors in Canada and internationally. Those branches are:

- Materials and Fuels Performance Testing
- Materials Science Branch
- Reactor Chemistry and Corrosion
- Fluids Engineering
- Inspection and Monitoring Technologies

CNL also plays a key role in supporting refurbishment efforts, which is critical for continued success of nuclear power in Canada as most of Canada's 19 reactors are midway through their life cycles. These refurbishment efforts on existing CANDU® reactors are carried out both within Canada and globally. For example, there is a refurbishment underway at the Qinshan Nuclear Generating Station in China which will allow for another 30 years of operation, as well as an agreement signed in 2023 for Canada to support refurbishment of a CANDU® reactor in Romania, with the contract value estimated at $750 million and over 80% of the reactor components and 100% of the retube tools manufactured in Canada[17].

Undergoing such refurbishment has notable impacts including increasing return on investment of the existing nuclear fleet as refurbishing existing plants extends their lifespan and continuing to support decarbonization by allowing for extended use. Refurbishment activity also generates employment opportunities and economic activity, with the Canadian Manufacturers and Exporters calculating the following:

	Jobs	Labour income[18]	Spending on goods and services in Ontario[19]
Refurbishment of 12 nuclear reactors at the Bruce and Darlington sites[20]	9,000	$1.7 billion	$2.2 billion
Annual operations of these reactors	15,600	$2.7 billion	$900 million

CNL's support for the CANDU® fleet enables decarbonization efforts across Canada and globally. Nuclear is seen by many experts as a leading way to quickly expand availability of reliable, non-emitting energy in order to support electrification and decarbonization. The Director General of the UN's International Atomic Energy Agency noted that "without nuclear, it will be almost impossible to decarbonize by 2050"[21], and the International Energy Agency (IEA) updated it's 2021 *Net Zero Roadmap* to increase the importance of nuclear, stating that nuclear capacity most more than double from 417 GW in 2022 to 916 GW in 2050 to achieve net zero emissions[22].

17 Canadian Commercial Corporation - Canada signs deal to refurbish CANDU® reactor at Cernavoda Nuclear Power Plant in Romania

18 Labour income adjusted from 2010 dollars in source report to 2024 dollars using growth in average income of electric power engineering construction sector for refurbishment, and professional occupations in engineering for annual operations

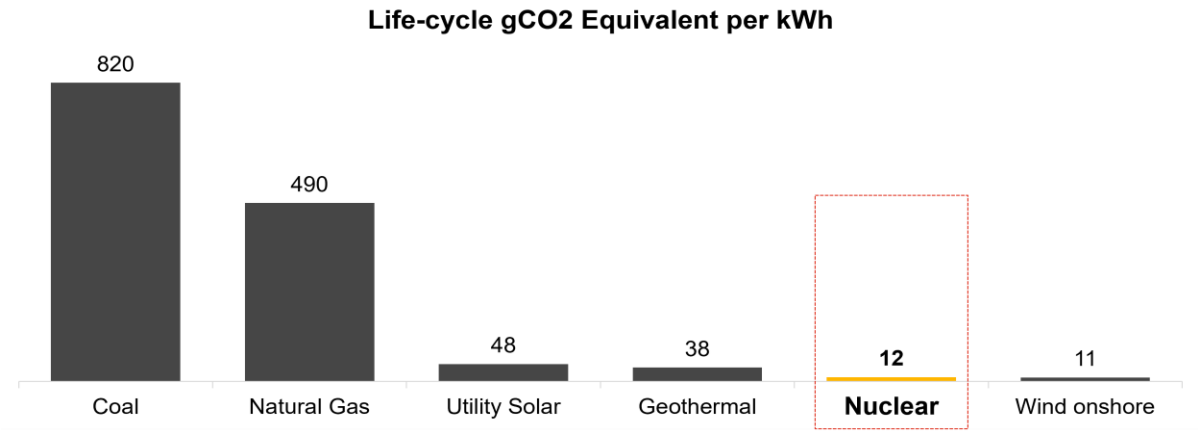
19 Spending adjusted from 2010 dollars in source report to 2024 dollars using the growth in the industrial product price index from Statistics Canada Table 18-10-0265-01

20 Canadian Manufacturers & Exporters, *The Economic Benefits of Refurbishing and Operating Ontario's Nuclear Reactors*

21 United Nations, *'Without nuclear, it will be almost impossible to decarbonize by 2050', UN atomic energy chief*

22 World Nuclear News, *IEA sees greater role for nuclear in attaining net-zero by 2050*

The graph below illustrates the low life-cycle emissions per unit of energy for nuclear relative to other key sources.[23]



The economic benefits stemming from AECL's development of the CANDU® reactor and CNL's support for the CANDU® fleet are anticipated to continue long into the future with the development of next-generation CANDU® reactors, such as the CANDU® MONARK™ reactor proposed by AtkinsRéalis. The MONARK™ reactor is a next-generation nuclear power reactor that is the most powerful CANDU® reactor to date, capable of producing 1,000 megawatts of electricity. According to AtkinsRéalis, a pair of CANDU® MONARK™ reactors would remove over 17 million tonnes of CO_2 emissions per year compared to traditional coal, which is the equivalent to the emissions from over 5 million cars driven for one year or energy used by almost 4 million homes for one year.[24]

According to a study by the Conference Board of Canada[25]:

Overall, AECL's historic research and development efforts to develop the CANDU reactor positioned **Canada as one of the global leaders in the nuclear industry**, and current collaboration and continued innovation can maintain this position into the future.

In addition to generating significant economic benefits, the increased use and innovation around CANDU® reactors will continue to deliver environmental benefits and make a significant contribution to new clean energy capacity required in Canada to support the transition towards net-zero in 2050.[26]

23 World Nuclear Association, *How can nuclear combat climate change?*

24 According to Natural Resource Canada's Greenhouse Gas Equivalencies Calculator. We note that the estimate of carbon emissions avoided likely overestimates the emissions that would be actually avoided as the source compares emissions relative to the use of coal, which has significantly higher emissions relative to other sources such as natural gas that are more commonly used in Canada.

25 Conference Board website, *An economic impact assessment of the CANDU® MONARK Nuclear Reactor*.

26 IESO website, *Pathways to Decarbonization*.

Chalk River Laboratories is at the forefront of nuclear research through its commercial science and technology program

A major function of the Chalk River Laboratories is to support Canadian nuclear industry partners by conducting research and providing services that both advance the state of nuclear technology and provide essential support to the existing fleet of CANDU® reactors. In doing so, CNL generates revenue to recover some of the costs associated with the management and operation of its nuclear research infrastructure and reinvest in internally funded laboratory directed science and technology (LDST), ensuring the availability of sovereign nuclear capability for Canada. The role of the Chalk River Laboratories as an applied science and technology laboratory allows it to act as a connector between industry and academia, where required, creating strategic partnerships and supporting industry-led initiatives to advance innovation and span the “valley of death”, the gap between scientific research and commercial viability where many innovative goods and services fail to survive.

The research and partnerships led through the Chalk River site are positioning Canada for future economic and social benefits of nuclear and related clean energy technologies. This enables Canada to be an early adopter of nuclear technologies such as in small modular reactors (SMRs), where Ontario is advancing what will likely be the first commercial SMR in the G7[27]. Early adoption of technology also positions Canada to grow its competitive nuclear value chain, and export related goods and services to other countries as they follow in adopting new technologies. Following in the model of CANDU® technology, IP that is commercialized in Canada can create economic benefits for decades by driving revenue growth, R&D investment, and employment. Finally, research that improves the cost-effectiveness, feasibility, and safety of nuclear technology, helps to reduce barriers to deployment and increase the attractiveness to implement nationally and globally, thereby helping to advance decarbonization in the fight against climate change.

[27] Government of Ontario, *Ontario Leads the G7 by Building First Small Modular Reactor*

SMR, MMR, and AR	Outcomes
• Research at Chalk River Laboratories brings small modular reactors (SMRs), micro modular reactors (MMRs), and advanced reactors (ARs) closer to commercial readiness. • Through AECL's Federal Nuclear Science and Technology Work Plan, there has been approximately $238 million invested across 95 projects since 2015, working to advance the deployment of SMRs, MMRs, and ARs in Canada and internationally. • Key focus areas are the nuclear fuel cycle, reactor safety and security, materials and chemistry, and energy systems analysis.	Driving innovation and knowledge through the publication of almost: **200** journal articles **480** technical reports **291** conference reports and presentations[28]. Participated in training **more than 200 highly skilled workers** who will help Canada's adoption of next-generation reactors. Global deployment of SMRs, supported by research institutes such as the Chalk River Laboratories, are expected to **reduce global GHG emissions by 15 gigatons by 2050**[29] Deployment of new reactor designs in Canada provides a **reliable source of clean energy and generates economic benefits for Canada**[30] while supporting domestic energy security and reducing greenhouse gas emissions.

Nuclear fusion	Outcomes
• AECL, through CNL, is a key part of Canadian efforts to make nuclear fusion commercially viable in Canada. • CNL released their Fusion Energy for Canada report in 2024, a roadmap to a national strategy for nuclear fusion and is investing in efforts to advance fusion research[31], in particular leveraging its experience in the management and handling of tritium for future fusion fuel cycles • CNL is partnering with organizations globally on fusion research including the United Kingdom Atomic Energy Authority, Stellarex, and Canadian company General Fusion. • CNL formed Fusion Fuel Cycles, a joint venture with Japan's Kyoto Fusioneering in 2024 which aims to develop and deploy deuterium-tritium fusion fuel cycle technologies[32].	Harnessing nuclear fusion energy could drastically reduce global dependence on fossil fuels, mitigate climate change, and offer energy security as fusion could be able to provide virtually limitless clean energy. Leveraging leading expertise through joint ventures and partnerships and unique experience in the handling and management of tritium developed through decades of operating CANDU® reactors where tritium is a bi-product, Canada is well positioned for success in Fusion. CNL estimates that nuclear fusion could **create more than 63,000 jobs in Canada** and result in a cumulative **economic benefit of up to $520 billion by 2100** through building and operating domestic powerplants, and exporting products and services globally.[33]

28 AECL Federal Nuclear Science and Technology Work Plan, *Compendium of Advanced Reactor, Small Modular Reactor, and Micro Modular Reactor Research and Development*

29 Nuclear Energy Agency and OECD, *Small Modular Reactors (SMRs) for Net Zero*.

30 A study by the Conference Board of Canada found that investing in four SMRs in Ontario would sustain, on average, 2,000 jobs per year for the next 65 years, generate approximately $15.3 billion GDP in 2019 dollars, and lead to approximately $4.9 billion in tax revenues over the next 65 years.

31 CNL website, *CNL announces new programs to position Canada to seize opportunities in fusion energy*

32 CNL website, *Kyoto Fusioneering and Canadian Nuclear Laboratories Launch Joint Venture, Fusion Fuel Cycles Inc.*

33 CNL website, *It's Time for a Canadian Fusion Strategy*

Hydrogen	Outcomes
• CNL, conducts research including through the Hydrogen Isotopes Technology Laboratory at Chalk River, which specializes in commercial research on hydrogen production and hydrogen isotope management.[34] • CNL are expanding capacity in hydrogen research by installing high-temperature steam electrolysis facilities that will help improve the industry's ability to produce hydrogen in a cost-effective way. • CNL launched the Canadian Hydrogen Safety Centre, which brings together industry, government, and academic partners to provide hydrogen safety solutions.	Work at Chalk River grows Canada's role as a global player in hydrogen, laying the groundwork for future economic benefits: Natural Resources Canada (NRCan) estimates that the global market for hydrogen could reach almost **$2 trillion by 2050** in a net zero scenario.[35] Hydrogen can be produced domestically from a variety of sources and is stable when being stored for long periods of time making it a **flexible energy alternative that strengthens Canada's energy security.** Hydrogen can be used as a **low-emission fuel in transportation, industry, and power generation, reducing greenhouse gas emissions and supporting net-zero goals.** This is especially important in industrial sectors where electrification may not be practical, as use of hydrogen will allow for a significant reduction in emissions.

Chalk River's research contributes to safety and national security

The ability to quickly detect and assess nuclear material threats at Canada's borders is crucial for national security and is being improved by CNL through the construction and testing of a next-generation system which comprises both passive counting and active interrogation capabilities. In addition to detecting nuclear materials, this detection technique could also be applied to other areas, such as opioid detection. These detection technologies lower risk for border personnel by reducing exposure to potential hazards. CNL has supported Canada Border Services Agency (CBSA) in detecting nuclear materials, by commissioning a new radiation portal monitor (RPM) facility and material test facility. Research at Chalk River Laboratories continues to contribute to Canada's ability to rapidly assess nuclear threats and determine appropriate responses.

Leveraging its extensive history in nuclear research and development, CNL has contributed to nuclear forensics. This refers to the ability to determine the provenance of nuclear materials, and is considered an important deterrent against those that would seek to use them to cause fear or harm. CNL expertise is making important global contributions in a variety of international meetings and groups such as the Nuclear Forensics International Technical Working Group (ITWG), which includes partners like the IAEA, INTERPOL, and the United Nations Interregional Crime and Justice Research Institute. CNL also engages in hands-on nuclear forensics training, participating in ITWG exercises. This includes operational exercises partnering with the RCMP and the National Nuclear Forensics Lab Network (NNFLN), among other organizations, to test responses to illicit radioactive source discoveries.

In 2018, CNL established the National Innovation Centre for Cyber Security (NIC) in Fredericton, New Brunswick. The primary goal of the NIC is to conduct research and develop methodologies to monitor, detect, and mitigate the risk and impact of cyber-intrusions and cyber security events in nuclear facilities and other critical infrastructure. CNL is also part of a Canadian consortium to establish a National Centre of Excellence for Cyber Security for Critical Infrastructure Protection. This consortium involves 16 directly participating organizations and more than 80 organizations participating indirectly. In this consortium, CNL's focus is on developing high-end cyber-security training and certifications, advancing forensics, addressing the security of supply chains, and utilizing cyber-intelligence collection platforms. In 2023, the NIC held a three-day security incident response

[34] AECL website, *Science and Technology, Chalk River Revitalization*.
[35] Government of Canada website, *Hydrogen Opportunities: Key findings*.

exercise with participants from Ontario Power Generation, Bruce Power, NB Power, Cernavoda Nuclear Power, Canadian Nuclear Safety Commission, Canadian Centre for Cyber Security, Idaho National Laboratories, Sandia National Laboratories, and the National Nuclear Security Administration.

Adopting the correct physical and cyber safeguards and the ability to detect, monitor, and conduct forensics on nuclear materials is critical to both the safety and security of Canadians, as well as the long-term viability of nuclear as an energy source.

Chalk River's research and environmental, remediation and management mission enhance the responsible management of nuclear waste

Research conducted at the Chalk River site is significant to understanding how radioactive materials move throughout the environment, and the impact they have on the health of humans, plants, and animals. For example, CNL has contributed to the development of databases and models for the Great Lakes basin, allowing for more accurate prediction of radioactive transport through the water. CNL has also conducted research to improve the ability to accurately and precisely measure tritium, a radionuclide of hydrogen that is produced as a by-product of CANDU® reactors. The work conducted at CRL supports the remediation activity at the Port Hope and Whiteshell sites and increases overall knowledge of how to safely manage waste and remediate nuclear sites.

In 2024, CNL received approval from the Canadian Nuclear Safety Commission to construct the Near-Surface Disposal Facility (NSDF) to address low-level radioactive legacy waste. This decision was then subject to federal judicial reviews related to Indigenous consultation and environmental impact. Notably, the Federal Court found that the Commission did not properly apply the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and concept of free, prior and informed consent (FPIC) to the NSDF, and directed the Commission to address the matter through a renewed consultation process, which will be led by the CNSC. CNL filed an appeal of the Federal Court decision in March 2025, which is currently pending.

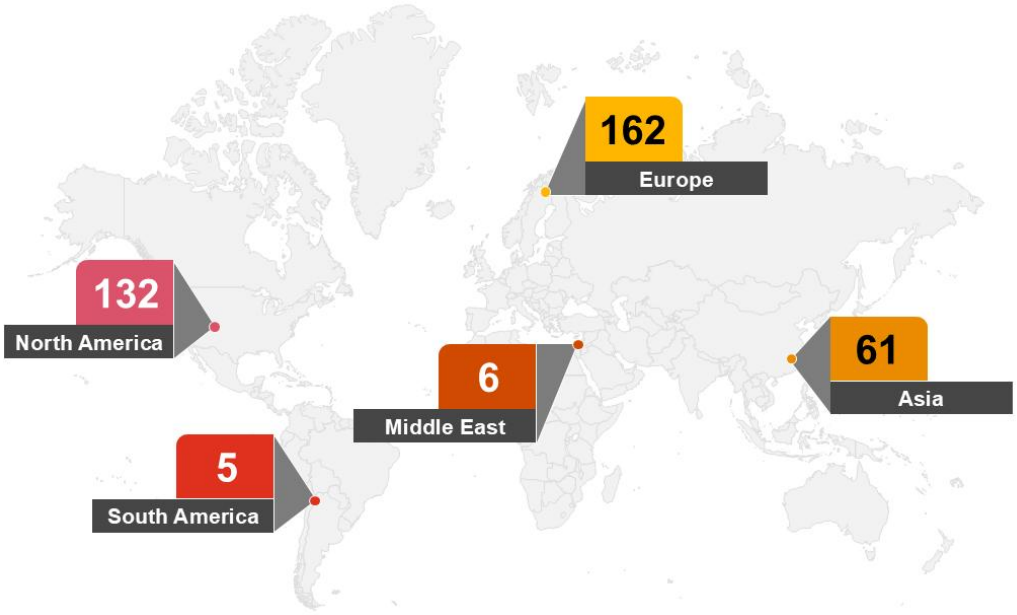
When construction can proceed, this facility will serve to further reduce the federal government waste liability, and enable revitalization of ageing site infrastructure. CNL, in their NSDF Environmental Impact Statement, estimates that the NSDF will be operational for approximately 50 years and will be able to receive up to 1,000,000 cubic meters of low-level radioactive waste, including waste from future operations, AECL facilities, and small amounts of off-site sources.

AECL and CNL signed a long-term relationship agreement with the Algonquins of Pikwàkanagàn First Nation (AOPFN) in May 2023. This agreement established mechanisms for ongoing collaborations and created the Neyagada Wabandangaki Guardian Program that supports a regular AOPFN monitoring presence at designated AECL sites, among other environmental, cultural and economic protection and promotion activities and programs.

Chalk River's Canadian and global partnerships support Canada's leading role in nuclear

CNL creates an environment that fosters collaboration between government, academia, and industry, both domestically and internationally. This effort is exemplified by collaborative research partnerships with national laboratories, national and international research institutions, industry partners, and Canadian federal departments and agencies, spanning several countries around the world. These contribute to Canada's global recognition in the nuclear field. At a time when many countries are looking to grow their nuclear generation, this role is important for Canada's continued growth and its influence is felt both domestically and abroad.

CNL's Global Collaboration Network[36]



Note: Number of organizations with which CNL has co-authored a publication with in each region

Key international partners:

- **Generation IV International Forum (GIF):** An international cooperative initiative established in 2001 to advance the research and development of next-generation nuclear energy systems.
- **International Atomic Energy Agency (IAEA):** An intergovernmental organization founded in 1957 to promote the peaceful use of nuclear energy and prevent its use for military purposes, including nuclear weapons. It serves as a global forum for scientific and technical cooperation in the nuclear field, providing international safeguards, promoting nuclear safety and security, and supporting the development of nuclear technology for peaceful applications.
- **Nuclear Energy Agency (NEA):** A specialized agency within the Organization for Economic Co-operation and Development (OECD), created in 1958 to assist its member countries in developing the scientific, technological, and legal bases for the safe, environmentally friendly, and economical use of nuclear energy.

Within Canada and internationally, CNL regularly convenes vested parties to collaborate on addressing leading issues in nuclear-related technologies such as opportunities for advancing new reactor designs, decommissioning, and cyber security. Initiatives include research, talent development, and development and sharing of standards and practices.

In the 2023-2024 fiscal year, research conducted at the Chalk River Laboratories led to **85 publications** with an additional **48 submitted and/or under external review** before being published.

CNL is partnering with universities and growing the talent pipeline, actively engaging with the Canadian academic community, and has developed strategic partnerships with Canadian universities. These partnerships benefit universities as they provide university researchers with access to highly specialized and unique infrastructure and facilities. They also benefit AECL, CNL, and other nuclear employers by supporting the development of highly qualified talent.

36

In the long term, CNL's role in developing an engaged and skilled talent pipeline **helps Canada to maintain its nuclear research and innovation advantage**, providing the workforce to meet the demands of an increasingly vibrant domestic nuclear sector.

To date, CNL has signed Memorandum of Understandings (MoU) with nine universities in Canada, more details can be found on these partnerships in Appendix 5.

While each of these partnership agreements has different focuses depending on the research strengths of the specific universities, they broadly target talent development and collaborative research to advance innovation. Parties interviewed in support of this study noted that these partnerships go far beyond a co-op or similar program and are truly "next level" involving speaking engagements, scholarships, as well as research-focused collaboration for students. Through these agreements, students can complete project-based work with CNL scientists, thereby supporting the development of nuclear talent and building a talent pipeline for the future of the nuclear industry across the country.

These partnerships also increase the integration of academics at CNL, and as of 2023-2024, CNL employees included 25 adjunct professors and two post-docs. As Canada and many other countries look to significantly grow their generation capacity, the nuclear sector is expecting a shortage of workers, particularly in highly specialized roles. CNL's activities help address these shortages by raising awareness of careers in nuclear, and by providing opportunities to gain nuclear experience.

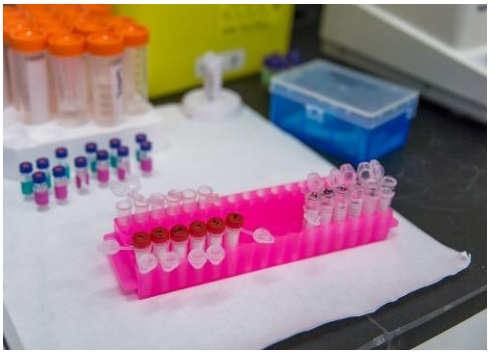
Chalk River Laboratories' work contributes to the health of Canadians through medical isotopes and radiation research

Medical isotope research

As discussed in Section 3.2, AECL was a key player in the research and development of radioisotopes for medical use. This research and development set the foundation for Canada's expertise in medical isotopes.

Today, more than 30% of all single-use medical devices produced globally are sterilized with Cobalt-60 while **more than 50% of the world's supply is produced at Canadian nuclear power plants**, and **more than 70% is processed in Canada.**[37]

To this day, isotopes are produced in Canada based on nuclear reactor technology originally developed by AECL. For example, AECL developed technology for the production of Cobalt-60 in CANDU reactors. Cobalt-60 is currently made in adjuster rods at Bruce Power, Pickering, and recently Darlington. In addition, Bruce Power and Ontario Power Generation have begun producing short-lived isotopes including Lutetium-177 and Molybdenum-99. This is made possible by the nature of the CANDU® design, and marks a significant achievement as the first power reactor to co-produce life-saving medical radioisotopes[38].



Since the inception of the NRU in 1957, AECL has produced enough isotopes to complete

more than

1 billion

cancer treatments and scans around the world.

Globally, there are more than 36 million diagnostic procedures that use isotopes, and more than four million radiation therapy procedures using isotopes[39]. In Canada specifically, it is estimated that there are around 760,000 diagnostic procedures and 76,000 radiation therapy procedures occurring each year, highlighting the impact and legacy of AECL's historical efforts in advancing research in nuclear medicine.

37 OPG website, *Darlington Nuclear's newly refurbished Unit 1 now producing life-saving Cobalt-60 isotopes*.

38 CNL website, *Over 75 years of industry leadership in radioisotope development and production*.

39 Canadian Nuclear Association, *Medical Isotopes*

Case Study: Actineer™ Inc. – a Joint Venture to unlock the potential of Actinium-225

Building on AECL's historical efforts to advance nuclear medicine and produce radioisotopes CNL is now driving the research, development, and supply of next-generation medical isotopes and radiopharmaceuticals. This includes Actinium-225, a highly rare isotope with significant potential for pioneering new cancer therapies. Actinium-225 is specifically in short supply as there are only a few generators globally that produce the isotope in large enough quantities to conduct research, one of them being at the Chalk River Laboratories. This positions CNL strongly to cement a position as one of the few organizations worldwide with a reliable supply of Actinium-225 for global markets.

International and domestic research partnerships will be instrumental in increasing the production of Actinium-225 to further support its use in clinical trials. One of the benefits of the GoCo model is allowing CNL to operate as a private-sector organization, enabling them to create new business models and investment vehicles, including the formation of joint ventures to advance commercialization.

To advance commercialization of Actinium-225, CNL has formed Actineer™ Inc., a joint venture with a German radiopharmaceutical biotech company Isotope Technologies Munich (ITM) to expand production capacity and research on Actinium-225 and its use as a medical isotope. Actineer has since formed partnerships with ecosystem players such as the University of Saskatchewan, the Fedoruk Centre for Nuclear Innovation in Saskatchewan, and Advanced Cyclotron Systems.

Low-dose radiation research

Research conducted at Chalk River Laboratories advances understanding of the effects of exposure to ionizing radiation (radiation that can change the structure of atoms and molecules, and as a result can potentially damage living cells) on the health of Canadians. This research helps with understanding and communicating the risks of low dose radiation that exist in our environment to the public and stakeholders and contributes to the body of evidence that informs the international radiation protection frameworks (such as the United Nations Scientific Committee on the Effects of Atomic Radiation, International Commission on Radiological Protection, and International Atomic Energy Agency).

Case Study: Community Support and Engagement

Chalk River Laboratories-based programming helps raise awareness about nuclear and STEM subjects among young people. For example, Science Summer Camp, an annual two-week science camp that provides hands-on scientific learning experiences for students aged 9-12. These camps are made possible through partnerships with the Towns of Petawawa and Deep River as well as the CNL researchers that invest their time. The focus of these camps is on real-world applied science, providing insights into the research CNL does and how it contributes to Canada, while inspiring the next generation of nuclear scientists and engineers.

20 **school tours** for high school science classes

15 **student engagements** at the Chalk River Laboratories, including in-class presentations

Girl Guides & Scouts Canada
Merit-badge programs

Supported Team Canada at the FIRST Global Robotics Challenge in Singapore in 2023[40]

CNL invests directly in local communities.
In 2023-2024 they invested almost
$500,000
to support local causes.

In addition to CNL's activities supporting economic and social development, direct community investments in 2023 totaled $185,000 in donations from CNL's annual Community Crowdfunding campaign[41], reaching more than $500,000 between 2021-2023 on a cumulative basis. This campaign uses money provided by the Canadian National Energy Alliance (CNEA) and is directed by employee ideas on how and where to invest it. The 2023 campaign resulted in 79 ideas generated by CNL employees, of which 41 charities and organizations were chosen to receive funds. These charities and organizations include local food banks, youth organizations and community centres, violence prevention centres, sports clubs, and many more.

CNL actively works to support local communities

In addition to CNL-led donations, CNL employees donated their own money to support their local communities, with staff across the Chalk River, Port Hope, and Whiteshell sites raising $85,000 through their annual United Way Campaign. This campaign aims to help local individuals and families struggling with mental health challenges, poverty, and homelessness, as well as provide support for youth within the communities. CNL employees organized and hosted their annual Black Bears hockey tournament, which in 2023 raised a record-breaking $67,000. These funds were then donated to local hospital foundations in Deep River and Pembroke, a fellow employee battling cancer, and the Robbie Dean Family Counselling Centre.[42]

CNL also works to support coordinated events like safety workshops, "ask a researcher" session for students, public information webinars, tree planting events, as well as the annual Christmas Tree harvest in which CNL hosts the local Deep River Scouts Canada to sustainably harvest trees for the Christmas season.

These donations and activities create stronger links between CNL and their local communities, fostering a stronger sense of community and contributing to improved quality of life. In addition, by hosting educational events, CNL works to build the talent pool for the nuclear as well as broader STEM industries and contributes to public knowledge surrounding nuclear safety.

40 CNL 2024 Sustainability Report

41 CNL website, *$185,000 donated to community causes through CNL's annual crowdfunding campaign*.

42 CNL 2024 Sustainability Report

6. Port Hope Area Initiative (PHAI)

6.1 Description of site and region

The PHAI refers to both the Port Granby Project and the Port Hope Project, which aims to safely relocate and manage approximately 2.1 million cubic meters of historic low-level radioactive waste and contaminated soils in the municipalities of Port Hope and Clarington, Ontario. It is part of CNL's broader environmental remediation and waste management mandate, aiming to reduce risk and liability for AECL and the Government of Canada

Port Hope's nuclear history began in the 1930s when the Crown corporation Eldorado Resources (later merged with the Saskatchewan Mining Development Corporation and renamed as the Cameco Corporation in 1988) began mining uranium and radium in the Northwest Territories and built a refinery to process them in Port Hope, Ontario. The PHAI represents the federal government's response to the community-requested solution for the cleanup and local, long-term, safe management of historic low-level radioactive waste. This initiative has significant direct local benefits through remediating sites to restore natural areas and enable residential and commercial uses.

Port Hope, Ontario is a small municipality with a population of 17,300 as of the 2021 Census, showing modest growth of 3.2% since 2016. The community has an older demographic profile, with a median age of 50.8 years and 28% of residents aged 65 and over. Economically, Port Hope had a median after-tax income of $38,400 for individuals aged 15 and over. The employment rate was 53.6%, with an unemployment rate of 6.6%. The prevalence of low income was 10.2%, slightly below the provincial average, indicating relatively stable economic conditions[43].

CNL built the Port Granby Long-Term Waste Management Facility (LTWMF) near the former site to transfer radioactive waste and marginally contaminated soil. The Port Granby project is now in Phase 3, which involves long-term monitoring of the site. CNL is also responsible for cleaning up non-radioactive industrial waste in Port Hope, transporting it to the Port Hope LTWMF and other licensed facilities. A similar above ground mound to that in Port Granby has been built in Port Hope, with large-scale remediations expected to be completed by the end of 2025.

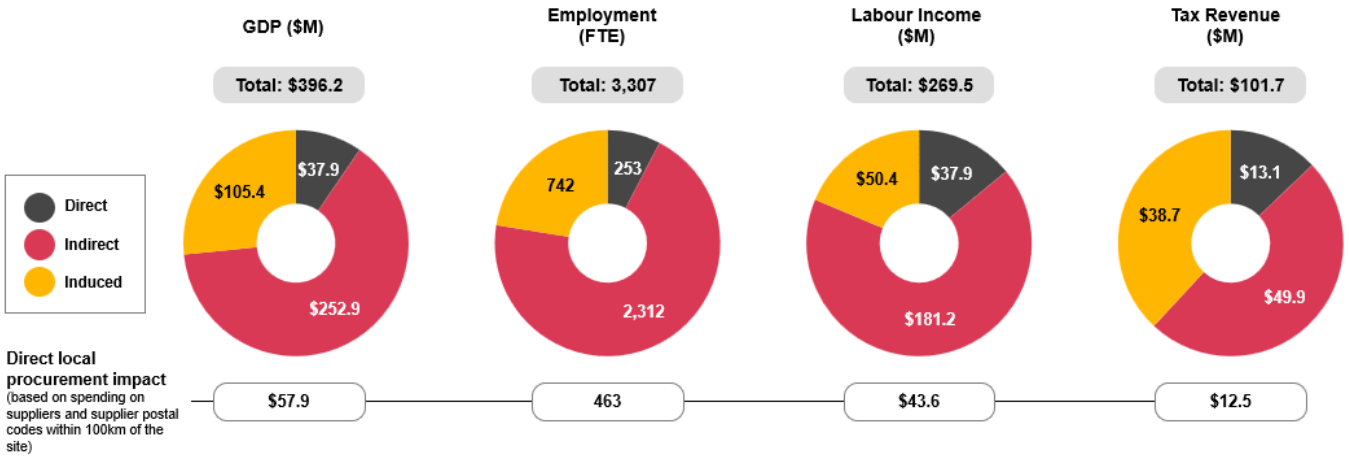
[43] Statistics Canada – 2021 Census

6.2 Economic impacts

In 2023-2024, the Port Hope Area Initiative contributed and facilitated approximately $396 million to national GDP, contributed to the employment of 3,307 jobs, and generated and facilitated approximately $270 million in labour income and approximately $102 million in tax revenues.

CNL's procurement spending on suppliers within 100 kilometers of the Port Hope Area Initiative was approximately $90.6 million. This generated $58 million in GDP, supported 463 jobs contributing $44 million of labour income, and generated more than $12 million in tax revenues.

Economic footprint of the Port Hope Area Initiative



6.3 Social impacts

Following PHAI activities, public trust in ability to manage waste is growing

The Port Hope Area Initiative has significant social and environmental benefits. The Long-Term Waste Management Facility continues to receive waste and contaminated soils from sites being remediated, totalling 1,419,661 metric tonnes of waste received by the end of 2022. Throughout the duration of this project, CNL's approach has instilled confidence within the local population in their ability to safely manage the waste. This is reflected in a 2022 survey, which was conducted among residents of the Port Granby area and found that 71% of residents were confident that CNL could safely manage the low-level radioactive waste at the LTWMF. This marked a significant increase from when the survey was issued in 2014, when only 44% of respondents responded positively.[44] This improvement in public confidence and trust is a testament to both AECL's and CNL's efforts, and will continue to improve the perception of the nuclear industry.

PHAI's activities return land to assets of community value

As a part of the PHAI and AECL's mandates, CNL has tested almost 5,000 private, residential properties in Port Hope for the presence or absence of radioactive materials. The primary benefit to private property owners/residents is either the confirmation, through testing, that their property does not contain historic low-level radioactive waste or, if waste is identified on a property, CNL remediates the property at no cost to the property owner. In addition, if CNL must remove any part of a house to complete the remediation, it will be replaced once the remediation work is completed. As many of the homes are older, these efforts often involve bringing the buildings up to current building codes.

CNL is also working to remediate a number of public and municipally owned properties in Port Hope and has almost remediated all impacted public lands. The primary benefit of this project is that once the waste is removed and the land remediated, it increases the ability to use the land in a productive way, such as building parks,

44 Port Hope Area Initiative, *Port Granby Project News, Winter 2023*.

building homes, creating new commercial areas, etc. This work will also improve usability of the waterfront, as CNL plans to complete infrastructure projects once the PHAI is completed, including upgrades to existing infrastructure, repairing roadways, and repairing waterfront piers.

CNL's work generates community value through several channels: remediation of the property (including upgrades and modernization), and the addition of new park land and public infrastructure. CNL operates on a like-for-like basis, which means that if CNL must remove any part of a property to complete the remediation, it will be replaced once the remediation work is completed.

PHAI benefits local communities through project spending and by creating natural spaces

The PHAI has also had a positive economic impact on the local community through employment and general spending. CNL has almost 300 employees working in Port Hope, as well as prime contractors that hire close to 500 people in the community. CNL has also directly supported the downtown hub of Port Hope. During the Walton Street Redevelopment program to offset business losses from such a development, CNL launched the Shops Downtown program. According to stakeholder interviews, this is estimated to have resulted in $50,000 of staff spending in the downtown core.

The PHAI has significant environmental benefits. Looking specifically at the completed Port Granby project, since completion of the project, there has been almost 60,000 trees planted on and around the new green space.

According to EcoTree, a tree absorbs, on average, between 10 and 40 kg of CO_2 per year, suggesting the new Port Granby green space has the **potential to absorb between 600,000 and 2.4 million kg of CO_2 per year.**

Based on interviews with vested parties, many see the remediation work as leaving an honourable legacy around Port Hope, and being something for all staff members to take pride in as it has made a tremendous difference for these towns.

PHAI carries out remediation in partnership with Indigenous nations and local communities

CNL is highly involved in supporting and engaging with the local communities in which they operate. This engagement ranges from sustainable procurement from local companies, to land-use consultation with local stakeholders and Indigenous nations, communities, and organizations, to education initiatives, and facility tours. These have a positive benefit on local communities, including economic benefits from procurement and investment, and social benefits from increased public education, trust, and community cohesion. CNL and AECL are also committed to working and collaborating with Indigenous nations on environmental initiatives as well as for land-use planning and consultation. As a part of the recently launched CNL Land Use Program, all future sites that are conducting decommissioning, demolition, and environmental remediation work will be required to follow the consistent approach set out in this program. This places a focus on early and meaningful Indigenous and public engagement to ensure that CNL has achievable and relevant plans for future land-use.

The work being done in Port Granby was nominated for the 2024 Brownie Award, which is an award that "recognizes the innovative efforts of professionals who rehabilitate sites that were once contaminated, under-utilized, and undeveloped by remaking them into productive residential and commercial projects that contribute to the growth of healthy communities across Canada".[45] This highlights the positive impact of CNL's work on the municipalities of Port Hope and Clarington.

Furthermore, AECL is collaborating with the communities of Clarington and Port Hope, as well as the Michi Saagiig Anishinaabeg, which includes the Mississaugas of Scugog Island First Nation, Curve Lake First Nation, Hiawatha First Nation and Alderville First Nation, for the purposes of creating a nature reserve along the shore of Lake Ontario.[46]

While we have provided qualitative estimates as to potential social, environmental and health benefits of the project, we are confident that these will continue to be felt by the community going forward. Upon the successful completion of the remediation project, Port Hope is poised to experience a significant transformation. Enhancing the quality of the environment and increasing community confidence is expected to attract substantial business investment and foster economic and social development over the long term.

Case Study: Port Hope Waterfront Revitalization

CNL has been actively engaged in a series of major remediation projects along the Port Hope waterfront, paving the way for transformative community development and environmental restoration. These efforts are integral to enabling the Municipality of Port Hope to move forward with its long-term Waterfront Master Plan.

One of the most significant achievements is the remediation of the Chemetron Lagoon, a former industrial site that was previously fenced off and inaccessible to the public. With cleanup now complete and the Record of Site Condition pending, this area is set to be transformed into a vibrant public space. Plans include new recreational and natural features such as walkways connecting to the Sculthorpe Marsh, a designated natural heritage site, along with a scenic lookout, picnic areas, and a new parking lot. This redevelopment will enhance connectivity to the larger river walk and east beach, creating a seamless and inviting waterfront experience.

The West Beach has also undergone substantial remediation, including environmental rehabilitation and the addition of new recreational amenities like a playground and parking area. Importantly, the restoration of trout habitat creeks is being carried out in consultation with Indigenous rights holders, specifically the Williams Treaties First Nations, with Indigenous firms leading this aspect of the work – highlighting a commitment to reconciliation and local economic inclusion.

At the heart of the waterfront is the Centre Pier, once home to contaminated factory buildings and closed to the public, is being remediated and prepared for return to the municipality. This prime piece of real estate will soon offer a clean slate for a variety of future uses, including passive recreation, fishing, festivals, and potential business development. Community consultations are ongoing to shape its long-term vision.

Additionally, the Port Hope Harbour has seen critical infrastructure improvements, including the rebuilding and stabilization of its walls. This work not only ensures safety but also delivers significant financial benefits to the municipality. The harbour has been remediated down to bedrock, a milestone that supports the removal of its Beneficial Use Impairment (BUI) designation. Once approved by the Ministry, this will lift restrictions on use and development, marking a major environmental and regulatory achievement for the town.

Beyond environmental and recreational gains, these projects have also generated economic benefits, creating jobs and business opportunities for local and regional subcontractors and suppliers. Together, CNL's remediation efforts are laying the foundation for a cleaner, more accessible, and economically vibrant Port Hope waterfront.

[46] AECL 2023 Environmental, Social and Governance Report

7. Whiteshell Laboratories

7.1 Description of site and region

Whiteshell Laboratories, located in Pinawa, Manitoba, is the second largest of AECL's sites operated by CNL. Pinawa as a town was originally established in 1906 to support Manitoba's first year-round hydroelectric generating station. After closure of this site in 1951, the town was abandoned and redeveloped in a new location as a planned community to house employees of AECL to work at the Whiteshell Laboratories. The Laboratories were then established in 1963 as a research laboratory and operated for 35 years before a decision was made to shut down the site in 1998.[47] The laboratory's early work focused on the development of Whiteshell Reactor No. 1 (WR-1) to test the concept of utilizing an organic coolant in place of a more traditional heavy water design. The Whiteshell Laboratories are currently undergoing decommissioning to reduce risk and liability for the Government of Canada.

CNL has been able to accelerate the decommissioning activities taking place and is aiming to complete site closure by the mid-2030s, nearly 30 years ahead of schedule, leading to lower annual costs and liabilities for the federal government. This improved schedule has, in part, been a result of CNL's proposed innovative approach to decommission the WR-1 reactor *in situ*. *In situ* decommissioning involves immobilizing the reactor in place, and containing radiological sources and hazardous materials for a defined period. Ongoing activities include the removal and management of radioactive materials using remote tooling and robotics, structure demolition, environmental restoration and monitoring, and the shipment of spent fuel to Chalk River for temporary storage prior to final disposal in a future deep geological repository.

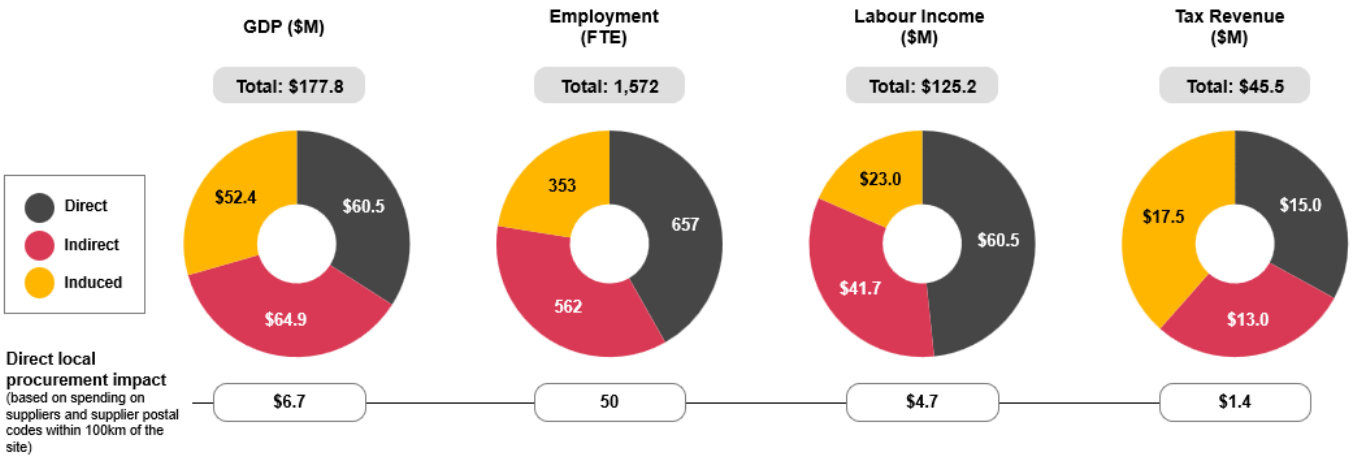
[47] AECL 2024 Annual Report

7.2 Economic impacts

In 2023-2024, the Whiteshell Laboratories contributed and facilitated approximately $178 million to national GDP, contributed to the employment of 1,572 jobs, and generated and facilitated approximately $125 million in labour income and approximately $46 million in tax revenues.

CNL's procurement spending on suppliers within 100km of the Whiteshell Laboratories was approximately $10.3 million. This generated $6.7 million in GDP, supported 50 jobs contributing almost $5 million of labour income, and generated over $1 million in tax revenues.

Economic footprint of Whiteshell Laboratories



7.3 Social impacts

The ongoing decommissioning of the Whiteshell Laboratories has additional downstream social and environmental benefits. A key part of the project is ensuring collaboration with municipalities, Indigenous nations, communities, and organizations, and other stakeholders. This process highlights a broadened understanding of municipal and Indigenous perspectives through collaborative capacity-building initiatives, traditional knowledge studies, and community participation in site-monitoring activities.

For example, as a part of the Whiteshell decommissioning activities, the Sagkeeng Anicinabe Nation, with financial support from AECL, CNL, and the federal government's First Nations Guardians Initiative, has developed the Niigan Aki Guardian Program to enable community-led monitoring in Sagkeeng's traditional territory. A key focus of this program is to carry-out a collaborative long-term environmental monitoring program for Whiteshell Laboratories.[48] This partnership will involve monitoring priority areas through traditional knowledge, as well as completing data collection and analysis on environmental outcomes.

Public consultation on future land-use of the Whiteshell site has already begun. CNL is working with the local community, First Nations, and Red River Métis to develop future land-use plans and identify opportunities to achieve shared goals following the closure of the remediation project.

The previous work done at Whiteshell, as well as the existing decommissioning activities, continue to contribute knowledge and understanding, as well as empirical data, as to how to ensure the responsible management of legacy nuclear materials and facilities. Having a greater understanding of this serves to continue to protect our environment, and supports the Canadian contribution to the responsible management of nuclear materials globally.

[48] Sagkeeng Anicinabe Government, Guardian (Niigan Aki Guardians Program)

Case Study: Legacy of AECL and CNL activities in Pinawa

Pinawa was redeveloped as a planned community to house employees of AECL working at Whiteshell Laboratories. As the original owner of the redeveloped town, AECL funded significant infrastructure that continues to benefit Pinawa today, including much of the housing, and a staff hotel that is now the Wilderness Edge Retreat and Conference Center in Pinawa.[49] This center has capacity for 400 guests as well as seven meeting spaces to host events[50] which in turn will generate additional economic activity. Other town infrastructure originally built by AECL includes a school, hospital, shopping mall, gas station, and marina, all of which continued to benefit the town of Pinawa after it was designated a Local Government District and ownership was transferred from AECL.

In the present day, CNL continues to provide funding to support economic development through their support for North Forge East (NFE) Technology Exchange (rebranded in 2024 as Innovation Eastman), a local non-profit organization and innovation-based economic development agency. CNEA (the consortium that manages and operates CNL) provides annual grants of $80,000 to this agency and has done so since 2016 when the agency was founded to help support local entrepreneurs to stimulate the local economy during the decommissioning of the Whiteshell Laboratories.[51] The goal of this effort is to support the local economy as it transitions toward self-sufficiency once the Whiteshell Laboratories reaches closure. Innovation Eastman has partnered with Wiitahnookiinitaw Tahshkayzing Entrepreneurship Centre, Canada's novel First Nation-led Indigenous entrepreneur centre, established by Treaty One Nation[52]

In 2021, the Mayor of the Local Government District of Pinawa noted that "CNEA's funding has enabled the NFE team to exceed our forecast for attracting entrepreneurs and encouraging people to move to Pinawa to start their businesses."

49 Pinawa Arts and Culture – Pinawa's History
50 Wilderness Edge Retreat and Conference Center website
51 CNL – CNEA donates $240,000 to North Forge East
52 Bringing Spirit into Business through the 1st First Nations-Led Entrepreneurship Centre and Business Incubator in Canada - Treaty One - https://treaty1.ca/wtec-opening-2025/

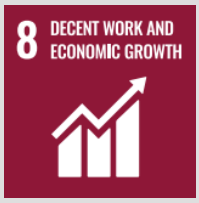
8. Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are a collection of 17 global objectives established by all UN member states in 2015 as part of the 2030 Agenda for Sustainable Development. These goals aim to tackle a variety of worldwide issues, such as poverty, inequality, climate change, environmental degradation, peace, and justice. The SDGs serve as a shared framework for achieving peace and prosperity for people and the planet, both now and in the future. They highlight the interconnected nature of social, economic, and environmental sustainability and call for immediate action by all countries through a global partnership.

In discussions with AECL and CNL, we have identified nine SDGs that the use of nuclear science and technology directly contribute to. These SDGs, as well as their link to AECL and CNL's operations, are listed below[53].

UN SDG	Description
#3 – Good health and well-being 	Radioisotopes are commonly used in medicine, particularly to fight cancer and to diagnose diseases. Historically **AECL was a key global player in the research and development of radioisotopes**, including the production of several isotopes in the National Research Experimental and National Research Universal reactors. For more information please refer to Section 3.2 on the history of AECL. Today, radioisotopes are still produced in Canadian nuclear reactors leveraging **technology originally developed by AECL**. CNL continues to conduct research on isotope development on the **next generation of isotopes through their joint venture with Actineer™ Inc.** (Section 5.3 and the Actineer Case Study). This research and the work being done with Actineer has the potential to improve health outcomes for Canadians, as well as cancer patients globally. CNL also conducts research to **expand the knowledge base and understanding of the impacts of low-dose radiation** on the health of humans. This supports public sector decision-making in terms of acceptable levels of radiation and ways to mitigate radiation exposure.
#7 – Affordable and clean energy 	Historically, AECL's research and development has had significant impacts on the supply of affordable and clean energy through the development of the CANDU® reactor model. Currently, **60% of Ontario's and 15% of Canada's energy is generated by nuclear reactors** based on AECL's IP. The CANDU® IP is also exported, with more than 30 CANDU® or CANDU®-derivative reactors installed globally, meaning **AECL's IP is supporting the availability of affordable and clean energy in several countries around the world**. Today, **CNL provides continued support to the CANDU® fleet**, contributing to the safe and reliable operations of the CANDU® reactors around the world while continuing to conduct research to improve operational efficiency and safety. **CNL is also supporting the development of the next generation of CANDU® MONARK reactors.** CNL is actively involved in the development and demonstration of **Small Modular Reactors (SMR), which can offer scalable, low-carbon energy solutions, notably for remote areas**, as well as research into related low carbon technology sectors, such as hydrogen, further supporting decarbonization.

[53] Note this report does not constitute an official assessment of sustainable development goals. The identification of these goals was based on AECL's 2024 ESG-I Report and CNL's 2025 Sustainability Report

UN SDG	Description
#8 – Decent work and economic growth 	Through their operations and partnerships, **CNL directly employs almost 4,000 Full Time Employees including high-quality jobs in science, engineering, and skilled trades,** and **contributed almost $1.7 billion to GDP** across direct, indirect, and induced impacts. More specifically, their activities **stimulate regional economies**, particularly in communities near the Chalk River Laboratories within the Country of Renfrew, and **contribute to Canada's innovation economy** through the research and development conducted as part of the Federal Nuclear Science and Technology Work Plan, for commercial industry, or as part of internally funded programs. For more information please refer to Section 5 on Chalk River Laboratories. CNL also invests in training programs, internships, and co-op placements in partnership with Canadian universities and colleges, helping to **develop the next generation of nuclear scientists**, engineers, and technicians. These programs not only provide students with hands-on experience but also help address the aging workforce challenge in the nuclear sector. In addition, AECL and CNL **promote inclusive and equitable employment practices**. They are working to increase diversity in their workforce, including initiatives to support the participation of women, Indigenous peoples, and other underrepresented groups in STEM fields.
#9 – Industry, innovation and infrastructure 	One of the most significant contributions is the **ongoing revitalization of the Chalk River Laboratories**. This multi-billion-dollar investment, includes the construction of modern laboratories, research facilities, and support buildings**. These upgrades are designed to meet the highest standards of safety, sustainability, and scientific capability**, supporting Canada's ability to remain at the forefront of nuclear innovation. For more information on the sustainability-focused infrastructure improvements, please refer to Section 4.3 on CNL's infrastructure mission. In terms of innovation, **CNL is involved in a broad range of research and development activities to support the federal government's priorities as well as the needs of business** (see Section 4.2 as well as Section 5.3). For example, CNL is actively researching and seeking to reduce the barriers to the deployment of SMRs and other advanced reactor technologies, in addition to the next generation of CANDU®. **These innovations will support both economic development and environmental goals through decarbonization**. CNL's work in fusion, hydrogen production, and materials science, among other research topics, further contributes to innovation in the nuclear sector.
#12 – Responsible consumption and production 	CNL is committed to ensuring their operations reflect the principles of responsible consumption and production. Notably, CNL is responsible for the **safe handling, storage, and disposal of radioactive waste** generated from decades of nuclear research and operations in Canada. This includes **legacy waste from historical activities as well as waste from ongoing research**, including small quantities from external organizations such as universities and hospitals that conduct nuclear research. CNL also leads several **decommissioning and environmental remediation projects** as discussed throughout this report, including at Chalk River Laboratories, Whiteshell Laboratories and the Port Hope Area Initiative (for more information on these sites please refer to the respective sections). These projects are designed to responsibly dismantle outdated nuclear facilities, clean up contaminated lands, and restore ecosystems. The **goal is to return these sites to safe, sustainable conditions for future generations in collaboration with local and Indigenous communities.** Also, as discussed in SDG #9, the ongoing revitalization of the Chalk River Laboratories is being carried out with an emphasis on sustainability.

UN SDG	Description
#13 – Climate action 	AECL and CNL are actively contributing to Canada's climate change mitigation and adaptation efforts by **advancing clean nuclear technologies and integrating climate resilience into their operations**. Their work supports the transition to a low-carbon economy and helps Canada meet its national and international climate commitments while strengthening Canada's energy security. As discussed in SDG #7, a major pillar of their climate action efforts is the **continued support to, and modernization of, CANDU® reactor technology**. In parallel, **CNL is investing in nuclear fusion research, which holds the promise of virtually limitless, clean energy**. Through its Advanced Nuclear Materials Research Centre (ANMRC), currently under construction at Chalk River Laboratories, CNL is developing the infrastructure and scientific capabilities needed to support next-generation nuclear technologies, which will contribute to **significant impacts in advancing decarbonization goals.**
#15 – Life on land 	AECL and CNL are committed to protecting terrestrial ecosystems, restoring degraded environments, and promoting sustainable land use practices. CNL is **undertaking large-scale cleanup projects to safely manage historic radioactive waste and return lands to a condition that supports healthy ecosystems and future use.** These projects involve extensive environmental assessments, habitat restoration, and long-term monitoring to ensure that remediation efforts are effective and sustainable. CNL conducts **extensive environmental monitoring programs** at all its sites, tracking air, water, soil, and biodiversity indicators to ensure that operations do not negatively impact surrounding ecosystems. These programs are publicly reported and used to inform adaptive management strategies that protect life on land. In addition, CNL **conducts research to better understand how radiation and radioactive isotopes interact with the environment.**
#16 – Peace, justice and strong Institutions 	AECL seeks to promote peaceful and inclusive societies through many channels. With respect to promoting inclusivity, AECL has a **diverse Board of Directors that supervises the execution of AECL's mandate**. The Board represents several professions as well as areas of diversity including female representation, visible minorities, and Indigenous representation. AECL and CNL advance peaceful societies through CNL's threat reduction **research on detecting and assessing Special Nuclear Material**, working with the Canadian Border Services Agency to detect nuclear materials that could otherwise be used to do harm. This includes testing to evaluate and refine the accuracy and precision of their detection techniques. CNL also conducts **research to contribute to the field of nuclear forensics**, working with international organizations to test responses to the discovery of illicit radioactive sources. Finally, through CNL's National Innovation Center for Cybersecurity in New Brunswick, CNL is conducting **research and development on methodologies to monitor, detect, and mitigate the risk and impact of cyber-intrusions and cyber security events,** and delivers training programs to the Canadian nuclear industry. This work overall strives to improve peace and justice while combatting violence, terrorism, and crime.
#17 – Partnerships for the goals 	CNL's collaborative approach spans local, national, and international levels, bringing together governments, Indigenous communities, academia, industry, and global institutions. At the national level, **CNL works closely with federal and provincial governments to align their research and infrastructure investments with Canada's climate, energy, and innovation goals.** This includes supporting the federal government's SMR Action Plan and contributing to Canada's net-zero strategy through clean nuclear energy development. A **key area of partnership is with Indigenous nations**, where CNL and AECL support initiatives such as the community-led Guardian Programs to help integrate traditional knowledge and community leadership into environmental stewardship and land restoration efforts. In the academic and research sectors, **CNL collaborates with Canadian universities and research institutions to advance nuclear science, materials research, and clean energy technologies**. These partnerships foster innovation, support student training, and accelerate the development of next-generation nuclear solutions, including SMRs, hydrogen production, and fusion research.

UN SDG	Description
#17 – Partnerships for the goals (continued)	CNL has a global collaboration network including 132 partners in North America, 162 partners in Europe, 61 in Asia, 6 in the Middle East, and 5 in South America. **These collaborations focus on knowledge exchange, best practices in decommissioning and waste management, and joint research initiatives that enhance global nuclear safety and sustainability.** **CNL also partners with private sector companies to support the commercialization of nuclear technologies and the development of a robust Canadian nuclear supply chain.** These partnerships help bring innovative solutions to market and ensure that Canada remains competitive in the global clean energy economy. For more information on partnerships, please refer to the Section 5.3, Chalk River social impacts, sub-section entitled CNL's Global Collaboration Network.

Appendix 1: Assumptions and Limitations

The conclusions expressed and information presented in this report rely on the following major assumptions:

- Completeness, reliability, and accuracy of data provided by AECL and CNL, including data on operational expenditures, procurement expenditures, and socioeconomic impacts.
- Reliability and accuracy of external sources used in this report.
- The 2019 Statistics Canada Supply-Use Tables and the Statistics Canada Interprovincial Input-Output (IO) Model constitute a reasonable representation of the underlying relationships in the economy during the relevant periods modelled in the report.

We note that significant deviations from the above-listed major assumptions may result in a significant change to our analysis.

Data limitations: PwC has relied on the information provided by AECL and CNL, including data on capital and operating expenditures, procurement and other socioeconomic factors. PwC has relied upon the completeness, accuracy, and fair presentation of all information and data obtained from AECL and CNL data sources, which were not audited or otherwise verified. The findings in this report are conditional upon such completeness, accuracy, and fair presentation, which have not been verified independently by PwC. Accordingly, we provide no opinion, attestation or other form of assurance with respect to the results of this Assessment.

Use limitations: This report has been prepared solely for the use and benefit of, and pursuant to a client relationship exclusively with, AECL. You may share our report with third parties, provided it is issued in its entirety. If you wish to create derivative work or quote report findings, you must provide a link to the full report. PwC accepts no duty of care, obligation or liability, if any, suffered by any third party that reads our deliverable, any excerpts from our deliverable or statements describing our deliverable. Further, no person or entity, other than AECL, shall place any reliance upon the accuracy or completeness of the statements made in our deliverable. In no event, shall PwC have any liability for damages, costs or losses suffered by reason of any reliance upon the contents of this deliverable by any person or entity other than AECL.

Receipt of new data or facts: PwC reserves the right at its discretion to withdraw or make revisions to this report should we receive additional data or be made aware of facts existing at the date of the report that were not known to us when we prepared this report. The findings are as of June 2025, and PwC is under no obligation to advise any person of any change or matter brought to its attention after such date, which would affect our findings.

Appendix 2: Social impact summary

In delivering on their missions, AECL and CNL are focused on developing nuclear technology for peaceful and innovative applications, making a considerable contribution to Canada's status as a Tier 1 responsible nuclear nation. As a result, in addition to the economic impacts generated by spending, we identified, through interviews and secondary research, how activities undertaken at their sites deliver social impact across six broad themes:

- **Improving the health of Canadians:** Enabling diagnostics and cancer treatments through research on medical isotopes, conducting research to understand the impact of exposure to ionizing radiation on the health of Canadians and improving regulation surrounding radiation exposure.
- **Tackling climate change:** Supporting the existing fleet and advancing research, development and commercialization of nuclear technology and related clean energy technology sectors, such as fusion, to facilitate decarbonization of energy production in Canada.
- **Threat Reduction:** Developing innovative approaches in detecting radiation, promoting non-proliferation, supporting emergency preparedness, and enhancing physical and cyber security.
- **Protecting the environment:** Developing and applying leading practices in decommissioning, responsible waste management, environmental remediation, and safety.
- **Growing the nuclear talent pipeline:** Promoting nuclear careers through outreach and employment opportunities, and enriching university curricular.
- **Enhancing trust:** Building relationships with local communities and rightsholders to increase trust and transparency and advancing reconciliation with Indigenous Nations and communities through partnership and collaboration.

AECL and CNL are focused on continuing to improve and innovate nuclear technology to increase the benefits it delivers. Historically, Canada's global leading role in nuclear has developed in large part due to the contributions of AECL and CNL. As such, Canada is helping encourage adoption of nuclear globally, driving creation of these benefits. Amid growing global interest in nuclear, AECL and CNL's activities help Canada maintain its leadership role. In addition to creating global benefits from adoption, this leading role creates economic value for Canada as a provider of reactor technology and goods and services in the nuclear supply chain.

Improving the health of Canadians

AECL has been a global leader and pioneer in nuclear medicine, driving both research and production of isotopes for use in medicine. This section focuses on AECL's efforts surrounding medical isotope research, as well as research on low-dose radiation and its impact on human health.

Medical isotopes are critical in healthcare, particularly in imaging and cancer treatments. In diagnostic imaging, they enable physicians to visualize and assess the function of organs and tissues through techniques such as SPECT and PET scans. These scans rely on these isotopes to produce detailed images of the body's internal structures, aiding in the early detection and diagnosis of various conditions. In cancer treatments, medical isotopes play a crucial role by directly targeting and destroying abnormal cells. This targeted approach minimizes damage to surrounding healthy tissues, making treatments more effective and reducing side effects.

Key activities/Statistics

- CNL is one of the only producers globally of Actinium-225, and increased its production by almost 25% between 2022-2023.
- Today, more than 30% of all single-use medical devices produced globally are sterilized with Cobalt-60 while more than 50% of the world's supply is produced at Canadian nuclear power plants, and more than 70% is processed in Canada.[20]
- Globally, there are more than 36 million diagnostic procedures that use isotopes, and more than four million radiation therapy procedures using isotopes[54].
- In Canada specifically, it is estimated that there are around 760,000 diagnostic procedures and 76,000 radiation therapy procedures occurring each year.

Tackling climate change

CNL has strong research and innovation expertise. In this section, we discuss some of the key themes of this research, as well as potential impacts that this research, innovation, and technological leadership will have on Canadians. The focus of this section is on AECL's domestic and international partnerships, their work on CANDU® reactors and its IP, their research to drive commercial revenues, as well as research on SMRs, MMRs, and ARs, nuclear fusion, and hydrogen.

Key activities/Statistics

- CNl's collaboration network spans 132 partner organizations in North America, 162 in Europe, 61 in Asia, 6 in the Middle East, 3 in Africa, and 5 in South America.
- In the 2023-2024 fiscal year, CNL published 85 publications with an additional 48 submitted and/or under external review before being published. They also submitted six invention disclosures, had five filed as provisional patents, and had four covered under completed patent filings.
- CNL, enabled by AECL, generated revenues from commercial science engagements that we have estimated to have generated $89 million in GDP across direct, indirect and induced impacts, created and/or sustained 795 jobs, and generated $58 million in labour income.
- Cutting-edge research on nascent topics such as nuclear fusion and hydrogen have significant potential for economic benefit. Constructing and operating domestic fusion powerplants and exporting fusion products and services is forecasted to generate more than 63,000 jobs in Canada and generate $520 billion of economic benefit by 2100, and the hydrogen market size is estimated to reach $2 trillion by 2050.

[54] Canadian Nuclear Association, *Medical Isotopes*

Threat reduction

AECL supports CNL in conducting research and development specifically on cyber security products and protocols to safeguard nuclear technologies. Recent innovations in this space have impressed international audiences, highlighting AECL's global leadership in nuclear cyber security.

Additionally, AECL works to advance non-proliferation and safeguards by developing new technologies and techniques to monitor and track nuclear materials and protect Canada's borders from people attempting to bring nuclear materials into the country. AECL is a member of the IAEA's Network of Analytical Laboratories (NWAL) which is a group of 202 laboratories from 90 countries. AECL contributes to the NWAL by providing specialized analytical services and supporting the IAEA's mission to safeguard nuclear materials and ensure the peaceful use of nuclear energy.

Key activities/Statistics

- In 2019, CNL hosted a week-long cyber security research event sponsored by the International Atomic Energy Agency (IAEA), bringing together sixteen participants from seven countries: South Korea, China, the US, Germany, Poland, Hungary, and Austria.
- CNL has been involved in national forums with partners including the CSE Canadian Centre for Cyber Security, NRCan, the NRC, Public Safety, DND, the CNSC, DRDC, the RCMP, Innovation, Science and Economic Development Canada, and Global Affairs Canada.
- CNL has commissioned a new radiation portal monitor (RPM) facility with the Canada Border Services Agency allowing for innovation, notably for new techniques including and technologies including active interrogation to identify and monitor nuclear materials.
- CNL's Safety and Security Directorate designed and built mock-up warheads to evaluate the accuracy and precision of active interrogation techniques for nuclear disarmament verification purposes
- An internal nuclear forensics (NF) exercise was carried out at CNL, the objective of the exercise was to challenge non-destructive characterization techniques, assess their readiness for application to nuclear forensics, and solicit feedback on two new procedures for nuclear forensics
- In 2018, CNL established the National Innovation Centre for Cyber Security (NIC) in Fredericton, New Brunswick.
  This cutting-edge facility is home to the Cyber Range, a multi-million-dollar distributed control systems testing platform.

More details on AECL's collaborations in cyber security and the National Innovation Centre for Cyber Security are available in Appendix 4.

Protecting the environment

A large portion of AECL and CNL's efforts focus on managing waste, remediating impacted land, and monitoring the environment to ensure continued safety. These activities help uphold and grow public trust of nuclear and reinforce nuclear's social license going forward. Notably, AECL and CNL's historical and ongoing activities further highlight that nuclear waste can be dealt with in a responsible and environmentally sustainable fashion. This in turn allows for greater adoption of nuclear technologies as an energy source, leading to greater decarbonization across Canada and the world.

Key activities/Statistics

- By 2021 the Port Granby Project had 1.3 million metric tonnes of total waste placed in the LTWMF and by the end of 2022, the Port Hope Project had received 1.4 million metric tonnes of waste.
- CNL has tested almost 5,000 properties in Port Hope for the presence of radioactive materials;.
- 60,000 trees have been planted in and around the Port Granby long term waste management facility, absorbing between 600,000 and 2.4 million kg of CO_2 per year.
- CNL has been able to accelerate the decommissioning activities taking place at Whiteshell, forecasting closure nearly 30 years ahead of schedule.
- AECL has supported the development of community-led Guardians programs with the Algonquins of Pikwàkanagàn First Nation in Ontario and the Sagkeeng Anicinabe Nation in Manitoba to enable long-term environmental monitoring in their respective traditional territory.

Developing nuclear talent

CNL's efforts on education and talent retention work to support talent development in the nuclear industry, building a talent pipeline for highly skilled nuclear professionals across Canada. These efforts range from academic partnerships, to upskilling programs, to programs focused on improving equity and diversity among employees and increasing Indigenous employment and collaboration.

Both globally and within Canada, a shortage of skilled labour is at risk of becoming a constraint to growth and development of the nuclear industry, making the work being carried out by CNL critical to the future success of Canada's nuclear industry.

Key activities/Statistics

- CNL has MoUs and partnerships with nine universities in Canada to support talent development, research collaboration, student co-op programs, scholarships, etc.
- Both CNL and AECL place an emphasis on equity, diversity, and inclusion. CNL has joined the Canadian Centre for Diversity and Inclusion as an employer partner, expanding access to diversity and inclusion knowledge and resources for its employees. Both are also involved with the Women in Nuclear organization, have joined the Equal by 30 Campaign, and are focused on engagement with Indigenous communities to advance reconciliation efforts.
- CNL hires summer students from university and high school, and does significant work on STEM education and school programming. They are involved in approximately 50 engagements a year with youth, as well as sending a STEM-related kids newsletter that gets sent to more than 70,000 homes a year.

Enhancing trust

In delivering its missions and creating the social impacts outlined above, AECL also generates economic value through employment and spending on suppliers, much of which happens in close proximity to its main sites. We calculated that in 2023-2024, AECL contributed and facilitated approximately $1.7 billion to national GDP, contributed to the employment of more than 12,000 individuals, and generated and facilitated approximately $1.2 billion in labour income and approximately $423 million in tax revenues across personal income and corporate income tax (PIT and CIT), and taxes on products and production (including PILT).

	GDP ($ millions)	Employment (FTE)	Labour income ($ millions)	Tax revenues ($ millions)
Direct	$505.6	3,798	$505.6	$111.8
Indirect	$664.6	5,709	$458.7	$134.2
Induced	$481.3	3,383	$229.2	$177.1
Total	**$1,651.4**	**12,890**	**$1,193.4**	**$423.1**

Key activities/Statistics

- In 2023-2024, AECL spent almost $135 million contributing approximately $115 million to local GDP in the communities within 100km around their sites and sustaining 1,224 jobs.
- In 2023-2024, AECL and CNL invested almost $300,000 to support local causes including $185,000 in donations from CNL's annual Community Crowdfunding campaign.
- Staff across the Chalk River, Port Hope, and Whiteshell sites raised $85,000 through their annual United Way Campaign, and a record-breaking $67,000 from their annual hockey tournament.

Direct economic benefits of local procurement

AECL strives to support the economic development of the communities in which they operate. A key way they do this is through their procurement practices, in which they place an emphasis on working with local suppliers. In 2023-2024, AECL spent almost $135 million on suppliers located within 100km of their sites, which has significant economic impacts on those local communities. The following table provides calculations from our economic modelling on the direct impact in terms of GDP and jobs as a result of the local procurement spending by AECL. These impacts are also presented in the economic modelling section of this report, as a subset of the site-specific impacts.

Site	GDP ($M)	Jobs (FTE)
Port Hope	$57.9	463
Chalk River	$20.8	167
Whiteshell	$6.7	50
Total	$85.4	680

Based on AECL's procurement spending on local companies, we calculate that they contributed approximately $85 million to local GDP in the communities within 100km around their sites and sustained 680 jobs.

In addition to the above economic impacts generated by AECL procurement spending, AECL also makes Payments in Lieu of Taxes (PILT) to the municipal governments. As a Crown corporation, AECL is exempt from property taxes; however, they contribute PILT as an alternative payment to municipal governments. In essence, these payments can be viewed as equivalent to municipal property taxes, and as such they support government initiatives.

Appendix 3: Project approach

1. Review of AECL planning documents and technical studies

Key documents (non-exhaustive) included:

- FY 2023-2024 Annual Program of Work and Budget
- Federal Nuclear Science and Technology (FNST) Work Plan
- FNST – Compendium of Advanced Reactors (AR), Small Modular Reactor (SMR), and Micro Modular Reactor (MMR) Research and Development
- FY2023 AECL/CNL spending data, by project and defined budget area
- 2023-2024 Indirect Cost Attribution Model
- 2023-2024 Supply chain procurement spending
- Various “highlights” documents summarizing the efforts, activities, and results of different AECL programs.

2. Research and secondary data collection

- AECL 2024 Annual Report
- CNL 2024 Sustainability Report
- AECL 2023 ESG and Climate Resilience Report
- CNL Vision 2030 Report
- Additional web research as required.

3. Primary data collection (interviews)

- Group 1: AECL Leadership
- Group 2: CNL – Human Resources
- Group 3: CNL/AECL – Science and Technology
- Group 4: Supply chain and sustainability
- Group 5: CNL – Corporate and Indigenous Affairs
- Group 6: CNL – Waste Management and Environmental Protection
- Group 7: Port Hope site
- Group 8: Whiteshell Site
- Additional ad-hoc interviews were also held to better understand the value of AECL's research, the Port Hope initiative, the Science and Technology program, among others.

4. Economic footprint modelling

- Our assessment of the economic footprint of AECL's operations included the direct, indirect, and induced impacts at the national level, as well as for the environmental remediation management, science and technology, and capital missions.
- Site-specific impacts were assessed for Chalk River Laboratories, Whiteshell Laboratory, and the Port Hope Area Initiative, and specific impacts were assessed for local spending based on procurement data provided by AECL.
- Our economic modelling provides estimates of impact across Gross Domestic Product (GDP), Full Time Equivalent (FTE) jobs, labour income, and tax revenues.

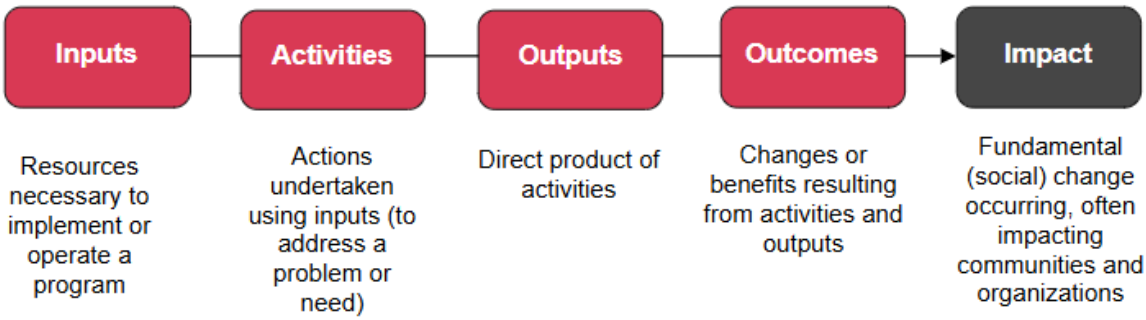
5. Wider social impact analysis

- Our assessment of the broader social impacts of AECL's operations were based on a logic-model approach to understand how AECL and CNL's specific activities generated positive impacts on Canadian society across health, environment, economic, and safety perspectives.
- Our assessment identified impact themes, which include: Improving the health of Canadians; tackling climate change; threat reduction; protecting the environment; developing nuclear talent; and enhancing trust.
- These six themes support broader overarching objectives, including decarbonization through the promotion of nuclear adoption, economic benefit from technological leadership, and sustainable energy security.

Approach

To understand AECL’s operations and their impacts on Canadian society, we conducted ten interviews with vested parties, interviewing more than 30 individuals in total. Interviews were conducted with executives at AECL and CNL, as well as individuals involved in human resources, the Science and Technology program, the Port Hope Area Initiative, supply chain and procurement, corporate affairs, Indigenous affairs, environmental protection, among others. In addition to these interviews, we conducted secondary research on information provided by AECL and publicly available information.

In conducting the assessment of social impacts arising from AECL’s operations, we framed the research, interviews, and analysis using the concept of a logic model, as illustrated below. We assessed the inputs and activities that AECL undertakes and assessed the extent to which those inputs and activities are linked with tangible impacts on society.



Appendix 4: Economic impact approach

Approach overview

This section calculates the economic footprint of AECL's operations in terms of GDP, jobs, labour income and tax revenues. These calculations refer to AECL's operations in the 2023-2024 fiscal year. The economic footprint was assessed across the following three missions: Environmental Remediation Management, Science and Technology, and Infrastructure.

In addition to the economic footprint of the missions, the economic footprint of the Chalk River Laboratories, Whiteshell Laboratories, and Port Hope Area Initiative were calculated, with a specific focus on local procurement spending. In this context, we define local procurement spending as AECL spending on suppliers/subcontractors within 100km of the three sites being assessed. To complete this, we relied on data provided by AECL.

This included data on operational spending by AECL and CNL across all three missions and the three sites, payments in lieu of taxes (PILT), and local procurement spending. As a result, these impacts do not reflect downstream impacts that are attributable to AECL but occur outside of AECL's operations. For example, these impacts may include IP generated by AECL's research or future exports of nuclear technologies.

The input-output model

The economic footprint of AECL's operations has been calculated at the direct, indirect and induced levels using an input-output (IO) modelling approach. These impacts represent how the spending and employment associated with AECL's operations would ripple throughout regional economies and across Canada as a whole.

The fundamental philosophy behind input-output analysis is that spending on goods and services has related impacts throughout the economy. For instance, nuclear research and development would generate demand for the inputs to this process, such as labour and raw materials, which in turn generates additional demand extending beyond the initial spending.

For the purpose of this report, economic footprints were calculated for the following measures of economic activity:

- **Value added, also called GDP** – The value added to the economy, or the unduplicated total value of goods and services. GDP includes only final goods to avoid the double counting of inputs.
- **Employment** – The number of jobs created or supported. It is expressed as Full Time Equivalent (FTE) jobs.
- **Labour income** – The value of income generated by labour from wages, salaries, supplementary labour income and mixed income. Mixed income largely consists of non-wage income earned by self-employed persons.

- **Tax revenues, including:**
  - **Personal income tax (PIT)** – The amount of personal income tax revenues generated from taxes on the income of employees and self-employed individuals at the federal and provincial levels.
  - **Corporate income tax (CIT)** – The amount of corporate income tax revenues generated at the federal and provincial levels. It should be noted that as a Schedule III Part I Crown Corporation under the Financial Administration Act, AECL is exempt from income taxes in Canada. AECL's activities, however, do generate attendant economic activity through their supply chain, which includes profit-generating companies who pay corporate income taxes.
  - **Taxes on production and products** – The amount of tax revenues generated from taxes on products (e.g. gas tax, sales taxes, and excise taxes) and taxes on production at the federal, provincial and municipal levels (e.g. property taxes). It should be noted that similar to CIT, AECL is exempt from property taxes (taxes on production); these taxes are instead covered in the PILT described below.
  - **Payments in lieu of taxes (PILT)** – Specific payments made from AECL to municipalities in the place of municipal property taxes, which AECL does not pay as a crown corporation. These payments are based on property assessments by MCAP and can be viewed as equivalent to property taxes.

Economic footprints were calculated at the direct, indirect and induced levels based on the AECL's operations in Canada:

- **Direct impacts** – Impact from AECL's spending on suppliers and employees. This includes direct employment and direct purchases of goods and services.
- **Indirect impacts** – Refers to the economic activities stimulated by activities of the firms providing inputs to a company's suppliers (in other words, the suppliers of its suppliers). This includes the business generated for suppliers of equipment, materials, construction, utilities, etc., through AECL's procurement of goods and services.
- **Induced impacts** – Results from consumer spending by employees of AECL and suppliers' employees.
- **The total economic footprint** – Equals the sum of the direct, indirect, and induced economic impacts.

The above economic footprints pertaining to GDP, employment and labour were calculated as a national figure, as well as separately for each of AECL's three missions, as well as for each of the Chalk River, Whiteshell, and Port Hope Area Initiative sites. For direct labour income and employment, actual figures from AECL were used instead of estimates from the input-output model.

Appendix 5: Academic partnerships, training and upskilling

This section provides more details on CNL's partnerships with Canadian universities, as referenced in Section 5.3.

McMaster University

At McMaster University, AECL, CNL, and the university collaboratively established the Undergraduate Nuclear Research Experience Program, which provides funding to allow students in the Faculties of Engineering and Science to develop research and technical skills in the nuclear field.[55] In 2024, there were seven students from the Faculty of Engineering and five students from the Faculty of Science that took part.[56] This program, while broadly supporting the advancement of nuclear research, is primarily expected to develop a highly skilled workforce that will be required to support anticipated growth of nuclear capacity in Canada. As part of an eight-week program, McMaster students are paired with a CNL employee for mentorship and guidance on their research projects, with a focus on health, safety and security, energy, and the environment. The program includes two weeks of hands-on research for students at AECL's Chalk River site, providing access to state-of-the-art technologies and infrastructure.

University of Ottawa

AECL's partnership with the University of Ottawa builds on more than 15 years of collaboration, and was the first MoU signed by AECL in 2022. This partnership places a strong emphasis on increasing the supply of high-performing STEM graduates by providing opportunities for students to engage with CNL scientists. As a part of this agreement, CNL acted as a sponsor and will support various student-facing initiatives that aim to improve learning experiences and give opportunities to STEM students. One recent example of this is the University of Ottawa's "Design Day", one of the largest student competitions organized by the Faculty of Engineering. In 2024, CNL was the lead sponsor of this event.[57] More recently, in June 2025 CNL partnered with the University of Ottawa to advance research into the health effects of low-dose radiation and to cultivate the next generation of scientists in this field. As part of the collaboration, researchers from the university will be able to access AECL's Chalk River Laboratories, including the Biological Research Facility and low-dose radiation Tissue Bank. Similarly, CNL will establish a satellite lab within uOttawa's forthcoming Advanced Medical Research Centre which is set to open in 2026, enhancing access to specialized facilities and expertise. The initiative includes joint investments in cutting-edge equipment, such as a mass spectrometer for metabolomics research, and will provide students and early-career researchers with valuable training opportunities. This partnership strengthens Canada's capacity in radiation science and biomedical innovation while supporting national health and safety priorities.

55 AECL website, *McMaster, AECL and CNL Establish Undergraduate Nuclear Research Experience Program*.

56 McMaster website, *McMaster, CNL, and AECL kick-off second year of undergrad nuclear research program*.

57 University of Ottawa website, *Partnership with Canadian Nuclear Laboratories to boost research and student opportunities*.

Queen's University

AECL's MoU with Queen's University will support the creation of collaborative research opportunities. Specifically, Queen's will work in partnership with AECL and CNL to conduct joint research projects on the topics of waste management characterization and disposal, materials sciences related to nuclear reactor cores and plants, cyber security, and hydrogen production, transportation and conversion technologies. This partnership is also expected to lead to the sharing of knowledge and infrastructure, including Queen's Reactor Materials Testing Laboratory, which will support the development of talent and build a pipeline to grow the supply of talent needed to deploy nuclear technologies.[58]

These partnerships support the development of a highly skilled, domestic labour force that will become increasingly critical to the success of the nuclear industry in the near future. In Canada, as of 2024, the nuclear power sector employed approximately 89,000 people.[59] Planned expansions in the nuclear power sector through the deployment of advanced reactors means the industry is expected to face a significant labour shortage in the future. In the case of nuclear isotopes, the Canadian Nuclear Isotope Council (CNIC) released a report in 2023 stating that CNIC members are already facing labour shortage challenges, specifically in radiation safety, regulatory affairs, quality control, and radiochemists, which they note is already slowing or outright preventing research from progressing.[60] Furthermore, CNIC expects that with major capital projects planned by "almost all isotope producers surveyed", this labour shortage will become exacerbated. AECL's work to build the talent pipeline of highly skilled nuclear professionals by collaborating with universities is a crucial step towards mitigating the negative impacts of a future potential labour shortage.

Ontario Tech University

Ontario Tech University, CNL, AECL, have established a multi-year partnership to support nuclear research, workforce development, and innovation. This collaboration includes the Student Enrichment Program[61] and the Graduate Immersive Experience Program, which provide undergraduate and graduate students with hands-on learning, mentorship, and exposure to advanced nuclear technologies. In 2024, fifteen graduate students participated in a week-long immersive experience at CNL's Chalk River Laboratories, engaging in fusion research and networking with industry experts[62].

The partnership also includes career readiness workshops, mentorship sessions, and networking events such as the Fall Ideathon, where up to 75 graduate students pitch solutions to energy challenges with guidance from CNL experts who will act as mentors, advisors, and judges[63]. Through a formal Memorandum of Understanding, the organizations are advancing shared goals including research, workforce development, and engagement with Ontario Tech's Centre for Small Modular Reactors (SMRs), the Brilliant Energy Institute, and the IAEA Collaborating Centre[64].

Western University

Western University and CNL collaborate through the Western Nuclear Hub, a strategic initiative designed to bridge academia and the nuclear industry. This partnership focuses on advancing nuclear science and technology, developing a highly skilled workforce, and addressing national challenges in energy, healthcare, and sustainability[65]. The agreement includes an extensive list of focus areas where the organizations will collaborate, including imaging and radiopharmaceuticals; cybersecurity; high-performance computing and artificial intelligence; hydrogen; materials science and degradation; decommissioning and waste management; and advanced and small modular reactors, fuels and power grids[66].

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58 CNL website, *CNL and AECL continue to expand academic partnership through new agreement with Queen's University*.

59 Canadian Nuclear Association website, *Building a skilled nuclear workforce for Canada's energy future*.

60 CNIC website, *Securing Canadian Medical Isotope Talent and Expertise*.

61 CNL website, *CNL is a proud partner of Ontario Tech University's New Student Enrichment Program*

62 Ontario Tech University, *Ontario Tech students explore advanced fusion research at Canadian Nuclear Laboratories*

63 Ontario Tech University, *Ontario Tech students explore advanced fusion research at Canadian Nuclear Laboratories*

64 Ontario Tech University, *Ontario Tech University, AECL, and CNL re-energize partnership*

65 Western Research, *Western Nuclear Hub*

66 CNL website, *CNL, AECL, and Western University to collaborate on joint research under new agreement*

University of Waterloo

The University of Waterloo, AECL and CNL have signed a Memorandum of Understanding to pursue collaborative research in nuclear science, clean energy, and national security. This partnership supports joint research priorities including small modular and advanced reactors, additive manufacturing, energy storage, cybersecurity, and infrastructure lifecycle assessment and which restoring the environment, advancing clean energy technologies, and contributing to the health of Canadians[67].

It also enables Waterloo researchers and students to access CNL's Chalk River Laboratories for hands-on research and training and is designed to foster innovation, mobilize knowledge, and develop intellectual property while supporting the professional development of future nuclear scientists and engineers through training and mentorship from CNL scientists. A recent example of successful innovation includes a University of Waterloo student using CNL's proprietary Hybrid Energy Systems Optimization (HESO) Model to explore the role of SMRs in decarbonizing cement production, demonstrating the practical application of nuclear technologies in industry[68].

University of New Brunswick

The University of New Brunswick (UNB), AECL and CNL have built a longstanding and evolving partnership centered on nuclear research, innovation, and workforce development. This collaboration is based on a pre-existing working relationship between CNL and the University who collaborated on UNB's Centre for Nuclear Energy Research (CNER), a multidisciplinary institute established in 1991 to support AECL and NB Power In 2022,

In 2023, the partnership expanded through a Memorandum of Understanding that outlines joint research priorities in cybersecurity, hydrogen, medical isotopes, and SMRs[69]. This agreement strengthens knowledge mobilization and intellectual property development while enhancing professional development opportunities for students and staff across all three organizations.

A major milestone in 2025 was the opening of the Advanced Nuclear Reactors Laboratory (ANRL) at UNB, supported by federal and provincial funding. This facility enables cutting-edge research in Generation IV reactor designs and SMRs, and deepens collaboration with CNL, AECL, and other national partners. UNB remains the only university offering nuclear engineering courses east of Ontario, positioning it as a key contributor to Canada's clean energy future[70].

University of Regina

At the University of Regina, AECL and CNL have formalized a partnership through CNL's Academic Partnership Program, expanding collaborative nuclear research and workforce development into Western Canada. This agreement supports shared goals in clean energy innovation, health and environmental sciences, and safety and security, while strengthening Saskatchewan's position in Canada's nuclear sector.

The partnership enables joint research projects, faculty exchanges, and student training programs focused on nuclear science and engineering. It also provides access to CNL's national infrastructure, including Chalk River Laboratories, and supports knowledge mobilization and the development of innovative technologies. Dr. Christopher Yost, Vice-President (Research) at the University of Regina, emphasized that the agreement "strengthens pathways for our students to engage in hands-on learning with two globally recognized leaders in nuclear science, technology, and innovation"[71].

[67] CNL website, *CNL and AECL sign collaborative research agreement with the University of Waterloo*
[68] CNL website, *University of Waterloo student puts proprietary CNL tool to the test – investigating SMRs role in decarbonizing cement production*
[69] AECL website, *AECL and CNL build on longstanding relationship with the UNB through collaborative research agreement*
[70] University of New Brunswick, *UNB's CNER opens cutting-edge lab to support Canada's nuclear energy future*
[71] CNL website, *AECL and CNL Academic Partnership Program expands west through agreements with the Universities of Regina and Saskatchewan*

University of Saskatchewan

At the University of Saskatchewan (USask), CNL and AECL have signed a Memorandum of Agreement to advance nuclear research, innovation, and workforce development. This partnership is housed within USask's College of Engineering and is part of CNL's Academic Partnership Program, which aims to strengthen ties with Canadian universities and accelerate progress in nuclear science and technology. USask is one of the first institutions in Western Canada to join the program[72].

The collaboration focuses on shared goals in clean energy, health, safety, and environmental sustainability. It includes joint research projects, faculty exchanges, and specialized educational programs in nuclear engineering. Students and researchers benefit from access to national infrastructure, including Chalk River Laboratories, and opportunities for knowledge mobilization and innovation.

USask's leadership in nuclear science is further demonstrated by its hosting of the Canadian National Nuclear Energy Management School, a two-week IAEA-led program for mid-career professionals. This initiative, supported by SaskPower and other provincial partners, helps build regional expertise and prepares the workforce needed for Saskatchewan's nuclear future[73].

Training, upskilling, and inclusivity

In addition to the academic partnerships, CNL has a number of programs focused on training and upskilling individuals, and has placed an emphasis on diversity, equity, and inclusion (DE&I) as a part of their operations, as well as CNL's operations.

CNL has become an employer partner with the Canadian Centre of Diversity and Inclusion, which provides employees with a free membership to the Centre and gives them access to articles, resources, and events about diversity and inclusion. In addition, in 2023, AECL established an employee-led, executive-sponsored DE&I Working Group, with a similar group established within CNL called the DE&I Committee and in 2024, CNL had their first "DEI Week", which was a week focused on DEI topics, discussing how employees can exemplify inclusivity and create a more inclusive working environment.

AECL and CNL are committed to supporting Women in Nuclear (WiN), which is a global association focused on supporting and encouraging women working in the nuclear industry. AECL and CNL employees have been involved as members of WiN and have participated in various events as attendees and speakers at conferences, and have also been included on WiN panels. Furthermore, in 2021, AECL and CNL joined the Equal by 30 Campaign, which is a joint initiative with the Clean Energy Ministerial and the International Energy Agency that works to advance the participation of women in nuclear. As of 2021, Canada only had female representation at 22% of their nuclear workforce, lower than the global average, which is estimated at approximately 25% of nuclear across 96 organizations in 17 countries.[74] AECL significantly outperforms these representation rates, with 44% of their workforce and 50% of their Board of Directors made up by women.[75] In addition to improving equality and diversity in the nuclear industry in Canada, AECL's and CNL's efforts in this regard help to grow the overall size of the labour force by supporting women in viewing the nuclear industry as a career field for them in the future.

AECL is committed to working closely with Indigenous Nations and communities and seeks to work in partnership to recognize and incorporate Traditional Knowledge, ceremonies, and cultural and stewardship practices into AECL's daily operations, notably around environmental protection and management. AECL is working to build new relationships and strengthen existing ones with a focus on open and cooperative engagement to identify opportunities and achieve mutual benefit. CNL is also an employer of Indigenous employees in local communities, notably Deep River, ON and Pinawa, MB and attends an annual career fair hosted by the Algonquins of Pikwàkanagàn First Nation as well as career fairs and community events hosted by the Williams Treaties First Nations in Ontario and First Nations and the Manitoba Metis Federation in Manitoba .

[72] University of Saskatchewan, *USask signs MOA with national groups to advance nuclear research, innovation*
[73] University of Saskatchewan, *Building nuclear expertise: Saskatchewan hosts renowned IAEA program*
[74] OECD website, *Gender Balance in the Nuclear Sector*.
[75] AECL website, *AECL joins Equal by 30 Campaign*.

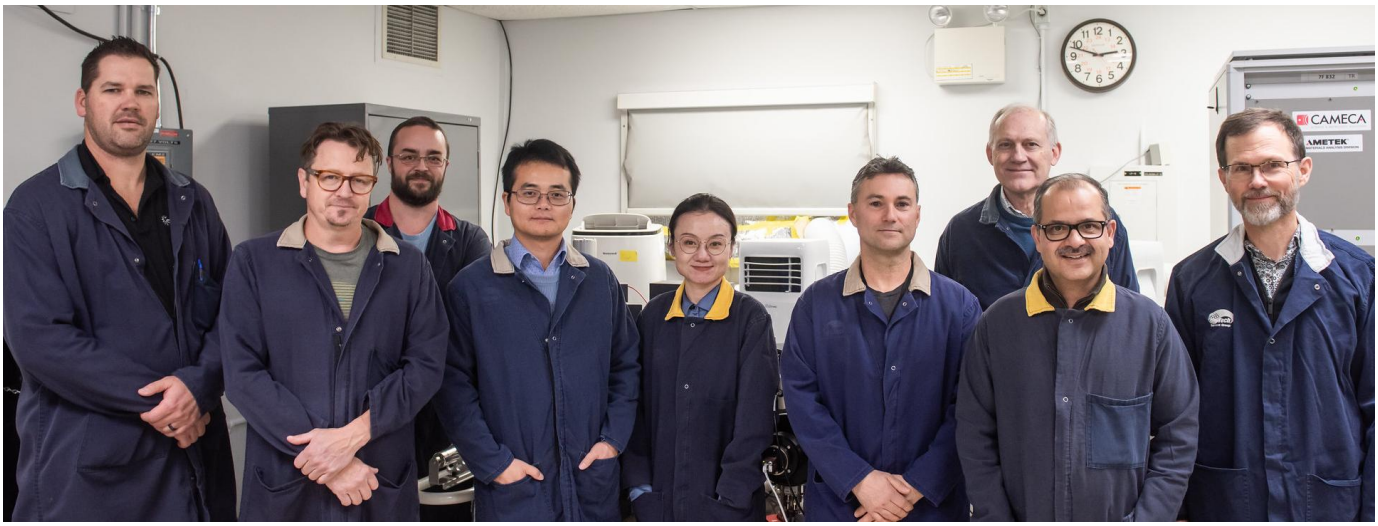
These events, along with ongoing engagement and relationship-building, allow CNL to present career opportunities and potential career paths to local Indigenous communities.

CNL also aims to work with students beyond their university partnerships. In this regard, they hire summer students, notably for environmental protection/monitoring activities. Last summer, CNL hired just over 100 summer students at Chalk River to be involved in environmental monitoring as well as biodiversity activities. In doing this work, students receive on-the-job training in environmental monitoring with a nuclear-specific lens, providing them with experience that may lead to them pursuing careers in the nuclear field in the future. It was also mentioned that while co-ops are typically for undergraduate and graduate students, CNL also has a high-school co-op program for environmental protection roles.

CNL does significant work on STEM education and school programming, with around 50 engagements a year with youth, as well as a kids STEM-related newsletter that gets sent to more than 70,000 homes a year.

Finally, CNL supports tradespeople in obtaining their Red Seal certifications. Red Seal certifications are qualifications provided to tradespeople in Canada that indicate they have demonstrated the knowledge and ability required, as well as gained sufficient experience to be endorsed as Red Seal qualified, which promotes excellence to employers, instills pride in workers, and facilitates labour mobility. As the nuclear industry also needs a significant supply of trades-related labour, AECL enables CNL to support tradespeople in achieving the training and experience requirements to become Red Seal certified, supporting upskilling of labour in the nuclear industry.

All of these efforts by CNL work towards building interest and skills among STEM careers, and more specifically careers in the nuclear field. In addition, AECL seeks to create an inclusive working environment, ensuring equal opportunity and representation, thereby growing the size of the nuclear industry and supporting the development of a more robust talent pipeline.



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