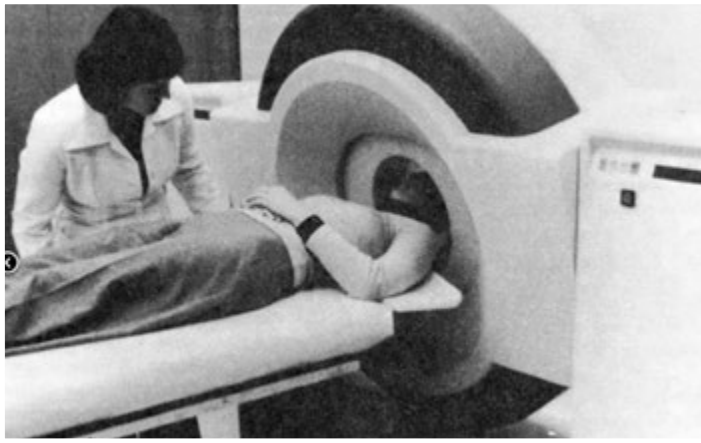
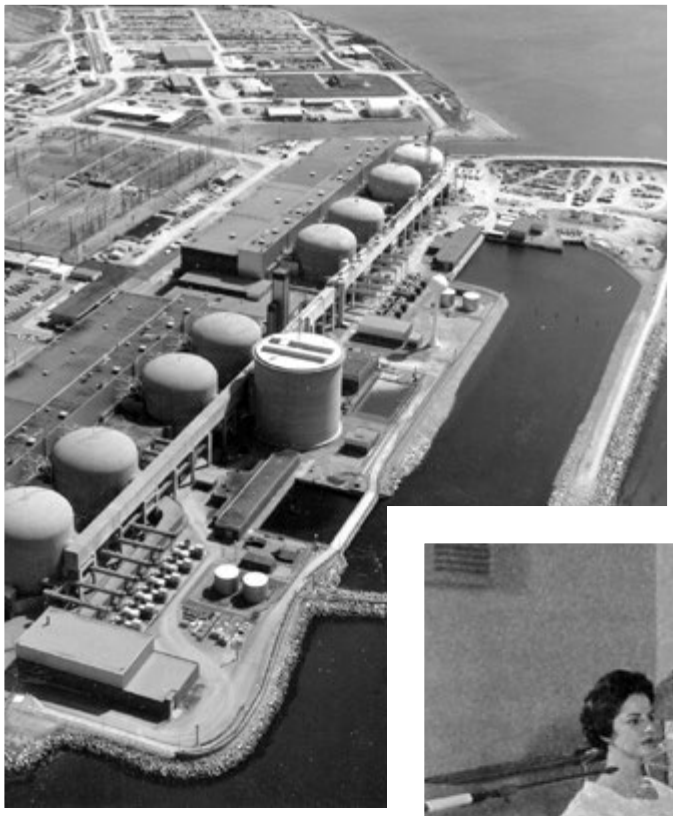
Atomic Energy of Canada Limited

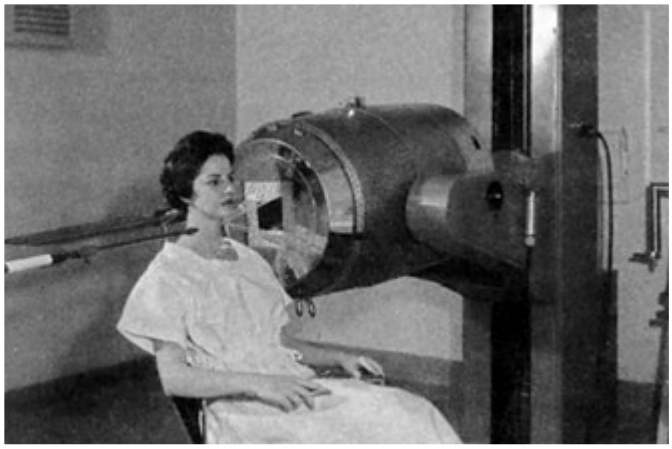


2022-23 to 2026-27 Corporate Plan Summary

Driving Nuclear Opportunity for Canada

AECL EACL 70 YEARS ANS





AECL acknowledges with gratitude that we operate on territories that have, since time immemorial, been the traditional lands of Indigenous peoples in Canada.

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Executive Summary

Atomic Energy of Canada Limited (AECL), a federal Crown corporation, works to advance Canada's interests through leading-edge nuclear science and technology and environmental protection initiatives. This includes combating climate change through clean energy growth and decarbonization strategies, pioneering new treatments for cancer and other diseases, and accelerating Canada's environmental remediation projects.

Since 2015, AECL has been delivering its mandate through a Government-owned, Contractor-operated (GoCo) model, whereby a private-sector organization, Canadian Nuclear Laboratories (CNL), manages and operates AECL's sites.

Vision

Driving nuclear opportunity for Canada.

Mission

Realize value for Canadians by driving nuclear innovation, creating a state-of-the-art nuclear campus, and cleaning up legacy wastes.

This change in delivery model has brought about significant transformation. CNL has made major progress in revitalizing the Chalk River site, where it has demolished 114 buildings and structures, upgraded a substantial portion of the site's supporting infrastructure and built two important science facilities. The goal is to build a modern, state-of-the-art nuclear science and technology campus that attracts the next generation of scientists who will drive nuclear opportunity for Canada. To this end, an Advanced Nuclear Materials Research Centre is being planned to enable nuclear scientific activities for decades to come.

CNL has also worked to place itself at the forefront of global efforts in exciting and valuable nuclear science and technology advancements, demonstrating production capabilities of an extremely rare isotope used in cancer therapy, partnering with the private sector to advance the demonstration of small modular reactors, and working to demonstrate production of hydrogen without greenhouse gas emissions.

Both AECL and CNL remain committed to working with Indigenous communities and organizations and other stakeholders in an open, respectful, and cooperative manner to foster mutual understanding, build long-term relationships, advance reconciliation, and achieve our overall objective of protecting the environment.

The COVID-19 pandemic has presented unprecedented challenges for organizations worldwide. For AECL and CNL, this included implementing work protocols to keep employees and their communities safe and adjusting important projects to reflect new working realities. Given the complexity and physical nature of a large portion of the work in managing our sites, there have been ongoing and unavoidable impacts to the business.

Nonetheless, nuclear science and technology activities performed at the Chalk River Laboratories continue to benefit both the Government of Canada and the broader nuclear industry. Through the Federal Nuclear Science and Technology Work Plan, research and scientific activities are undertaken to serve the needs of 14 federal departments and agencies in the areas of energy, health, safety and security, and the environment. Furthermore, CNL leverages the capabilities and expertise at the laboratories to grow and diversify commercial revenues, thereby positioning itself as a key player in nuclear science and technology in Canada and internationally.

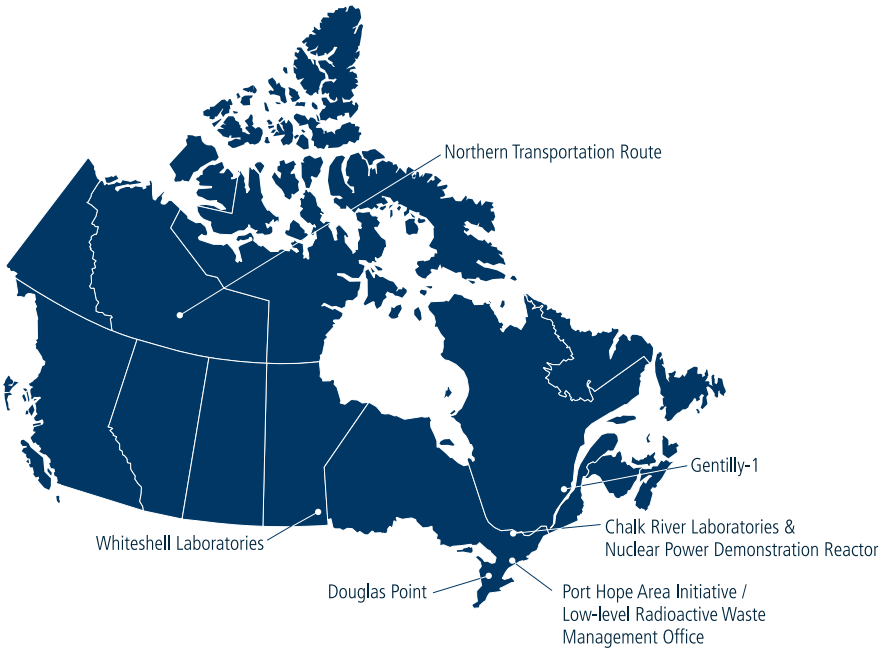
This 2022-23 Corporate Plan Summary outlines AECL's activities, objectives, and plans in nuclear science and technology, and environmental stewardship. This includes work to build a world-class nuclear laboratory at Chalk River through important infrastructure investments of $1.2 billion over ten years, starting in 2016.

The pages below present AECL's vision for continued transformation to meet these objectives, informed by long-term plans prepared by CNL and accepted by AECL.

Overview

AECL is a federal Crown corporation mandated to enable nuclear science and technology, and to protect the environment by fulfilling the Government of Canada's radioactive waste and decommissioning responsibilities. AECL undertakes this work at several sites across Canada, with headquarters in Chalk River, Ontario. AECL's operating model allows it to leverage private-sector expertise and experience to advance work and drive priorities.

AECL Sites



Nuclear Laboratories

The Chalk River Laboratories are Canada's largest science and technology complex and host to nearly 2,700 employees, including engineers, scientists, and technical staff. The work undertaken at the laboratories supports Canada's federal roles, responsibilities, and priorities in the areas of health, energy and climate change, the environment, safety, and security. Services are also provided to industry and other third parties on a commercial basis. The Chalk River site is undergoing an important renewal that will transform the site into a modern, world-class nuclear science and technology campus, thanks to a 10-year, $1.2 billion government investment that began in 2016.

Environmental Stewardship

The objective is to address safely and responsibly the environmental responsibilities and liabilities which have resulted from legacy activities at AECL sites. These legacy liabilities are the result of decades of significant contributions and advancements in nuclear science which have benefitted Canadians and the world, including the development of CANDU technology and the production of medical isotopes used in the diagnostic and treatment of cancer and other diseases. AECL is focused on the decontamination and decommissioning of redundant structures and buildings, the remediation of contaminated lands, and the management and disposal of radioactive waste at AECL sites – primarily at the Chalk River Laboratories and the Whiteshell Laboratories in Manitoba.

AECL is also responsible for the remediation and long-term management of sites contaminated with historic, low-level radioactive waste where the Government of Canada has accepted responsibility, most notably as part of the Port Hope Area Initiative. Responsible decommissioning and radioactive waste management are necessary to clean up AECL's sites, protect the environment, and make way for new buildings that will support the ongoing nuclear science and technology mission at the Chalk River site.

AECL receives funding from the Government of Canada and earns commercial revenues to deliver on its mandate. AECL reports to Parliament through the Minister of Natural Resources. AECL's most recent Annual Report (2021-22) can be found on its website (www.aecl.ca).

Reconciliation

As stewards of the environment, AECL recognizes that our nuclear science and research activities have created radioactive materials and waste, and we are committed to addressing this responsibly. We are dedicated to working in partnership with Indigenous communities to recognize and incorporate Traditional Knowledge, ceremony, and various cultural and stewardship practices. We have much to learn from each other as we work towards our common objective of environmental protection.

AECL is committed to collaborating with Indigenous groups in the spirit of reconciliation. As an organization, AECL is working hard to achieve this by building new relationships and strengthening existing ones, recognizing that meaningful, respectful engagement takes time.

Corporate Profile

AECL significantly restructured in 2015, moving the management and operation of its sites to a Government-owned, Contractor-operated (GoCo) model. Whereas previously AECL was directly responsible for the management and operation of its sites, today, a private-sector contractor—Canadian Nuclear Laboratories (CNL)—is responsible for the sites' day-to-day management. AECL remains the owner of the facilities, assets, intellectual property, and liabilities.

Through the restructuring, the Government of Canada confirmed AECL's mandate to enable nuclear science and technology, and to protect the environment by fulfilling the Government of Canada's radioactive waste and decommissioning responsibilities. AECL was also given a mandate to leverage the assets and capabilities at the Chalk River Laboratories to support industry on a commercial basis.

AECL's environmental stewardship activities are in line with the government's goals to protect the environment. AECL-funded nuclear science and technology activities contribute to science and innovation goals, which benefit Canada's economy through the development of a highly skilled workforce, support for industry, and technology development.

Furthermore, AECL is supporting efforts to meet Canada's climate change goals by funding work to help Canada's utilities to operate power reactors safely and for longer periods of time, and through our efforts to advance small modular reactors. Nuclear power is an important part of Canada's low-carbon energy production. More than 60% of Ontario's electricity and 30% in New Brunswick comes from nuclear power. Similarly, small modular reactor technologies offer a promising opportunity to bring low-carbon energy to the electrical grid, and to remote locations and communities.

Operating Model: The Government-Owned, Contractor-Operated Model

AECL's Oversight Activities

AECL oversees all CNL activities:

- We set priorities for CNL
- We approve their long-term plan
- We provide guidance for, and approve their annual plan and budgets
- We use internationally recognized tools to track performance based on activities set out in the plans
- We review their performance and perform audits
- We can reduce fee if performance is not adequate.

The GoCo model allows AECL to leverage private-sector expertise and experience to accelerate the decommissioning and radioactive-waste management program, build a world-class nuclear laboratory at Chalk River to fulfill government requirements, and reduce costs and risks to Canada. As the government's agent, AECL brings value to Canada by overseeing the GoCo arrangement and supporting the government's development of nuclear policy. Under this model, AECL can advance its priorities efficiently and effectively while ensuring that CNL meets and exceeds rigorous safety, security, and environmental requirements.

AECL sets priorities for CNL and assesses its performance. In other words, AECL sets out "what" needs to be achieved with CNL deciding "how" it is best executed.

AECL provides strategic guidance annually to CNL for the development of its plans which, in turn, are supported by, and aligned with, longer-term plans which are accepted by AECL. We track CNL's performance based on its planned activities, including project milestones and deliverables.

To monitor and assess contractor performance systematically, AECL issues a performance plan annually. The performance plan is based on, and developed in parallel with, the annual plan. It outlines AECL's priorities for CNL and sets out areas where the contractor stands to earn fee for the management and operation of AECL's sites, as per contractual arrangements. Two specific projects, the closure of the Whiteshell Laboratories and the Nuclear Power Demonstration reactor site, are managed separately under target-cost contracts.

AECL leverages other project management and performance measurement tools to track the performance of CNL, including an Earned Value Management System (an internationally recognized tool that allows for the simultaneous tracking of work scope, schedule and cost) and a Contractor Assurance System (a comprehensive and integrated performance assurance regime that allows for the capture of performance metrics across a wide array of work areas).

For more information on the Government-owned, Contractor-operated model visit our website www.aecl.ca.

Internal Environment

AECL oversees an important portfolio of work. Sound management underpinned by a comprehensive contract-management approach is at the core of the organization's strategy to deliver results for Canada. Amongst key internal challenges and strategic issues being managed by AECL, three are notable and presented below.

Contractor performance: As AECL relies on a private-sector contractor to execute scope related to its mandate, an inherent internal risk is the inability of the contractor to consistently execute and perform based on agreed-upon plans. To mitigate this risk and drive the appropriate behavior, the contract with CNL is carefully structured to include several mechanisms for AECL to track CNL's performance, as discussed in the Operating Model section above. Key amongst these is a performance measurement plan used by AECL to set priorities supported by achievable stretch targets to drive value for money for Canada. Ongoing evaluation of the contractor against the plan throughout the year provides AECL the opportunity to highlight strengths and weaknesses and the contractor the opportunity to correct course where needed.

Costs to operate the Chalk River Laboratories: The shutdown of the National Research Universal (NRU) reactor in March 2018 continues to create cost pressures. The combination of lost revenue from the activities of the reactor (including isotope sales) and diminishing funding for the NRU, together with site costs that have not proportionally decreased, contribute to funding pressures. As this was anticipated at the time of the restructuring of AECL, the GoCo contract includes requirements for CNL to look at all options for lowering costs, increasing revenues and managing the cost pressures to mitigate this risk. This is actively being pursued and implemented with a view to enable a sustainable and science-focused organization in the long-term, while continuing to protect workers, the public, and the environment.

Human resources: AECL is a small organization that relies on a small complement of national and international experts, many of whom bring experience in the management of similar GoCo arrangements. In 2021-22, AECL had 45 employees. It is expected that employee levels will remain in the range of 45 to 50 over the planning period. AECL's goal is to maintain the expertise and capabilities necessary to oversee the GoCo contract and assure value for money for Canada.

AECL is committed to supporting diversity and inclusion, from identifying discrimination, harassment, or lack of opportunities, to recognizing the different perspectives that employees bring to the workplace. Women make up 50% of AECL's workforce, and visible minorities 7%. AECL has in place a diversity and inclusion strategy with three over-arching goals:

- Workplace Inclusion: Promote a culture that encourages collaboration, flexibility, and fairness to enable individuals to contribute to their highest potential;
- Workplace Diversity: Attract, retain, and develop a talented and diverse workforce; and,
- Employee Capability: Enable employees' knowledge and understanding of what is meant by diversity and inclusion.

In 2022-23, AECL will further advance this to include the development of an Accessibility Plan in support of the Accessible Canada Regulations.

Given AECL's small size, an ongoing challenge is to adapt to fluctuating resourcing requirements across different areas of the organization and backfill those on short-term leave. To manage this, AECL strives to be adaptable and flexible, deploying a handful of third-party service contracts to bolster resourcing when required, and cross-training employees when the opportunity arises. A succession plan has also been developed and is reviewed on an annual basis at a minimum. Furthermore, AECL regularly reviews its total compensation package to remain competitive amongst similar employers nationally and internationally.

External Environment

External factors such as the dynamic nature of the COVID pandemic have shifted the environment in which AECL and its contractor operate. In alignment with recommended actions by the Government of Canada and public health authorities to mitigate risk to personnel and surrounding communities, CNL reduced operations at all sites in March 2020.

Nearly two years later, the pandemic continues to impact all AECL's sites and employees and CNL's employees and sub-contractors. In accordance with recommended actions and guidelines by the Government of Canada, provincial and local public health authorities, AECL and CNL continue to maintain the current posture of reducing the risks to their personnel and the surrounding communities. Overall, the impact of pandemic-related disruptions has been reflected to the extent possible in this document.

Environmental stewardship: As part of AECL's environmental stewardship responsibilities, three projects are currently undergoing Environmental Assessments through the Canadian Nuclear Safety Commission (CNSC):

- Construction of a Near Surface Disposal Facility (NSDF) at the Chalk River Laboratories;
- In-situ decommissioning of the WR-1 research reactor at the Whiteshell site; and,
- In-situ decommissioning of the Nuclear Power Demonstration facility in Rolphton, Ontario.

AECL and CNL are dedicated to engaging stakeholders, the public and Indigenous communities early and often, and throughout the regulatory process. Project timelines have been extended to consider all comments and concerns received; to accommodate additional scientific and technical studies requested by the CNSC; and to adjust aspects of the project, where possible, based on public, Indigenous, government and regulatory feedback.

Small modular reactors: CNL is pursuing opportunities related to small modular reactors, designed to be built at a smaller size but in greater numbers than most of the world's current nuclear fleet. As part of its long-term vision, CNL seeks to become an incubator for small modular reactor demonstration by the private sector and for supporting associated research and development. To that end, CNL's goal is to have a demonstration unit built by third parties at an AECL site before 2030. The objective is to advance SMR technologies in Canada to contribute to Canada's broader economic growth, competitiveness, science, innovation, sovereignty, and climate change objectives.

In Canada, small modular reactors have the potential for three major areas of application:

- On-grid power generation, especially in provinces phasing out coal. Utilities want to replace end-of-life coal plants with non-emitting baseload nuclear plants of similar size.
- On- and off-grid combined heat and power for heavy industry. Oil-sands producers and remote mines have expressed interest in medium-term options for bulk heat and power that would be more reliable and cleaner than current energy sources.
- Off-grid power, district heating, and desalination in remote communities. These currently rely almost exclusively on diesel fuel, which has various limitations (e.g., cost, emissions). Renewables and batteries can mitigate these limitations to some extent for residential power, but may not supply building heat, nor are they likely to offer reliable bulk energy to support economic development. Very small modular reactors have potential to catalyze development in the North, contributing to national sovereignty, energy security and the economy.

The opportunity related to small modular reactors is noteworthy given Canada's expertise in nuclear technology, including its existing supply chain and potential markets. Economic benefits for Canada derived from small modular reactor development and deployment include an estimated 6,000 new jobs (direct and indirect) supporting a highly skilled labour force and an estimated $10 billion in direct impacts and $9 billion in annual indirect impacts between 2030 and 2040.[1] There is also significant export potential for technology and services related to this industry should Canada be at the forefront, including an estimated total global export potential of approximately $150 billion per year between 2030 and 2040.[2]

These activities are responsive to the small modular reactor roadmap, which specifically recommended that, "Governments, utilities, industry, and the national laboratory support demonstration of small modular reactor technologies, preferably more than one, at appropriate sites in Canada." Also, AECL and CNL are responding to all four recommendations specific to AECL and CNL, including doing preliminary site identification work, undertaking small modular reactor research and development, continuing the invitation process and collaborating with international partners on small modular reactors.

New area of cancer research: CNL is leveraging its world-class expertise in medical isotope production to advance the development of targeted alpha therapy – a next-generation cancer treatment. CNL has developed a generator to produce actinium-225 from its available nuclear materials. This has been used in pre-clinical trials and now in clinical trials to demonstrate the efficacy of the proposed therapy. Based on the promising results, CNL has explored opportunities to partner with others in the production of actinium-225 on a scale to support clinical trials more broadly, and more widespread use in treatment across Canada and internationally.

[1] *A Call to Action: A Canadian Roadmap for Small Modular Reactors*. Small modular reactor roadmap steering committee, November 2018. Available online at smrroadmap.ca.

[2] Ibid

Funding Requirements

The Government of Canada approved a ten-year funding profile in 2015 for AECL to enable it to leverage its contract with CNL to deliver its mandate. The funding profile carries AECL to September 2025, the end of the current contract. That date falls within the five-year period addressed by this corporate plan. There is therefore a need to forecast funding requirements outside of existing funding parameters.

The two tables below differ in that the first includes approved funding only and the second table includes funding requirements beyond the current contract end date in September 2025. These are early and preliminary values and ultimately will be subject to further planning and funding approval.

Total Funding Projections Based on Approved Government Funding

				Plan					
(millions of Canadian dollars)	**Notes**	**Actual 2020-21**	**Budget 2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**5 Year Total**
Funding Requirements									
Environmental Stewardship		646	818	978	1,000	971	451	80	3,480
Nuclear Laboratories – Operating		183	256	201	198	263	102	17	780
Nuclear Laboratories – Capital		107	142	147	142	158	81	–	529
Federal Funding Requirement AECL	1	**936**	**1,216**	**1,326**	**1,340**	**1,392**	**634**	**97**	**4,789**

[1] AECL currently has approved funding for the majority of its activities until mid-2025. Please refer to the next table for details on funding requirements beyond this date.

Total AECL Five-Year Projection of Federal Funding Requirements Including Unapproved Funding

				Plan					
(millions of Canadian dollars)	**Notes**	**Actual 2020-21**	**Budget 2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**5 Year Total**
Funding Requirements									
Environmental Stewardship		646	818	978	1,000	971	786	650	4,385
Nuclear Laboratories – Operating		183	256	201	198	263	180	195	1,036
Nuclear Laboratories – Capital		107	142	147	142	158	145	150	742
Federal Funding Requirement AECL	1	**936**	**1,216**	**1,326**	**1,340**	**1,392**	**1,111**	**995**	**6,164**

[1] The table above includes, in addition to approved funding, preliminary AECL projections of anticipated funding requirements that have not yet been subject to the federal cycle for approval of expenditures by the government and Parliament. These estimates are subject to further planning, and neither their preliminary status nor the numbers should be interpreted as an indication of the future funding level for AECL.

AECL's detailed financial performance information and annual report can be found on our website.

Objectives and Plans – Nuclear Laboratories

AECL has been leading nuclear science and technology for seven decades. The organization was the birthplace of Canada's nuclear industry, having hosted the first sustained criticality (controlled nuclear chain reaction) outside of the United States. More importantly, the Chalk River Laboratories were the birthplace of the CANDU reactor technology used today at 19 reactors in Canada and 30 (CANDU or CANDU-derivatives) internationally. It also provided the research and facilities for breakthroughs in the life-saving application of medical isotopes, including cobalt-60. Work undertaken at the Chalk River Laboratories has led to numerous and important scientific achievements – including two Nobel Prize winners.

Over the years, AECL has played an important role in supporting public policy and in delivering programs for the Government of Canada. This includes the production of medical isotopes, and the provision of nuclear science and technology in the areas of energy, non-proliferation, emergency preparedness, counterterrorism, health, and security. AECL's unique facilities have made it an attractive research destination for scientists across Canada and the world, leading to home-grown innovation and the development and retention of highly qualified nuclear workers and scientists.

The restructuring of AECL and the implementation of the GoCo model have brought new opportunities for building on this important scientific legacy. The government has clearly defined AECL's mandate to support its needs and responsibilities in nuclear science and technology (through the FNST and work for federal departments and agencies as a federal lab), and to provide services to third parties on a commercial basis. The government has enabled this mandate through an investment of $1.2 billion for new and renewed science and site-support infrastructure at the Chalk River Laboratories, with the objective of building a world-class, state-of-the-art nuclear science and technology campus. Nuclear science and technology activities support AECL's Federal Nuclear Science and Technology Work Plan, which helps the Government of Canada deliver on its responsibilities in the areas of health, nuclear safety and security, energy, and the environment.

AECL's planned results in this area include servicing the nuclear science and technology needs of federal departments and agencies, and advancing nuclear knowledge, innovation, job creation, and the use of clean technologies. AECL is focused on increasing collaboration and partnership with other nuclear industry members, academia, and other national laboratories. As well, the advancement of nuclear technologies for the benefit of Canadians and the growth of commercial business opportunities remain a top priority.

CNL has developed a strategic approach to delivering an integrated, effective, project- based and customer-focused science and technology mission that serves the needs of government and external customers. Based on an assessment of existing capabilities, external environment and market opportunities, CNL has identified eight key areas that it will focus on during the planning period which support the needs of the federal government and third-party customers to tap into new and expanded markets.

Conceptual image: Third Way

Small Modular Reactors

Small Modular Reactors are small reactors aimed at new markets, tackling a critical and time sensitive global need for safe, clean, economic energy. In Canada, this could mean vital, new clean energy options for replacing coal, greening resource extraction, and improving energy security for remote communities.

Canada is at the forefront of the small modular reactor industry thanks to the release of a roadmap convened by the Government and to CNL's work to site a demonstration reactor at an AECL site before 2030. This small modular reactor program is attracting significant attention worldwide as evidenced by the strong response to CNL's process to invite applications. Currently, three respondents have successfully completed the pre-qualification stage, and one has further progressed in the process, including submitting an application for a licence to prepare a site. CNL is supporting the vendors on commercial terms.

- **Small modular reactors:** With the release of Canada's SMR Action Plan in December 2020, the Government of Canada has recognized the potential of SMRs to help achieve Canada's goal of net zero by 2050. Small modular reactors could provide vital, new clean energy options for replacing coal, greening resource extraction and improving energy security for remote communities. To keep Canada at the forefront of the small modular reactors industry, CNL is aiming to site a demonstration reactor at one of AECL's sites before 2030. One project – by Global First Power – is the most advanced in Canada, having launched a licensing and environmental assessment process in 2019 to build a small modular reactor at the Chalk River Laboratories.
- **Advanced fuel fabrication:** Development of advanced nuclear fuel concepts in order to support the long-term reliability of existing reactors and the development of advanced reactors. These advanced fuels offer higher performance, improved failure tolerance, increased safety, proliferation resistance and accident tolerance, and are recycled or recyclable. As new methods are required to fabricate these fuels, CNL is reviewing its strategy on advanced fuels to align with emerging markets in small modular reactors.

- **Decarbonizing the transportation sector:** Building on capabilities developed to support hydrogen safety and heavy water and tritium management in CANDU reactors, and leveraging recent capital investment in modern hydrogen laboratories, CNL's goal is to play a leading role in the demonstration of hydrogen-based bulk transport. This goal remains unchanged despite COVID, but risks remain, and progress is being monitored closely. As hydrogen technologies have matured, costs have dropped to the point that hydrogen solutions are financially competitive with similar energy conversion technologies. Hydrogen technology offers low-carbon options for the energy and transportation sectors, which supports Canada's international commitments for carbon reduction and national objective of achieving net zero by 2050.
- **Nuclear forensics, detection and response:** The need for science and technology activities in nuclear security continues to grow in Canada, as evidenced by the Government's renewed commitments to nuclear threat reduction, both domestically and abroad. There is a growing demand from government departments and agencies for nuclear science and technology expertise to inform their response to emergent national and international issues concerning nuclear safeguards, safety and security. CNL is working to establish a centre for government agencies and commercial partners to develop, test, calibrate and validate nuclear forensics, non-proliferation, security and response technologies and materials. Furthermore, CNL is supporting work to improve safeguards and security at the borders by developing essential tools to detect contraband special nuclear materials.

Targeted Alpha Therapies

While current forms of radiation treatments affect many cells in the body, both healthy and cancerous, targeted alpha therapy is significantly more focused and delivers the radiation directly to the cancerous cells by chemically binding appropriate radionuclides with targeting biomolecules. This is both more effective in killing cancer cells as well as protecting healthy cells. A radionuclide with significant potential in this therapy is Actinium-225, but it is extremely rare and difficult to produce. CNL first demonstrated research quantity production of Actinium-225 through the Federal Nuclear Science and Technology Work Plan. Subsequently, and in partnership with TRIUMF (Canada's particle accelerator centre), the first production run of Actinium-225 has recently been completed. The objective is to demonstrate commercial viability in order to support this important and exciting healthcare research and treatment.

- **Targeted alpha therapy research:** Targeted alpha therapy is a new area of research in the battle against cancer and other diseases. The benefit of this therapy is that the radiation is targeted at just the cancer cell, unlike existing treatments that often involve radiation of all cells in the vicinity of a tumor, healthy and cancerous. CNL aims to become the centre of international research efforts and a key supplier for these alpha-emitting isotopes by applying its expertise in isotope separation, scaling up of processing and handling radionuclides. CNL's goal is to develop and complete early demonstration of a suite of targeted alpha therapy compounds by 2022. This remains on schedule despite COVID.
- **Nuclear cyber security:** Cyber security of industrial control systems is a growing concern in all industries, and particularly in the nuclear industry where it represents a multibillion-dollar worldwide market. While a large commercial industry caters to the cyber security of information technology systems, most solution providers are focused on conventional hacking and data theft. The cyber security of industrial control systems used in nuclear power plants and other critical energy infrastructure, as well as non-nuclear process plants, is a priority in the new era of modernization. CNL has already commissioned a nuclear cyber security test facility located in New Brunswick, and has a deployable nuclear industrial control cyber intrusion detection and mitigation system.
- **Reactor sustainability:** Support Canada's fleet of reactors through work on life extension and long-term reliability of the existing fleet of CANDU reactors domestically and internationally, and expansion to include support for other reactor designs. CNL is transforming from a historical CANDU focus to a broader "CANDU and more" perspective and building on capabilities in advanced nuclear materials and fuels research and nuclear chemistry applications.
- **Science and technology for advanced environmental sustainability:** CNL is working to expand the understanding of the behaviour of contaminant radionuclides, and further develop safe, economical nuclear waste management technologies. The environmental technology capability will also continue to support the Government in monitoring for the presence and spread of low levels of contamination.

Nuclear Laboratories Five-Year Projection for Use of Approved Federal Funding

				Plan					
(millions of Canadian dollars)	**Notes**	**Actual 2020-21**	**Budget 2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**5 Year Total**
Nuclear Laboratories									
Nuclear Laboratories – Operating		240	319	269	274	343	183	104	1,172
Revenue		57	63	68	76	80	81	87	392
Capital		107	142	147	142	158	81	–	529
Federal Funding Requirement	1	**290**	**398**	**348**	**340**	**421**	**183**	**17**	**1,309**

[1] The current GoCo contract ends September 2025 and current approved funding only extends up until this point.

Science and Technology

Federal Nuclear Science and Technology Work Plan

Overview: AECL oversees the delivery of the Federal Nuclear Science and Technology Work Plan for nuclear research and development to support the government's priorities and core responsibilities in the areas of health, nuclear safety and security, energy, and the environment. The Federal Nuclear Science and Technology Work Plan serves to build, maintain, and maximize those capabilities that are unique to CNL. AECL engages with 14 federal departments and agencies to develop a program of work that meets their needs and priorities, fosters innovation through the development of technologies and applications, and supports Canada's international partnerships, commitments, and obligations.

AECL's Federal Nuclear Science and Technology Work Plan includes the participation of:

1. Canada Border Services Agency
2. Canadian Nuclear Safety Commission
3. Canadian Space Agency
4. Communications Security Establishment
5. Defence Research and Development Canada
6. Department of National Defence
7. Environment and Climate Change Canada
8. Global Affairs Canada
9. Health Canada
10. Innovation, Science and Economic Development
11. National Research Council of Canada
12. Natural Resources Canada
13. Public Safety Canada
14. Royal Canadian Mounted Police

AECL's Federal Nuclear Science and Technology Work Plan focuses on four research themes:

1) Supporting the development of biological applications and understanding the implications of radiation on living things. This includes:
   - Improving the understanding of radiological health risks caused by exposure to radiation at levels found in occupational and public environments.
   - Contributing to the body of evidence that informs the international radiation protection framework (e.g., United Nations Scientific Committee on the Effects of Atomic Radiation, International Commission on Radiological Protection, International Atomic Energy Agency).
   - Collecting or generating evidence to inform the application of international recommendations in Canada and incorporation into Canadian regulations and national guidance.
   - Increasing knowledge of the uncertainties in low-dose risk assessment to address challenges in regulatory policy, health assessment and public communication.
   - Developing better methods for diagnosis and treatment using biological applications of nuclear research.

2) Enhancing national and global security, nuclear preparedness and emergency response. This includes:
   - Developing and advancing science and technology to detect, monitor, track and characterize chemical, biological, and radioactive and nuclear materials, including special nuclear materials, and other threats, such as explosives.
   - Improving Canadian global leadership in science and technology development to support nuclear non-proliferation, safeguards and trade and export control objectives as part of Canada's broader aim to advance its security interests around the world.
   - Supporting Canada's international commitments on the peaceful use of nuclear energy and its interests in the Comprehensive Nuclear-Test-Ban Treaty, Fissile Material Cut-off Treaty and the International Partnership for Nuclear Disarmament.
   - Improving cyber security and protecting our nuclear critical infrastructure from cyber-threats.
   - Developing novel techniques and methodologies for nuclear forensics to support federal agencies in their effort to establish and advance the national nuclear forensics capability.
   - Ensuring that Canada is ready to respond in an event of a radiological, nuclear and mix-threats emergency, in Canada or abroad.

3) Supporting safe, secure, and responsible use and development of nuclear technologies. This includes:
   - Implementing the Pan-Canadian Framework and helping achieve Canada's international greenhouse gas targets by reducing the environmental impacts of energy production, bringing clean electricity onto the grid, reducing industrial emissions, and reducing diesel use in remote communities.
   - Increasing competitiveness and promoting the use of clean technology – including in Canada's natural resource sectors – through research, development, and demonstration of innovative nuclear energy technologies.
   - Supporting the Government of Canada's small modular reactors initiatives.
   - Delivering on Canada's commitment under Mission Innovation to advance clean energy research, development, and demonstration while encouraging private sector investment and increasing domestic and international partnerships.
   - Informing potential programs, regulations, and policies for new nuclear energy technologies.

4) Supporting environmental stewardship and radioactive waste management. This includes:
   - Supporting Canada's national and international leadership to reduce environmental impact of nuclear energy.
   - Enabling Canada's environmental stewardship by seeing that nuclear energy is developed within a robust framework that addresses environmental and waste management concerns.
   - Developing and demonstrating innovative technologies to reduce environmental impacts, increase competitiveness, and promote the use of clean technology including in Canada's natural resource sectors.

Status: In 2021-22, the federal interdepartmental committees, representing 14 departments and agencies, continued to work with CNL on developing a program of work that addresses the medium and long-term government priorities in climate change and a clean environment, innovation for economic growth and prosperity, and the health, safety and security of Canadians. This includes work to:

- Demonstrate the production of hydrogen without greenhouse gas emissions using a copper-chlorine (Cu-Cl) thermochemical cycle. This work contributes to the Generation IV Forum and CNL's work on hydrogen to decarbonize the transportation sector;
- Advance small modular reactor technologies and deployment for Canada in order to inform regulatory guidance, assessments and policies such as experimental validation of predictive models in support of safety analysis and licensing and the development of sensor monitoring of remote and underground structures;

- Support regulatory and licensing decisions for projects to understand the behavior of materials in advanced reactors, small modular reactors and the current fleet in extreme environments and the effects of aging, corrosion and degradation of in-core materials such as concrete and cables;
- Examine the potential for small modular reactors to meet the needs of a near-zero carbon remote mining operation;
- Develop improved bio dosimetry techniques for rapid triage in emergency response;
- Examine the safety and efficacy of Actinium-225 in support of new medical applications for cancer treatments;
- Improve the understanding of the basis of biological effectiveness of different radiations at low doses and dose rate;
- Advance technologies for the detection of special nuclear materials at the border;
- Reduce uncertainties in low-dose risk assessment to address challenges in regulatory policy, health assessment and public communication through in vivo mice studies;
- Improve the understanding of environmental impacts and waste of SMR operations in support of the SMR Action Plan;
- Host exercises to test cyber security resilience for nuclear power plants in a full- scale cyber physical simulation of the control and safety systems; and,
- Support Canada's interests, commitments and arrangements in non-proliferation, counter- terrorism and disarmament priorities such as the International Partnership for Nuclear Disarmament Verification and the Comprehensive Nuclear-Test-Ban Treaty Organization though international engagements and technology demonstrations at the Chalk River site.

Work in 2022-23 and over the planning period is consistent with and responsive to AECL's priorities, including support for the government's priorities and the achievement of its climate change targets in 2030 and 2050. On the international front, priorities include strengthening Canada's bilateral partnerships on nuclear science and technology with countries such as the United States and the United Kingdom, as well as multilateral partnerships including the Nuclear Energy Agency, the International Atomic Energy Agency, the Generation IV International Forum, the Fissile Material Cut-off Treaty, the Comprehensive Nuclear Test Ban Treaty, and the International Partnership for Nuclear Disarmament Verification.

As in previous years, the measures of success are related to meeting federal priorities through delivering on milestones and targets set out in CNL's annual plan.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Deliver quality research projects on time, as set out in the Federal Nuclear Science and Technology Work Plan and detailed in CNL's annual plan.	Meet identified project objectives and disseminate the results with uptake from stakeholders.	Support Canada's position as a global player in areas of security, health, energy, and nuclear regulation. Develop highly qualified personnel for the next generation of nuclear workers and scientists. Advance unique technical knowledge and understanding to support nuclear policy and regulation, and maintain Canada's ability to actively participate in international for a and meet international obligations with respect to energy technology, safety, security, and nonproliferation.

Construction is underway on the Science and Collaboration Centre at Chalk River.

CNL as a Federal Laboratory

Overview: In addition to work for federal departments and agencies under the Federal Nuclear Science and Technology Work Plan, CNL provides services and access to its unique expertise and facilities on a commercial basis. These capabilities are also made available to international agencies such as the International Atomic Energy Agency and the Nuclear Energy Agency.

Status: In 2021-22, CNL continued to work with various government departments and agencies on nuclear research in safety and security.

In 2021-22, CNL completed the re-fuel of the AECL-supplied SLOWPOKE reactor at the Royal Military College of Canada in Kingston, Ontario. This milestone will enable professional development and academic research, including nuclear and radiological forensic expertise, and rapid response capabilities for environmental and nuclear emergencies to continue to further support the activities and operations of the Canadian Armed Forces, Department of National Defence, the North Atlantic Treaty Organization, the Royal Canadian Air Force, Canadian Special Operations Forces Command and the Navy's Directorate of Nuclear Safety.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Propose and develop between 3 and 5 collaborative agreements, memoranda of understanding or other agreements with organizations.	Sign between 3 and 5 collaborative agreements, memoranda of understanding or other agreements with organizations.	Leverage nuclear science and technology to increase collaboration in support of federal roles and needs for the benefit of Canadians.

New Technology Initiative Fund

Overview: The New Technology Initiatives Fund allows CNL to undertake science and technology activities to build expertise and capability at the Chalk River Laboratories, with a long-term view to attracting and retaining world-class expertise and building skills and knowledge that are anticipated to be needed for future or emerging opportunities. Consistent with similar programs at national laboratories around the world, providing funding to support work and projects that may be at very early stages, peripheral to current research priorities, high risk, or exploratory, the New Technology Initiatives Fund is expected to promote innovative thinking, reward initiative, balance near-term priorities with long-term vision, and improve employee engagement.

Status: Planned work in 2022-23 includes:

- Materials, chemistry and corrosion testing on irradiated and unirradiated materials for CANDU facilities.
- Commercial work relating to small modular reactors. CNL expects to achieve further growth in multiple services categories including fuel prototyping and qualification, novel test facility design and operation, feasibility studies for end users, materials testing, and safety analysis.
- Production and supply of radionuclides for purposes of targeted alpha therapy in the battle against cancer and other diseases.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Maintain and enhance expertise and capabilities.	Maintain and develop expertise and capabilities.	Develop world-class expertise, new capabilities, and build skills and knowledge for future or emerging opportunities.

Commercial Science and Technology

Overview: CNL will continue to provide commercial services to third parties and to continue to build a strong, vibrant and sustainable nuclear science and technology mission.

Status: Building on previous years' efforts, CNL continued to engage with and respond to existing customers' requests and explore new markets, to the extent possible given COVID restrictions. CNL will continue to expand commercial opportunities based on identified strategic directions and opportunities, with growth expected in the areas of light water and small modular reactors.

Commercial opportunities in science and technology for industry customers continue to be pursued in the areas of health, safety and security, energy, and environment – with energy being the single largest area of current work and the largest growth area. Work for industry customers included energy-related services to the CANDU Owners Group, major utility companies, and new work in the light-water reactor market.

The Chalk River Laboratories

Anticipated work for 2022-23 includes:

- Materials, chemistry and corrosion testing on irradiated and unirradiated materials for CANDU facilities.
- Tool development and technical support to CANDU utilities to reduce outage time and worker dose rates during refurbishment and major component replacement projects.
- Post irradiation examination of light-water reactor fuel for a US utility, including innovative destructive examination (burst testing) of fuel cladding that will provide valuable insight into corrosion rates and material integrity. Once the study is complete, it is anticipated that other US utilities will be interested in similar examinations for their units.
- Characterization and related support for OPG's decommissioning strategy at Pickering and other commercial opportunities related to environmental decommissioning.
- Commercial work relating to small modular reactors. CNL expects to achieve further growth in multiple services categories including fuel prototyping and qualification, novel test facility design and operation, feasibility studies for end users, materials testing, and safety analysis. In particular, services to the OPG Darlington New Nuclear Project (DNNP) will be a crucial component of CNL's growth in this market sector in 2022-23.
- The provision of techno-economic feasibility assessments for hydrogen production and hydrogen-derived clean fuels (e.g. syngas, synthetic diesel, methanol, etc.).
- Tritium process engineering support for fusion energy developers and for CNL's heavy water detritiation project
- Production and supply of radionuclides for purposes of targeted alpha therapy in the battle against cancer and other diseases. This is in alignment with efforts to become an internationally recognized centre of excellence in this domain. CNL can apply existing expertise in isotope separation, scaling up of processing and handling of radionuclides. Strategic commercial partnerships are being pursued, including progress of arrangements with private sector industry, to grow revenues in the pharmaceutical market.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Generate more than $65.3M in revenue.*	3%-5% growth year-over-year.	2%-3% growth year-over-year.

* Revenue target adjusted for COVID-19 impact

National Research Universal Reactor

After 60 years of operation, the National Research Universal reactor was shut down in March 2018. Designed in the early 1950's, the low-temperature, low pressure, research reactor enabled great advances across a wide variety of globally important industrial sectors. The National Research Universal reactor was used to prove many concepts which later appeared in the CANDU reactor. It spawned a global medical radioisotope industry and provided the neutron source to conduct research across a wide spectrum of sciences, both applied and basic.

The reactor shutdown reactor has left a significant gap in research capabilities at the Chalk River Laboratories. AECL and CNL are currently exploring options around a future research reactor.

Heavy water

AECL currently owns heavy water assets which can be used either in a CANDU reactor or for non-nuclear purposes. Activities associated with this are limited to managing and selling the existing inventory. Through the GoCo model, CNL acts as an agent for AECL for the marketing, sale and distribution of AECL's heavy water inventory. CNL also manages AECL's inventory of heavy water at AECL's facility in Laprade, Quebec.

AECL will be looking to CNL to continue its work to optimize the management and sales of heavy water. Revenues from heavy water are retained by AECL to fund historic liabilities and business priorities in science and technology and related capital expenditures.

Revitalization of the Chalk River Laboratories (Capital Plan)

CNL's long-term plans for targeted and strategic capital investments will allow the laboratories to grow the unique complement of science and technology capabilities, while remaining flexible to quickly adapt to the evolutionary opportunities of nuclear and energy-related, leading-edge innovation. These investments will contribute to an efficient and cost-effective campus, replacing aged facilities and infrastructure that are costly to operate and maintain.

As part of AECL's role in overseeing CNL's activities for the management and operations of our sites, a clear focus is placed on the ongoing, safe operations of the nuclear laboratories and decommissioning sites. Above and beyond the role of the CNSC which, as a regulator, ensures that all nuclear activities in Canada are delivered safely, AECL expects high levels of performance from CNL in health, safety, security, and environmental protection.

AECL has also asked CNL to transform its operations to increase value for money and reduce costs and risks to Canada. The overall objective is to have in place a cost-effective, modern campus-like site with new and refurbished facilities to support the future growth of CNL. Any capital investments at AECL sites will take into consideration best practices with respect to sustainability and green building standards in order for AECL to meet its GHG emission reduction targets. Details on capital plans are provided in Annex 2.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Complete and commission new non-nuclear facilities.	Commence construction on the new Advanced Nuclear Materials Research Centre.	Complete construction and commissioning of the Advanced Nuclear Materials Research Centre
Ensure stability in health, safety, security, and environmental industry standard metrics against industry standard benchmarks.	Continue improving health, safety, security and environmental metrics.	
Implement actions to achieve CNL's objectives to manage operating costs while maintaining safety and the protection of the environment, with a view to ensuring a sustainable and science-focused organization in the long-term.	Continue achieving industry best practices for the management of the Chalk River Laboratories and all AECL sites.	

Objectives and Plans – Environmental Stewardship

AECL's objective is to protect the environment by advancing key decommissioning, remediation, and waste management projects to address risks and hazards.

AECL has been conducting nuclear science and technology activities for seven decades. While these activities have had important benefits for Canada and Canadians—for example the production of medical isotopes used in the detection and treatment of cancer—they also produced radioactive waste. AECL has various types of radioactive waste at its sites, including high-level waste (used fuel), intermediate- and low-level waste. Several sites, buildings and structures have also been contaminated as a result of nuclear science and technology activities and past waste-management practices; these need to be decontaminated and demolished, sites cleaned up and remediated, and the radioactive waste managed properly and safely.

AECL is also responsible for fulfilling Canada's responsibilities with respect to historic low-level waste at sites where the original owner no longer exists, or another party cannot be held liable and for which the Government has accepted responsibility. This includes the cleanup and safe long-term management of historic, low-level radioactive waste in the Ontario municipalities of Port Hope and Clarington, pursuant to an agreement between Canada and the municipalities. This project is one of the largest and most complex environmental projects in Canada.

With the implementation of the GoCo model, AECL received a mandate to accelerate these activities to reduce risks and costs for Canada in a safe manner, consistent with international leading practices. Specifically, AECL has asked CNL to propose long-term radioactive waste disposal solutions and to advance other decommissioning activities to reduce its environmental liabilities.

This work is well underway, with significant progress having been made at the Chalk River Laboratories where over one hundred old and outdated buildings and structures have been demolished. This not only reduces AECL's environmental liabilities and overall site-maintenance costs, but it also paves the way for new facilities to be constructed as part of the site's revitalization.

AECL's planned results under Environmental Stewardship include working safely to reduce environmental risks and hazards in the short-term, working towards environmental remediation and closure of four nuclear sites, and ultimately protecting Canadians and the environment through decommissioning and waste management activities.

Environmental Stewardship Five-Year Projection for Use of Approved Federal Funding

(millions of Canadian dollars)	Notes	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
Environmental Stewardship									
Total Environmental Stewardship		649	821	981	1,003	974	454	83	3,495
Revenue		3	3	3	3	3	3	3	15
Federal Funding Requirement	1	**646**	**818**	**978**	**1,000**	**971**	**451**	**80**	**3,480**

[1] AECL currently only has approved funding for the majority of its activities until mid-2025. Please refer to the next table for details on funding requirements beyond this date.

Environmental Stewardship Five-Year Projection of Federal Funding Requirements Including Unapproved Funding

(millions of Canadian dollars)	Notes	Plan 2022-23	2023-24	2024-25	2025-26	2065-27	5 Year Total
Environmental Stewardship							
Total Environmental Stewardship		978	1,000	971	786	650	4,385
Difference Between Approved Government of Canada Funding and Federal Funding Requirements Including Unapproved Funding	1	–	–	–	**(335)**	**(570)**	**(905)**

[1] The table above includes, in addition to approved funding, preliminary AECL projections of anticipated funding requirements that have not yet been subject to the federal cycle for approval of expenditures by the government and Parliament. These estimates are subject to further planning, and neither their preliminary status nor the numbers should be interpreted as an indication of the future funding level for AECL.

Indigenous Engagement, Consultation and Reconciliation

AECL has in place an Indigenous Engagement Strategy and is committed to:

- Identifying shared priorities and opportunities for mutual benefit.
- Co-developing engagement and risk communication strategies.
- Integrating Indigenous knowledge, perspectives, practices and ceremony.
- Prioritizing capacity-building initiatives, e.g., community-led monitoring and stewardship programs.
- Finding creative and collaborative ways to broaden, strengthen and formalize First Nation, Métis and Inuit participation in AECL sites and activities.
- Supporting initiatives and accommodations that reduce and overcome harm at the community level.

During the planning period, AECL will continuing its efforts to build meaningful relationships with Indigenous communities, recognizing that this takes time. Various agreements have either been put in place or are at different stages of development. AECL will continue to pursue these, including identifying work and activities that demonstrate its commitments beyond agreements.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Develop or renew between 3 and 5 agreements with Indigenous communities.	Publication and signing ceremony for AECL Reconciliation Plan in 2024/25.	Indigenous Nations are partners in providing advice on, and receiving benefits from, AECL activities.

A reconciliation action plan will also be co-developed with Indigenous communities to further identify collaboration and partnerships.

Remediation, Decommissioning and Radioactive Waste Management at the Chalk River Laboratories:

Activities in this area include all waste and decommissioning activities to address AECL's environmental, decommissioning, and waste management responsibilities at its Chalk River Laboratories.

Waste management and disposal at the Chalk River site

Overview: Radioactive waste is safely stored at the Chalk River site. However, long-term management and disposal solutions must be developed for various types of wastes to allow for the remediation of contaminated buildings, lands and soils, and to move away from continuous temporary storage. As such, CNL has proposed to build a Near Surface Disposal Facility (NSDF) for the disposal of AECL's low-level radioactive waste, as well as small amounts of waste from other Canadian producers such as hospitals and universities. The facility would allow for the disposal of the vast majority of AECL wastes currently in interim storage, as well as waste generated as a result of contaminated land remediation activities, decommissioning activities and continued operations of the nuclear laboratories. As noted above, this project is critical to advance decommissioning and remediation activities at AECL sites, and to further protect the environment.

With respect to AECL's intermediate-level waste, CNL will continue to explore options over the planning period and will align with the work that the Nuclear Waste Management Organization (NWMO) is doing, as requested by the Minister of Natural Resources, to develop an Integrated Radioactive Waste Strategy for Canada. Of note, AECL's high-level waste (used fuel) is destined to be disposed of in NWMO's proposed repository. Projects to manage used fuel are discussed in more detail in the section on *Management of used fuel and repatriation of highly-enriched uranium* below.

CNL also manages AECL's inventory of highly radioactive stored liquid waste which is a byproduct of medical isotope production. A project is in place to safely remove and process the legacy radioactive liquid wastes from existing tanks at the Chalk River site and to decommission the tanks and associated structures.

Until disposal solutions are approved and available, CNL will continue to manage radioactive waste inventories at dedicated waste management facilities at the Chalk River site in a manner that is safe and minimizes the impacts on the environment.

Status: Since 2016, CNL has been working with CNSC, the regulator, and meeting with stakeholders and Indigenous communities in order to discuss the proposed NSDF.

CNL submitted its final Environmental Impact Statement to the CNSC in December 2020. A two-part public hearing to consider CNL's application has now been scheduled to take place in the first half of 2022, with a decision expected in mid-2023.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Develop a program for radioactive waste where there are no plans for disposal. This will be aligned with the NWMO's work, as requested by the Minister of Natural Resources, to develop an Integrated Radioactive Waste Strategy for Canada.	Complete construction of facility for interim storage of intermediate-level waste. Determine the disposal path for all waste that does not currently have a project in place, including intermediate-level waste.	
Receive low-level radioactive waste from the Whiteshell Laboratories site for storage and/or disposal.		
Receive regulatory approval to begin construction on the NSDF		Safely operate the NSDF and routinely emplace low-level waste from decommissioning, remediation and ongoing nuclear science and technology activities. Retrieve low-level waste from legacy storage, characterize and process for disposal, and emplace in the NSDF. First waste emplacement at the NSDF.

Environmental Restoration at the Chalk River Site

Overview: Nuclear science and technology activities at the Chalk River site have produced a variety of radioactive and other hazardous wastes. These wastes are carefully managed in dedicated areas, otherwise known as waste management areas. While the majority of the Chalk River site remains undisturbed, certain areas, including the waste management areas have contaminated soil and waste requiring retrieval and processing to allow for final disposal. As there remains a significant amount of buried waste, soil contamination and associated plumes, remedial actions are required to further protect the environment. Until such a time, legacy waste is being safely managed and closely monitored.

Status: The remediation of the Waste Management Areas cannot progress until the NSDF is available. The intent is to align the completion of the characterization and remediation planning of the waste-management areas with the availability of the disposal facility.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Complete characterization and remediation plans for various waste management areas at the Chalk River site.	Remediate waste management areas once the NSDF is available.	Complete waste management areas and site remediation activities.

Decommissioning at the Chalk River Site

Overview: The Chalk River site includes multiple redundant and outdated buildings which require decontamination, decommissioning, and demolition. The site has operated since 1944, and some buildings still standing today date back to that era. Some facilities were used as nuclear science and technology facilities (and therefore may have some level of radioactive contamination), while others were used as support buildings (for example machine shops, garages, etc.). Most of these facilities and buildings are outdated, no longer required to meet operational needs and contribute to high site costs through ongoing maintenance for safety and security purposes, energy consumption, etc. Buildings also need to be removed to make way for the Chalk River site revitalization.

Status: Since 2015 there has been significant acceleration of decommissioning work at the Chalk River site: more than 110 buildings and structures have been decontaminated, decommissioned, and demolished.

While COVID required all active decommissioning field work to be paused for several months, and continues to lead to schedule drift, CNL is attempting to recover schedule to the extent possible. It should also be noted that delays in the approval for the Near Surface Disposal Facility have required expanded interim waste storage so that building decontamination and demolition can continue to progress.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Demolish 5 buildings and structures.	Develop and implement a program of work to reduce the liability associated with the inventory of waste and assets in the NRU rod bays.	Reduce long-term liabilities through the safe and environmentally responsible removal of redundant facilities and structures.

Management of Used Fuel and Repatriation of Highly-enriched Uranium

Overview: Highly enriched uranium (HEU) originating in the United States was used at the Chalk River site as reactor fuel and in the production of medical isotopes. This material requires high levels of security as well as costly and complicated storage. As part of the Global Threat Reduction Initiative (an initiative which aims at reducing proliferation risks by consolidating highly enriched uranium inventories in fewer locations around the world), AECL continues to work with the U.S. Department of Energy and CNL to return this material to the United States for conversion and reuse. This initiative provides for a safe, secure, timely and permanent solution to Canada's long-term management of this material.

CNL is also advancing efforts to consolidate AECL's inventory of used fuel. This entails transferring used fuel, currently stored in various locations across Canada, to the Chalk River Laboratories. Consolidating used fuel in a single location will increase safety and security and reduce costs while the NWMO develops a permanent disposal solution.

Status: The fuel-repatriation program continues to focus on the repatriation of nuclear fuel and fuel material to their respective countries of origin, thereby removing this risk and liability from Canada, and contributing to our non-proliferation and nuclear security objectives.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Continue to investigate and pursue the disposition or repatriation of fresh and irradiated fuel material to further reduce liabilities for Canada.	Continue to investigate and pursue the disposition or repatriation of fresh and irradiated fuel material to further reduce liabilities for Canada.	
Prepare plans and begin stakeholder and Indigenous engagement activities for the shipments of AECL used fuel to the Chalk River site. Various levels of engagement have already taken place. New fuel storage capacity is ready to accommodate AECL used fuel.		Complete AECL fuel consolidation.

Decommissioning of prototype reactors

Overview: Gentilly-1 and Douglas Point are shutdown prototype nuclear reactors owned by AECL and located in Bécancour, Quebec and Kincardine, Ontario, respectively. The reactors operated in the late 1960s through the mid 1980s to advance the understanding of boiling light waterpower reactors (Gentilly-1) and steam condenser power reactors (Douglas Point). Both reactors are now shut down and in a safe shutdown state prior to being fully decommissioned.

Status: Originally the decommissioning of these prototype reactors was not planned to occur for many decades. However, in an attempt to reduce costs associated with storage and surveillance of this aging infrastructure, decommissioning plans are being prepared to advance this work. In order to move forward with the decommissioning of certain non-nuclear buildings at the Douglas Point site, CNL requested an amendment to its operating licence. Permission to move forward with decommissioning of the non-nuclear facilities was granted in March 2021. At Gentilly-1, asbestos and bulk waste removal continued in 2021-22.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Demolish supporting and/or redundant facilities at the Douglas Point reactor. Review options for Douglas Point and Gentilly-1 for transport of fuel to the Chalk River Laboratories.		Continue to advance planning and Indigenous and community engagement for the decommissioning of the Douglas Point and Gentilly-1 reactors.

Port Hope Area Initiative

Overview: The Port Hope Area Initiative represents Canada's commitment to clean up and safely manage historic low-level radioactive waste situated in the Ontario municipalities of Port Hope and Clarington. The objective is to safely relocate and manage roughly 2.1 million cubic meters of historic low-level radioactive waste and contaminated soils. To achieve this, two projects are being undertaken: the Port Granby Project and the Port Hope Project. Both involve the remediation of contaminated material and the construction of a long-term waste management facility in each municipality. Whereas the Port Granby Project is virtually complete, the Port Hope Project will remain ongoing for the coming years.

Status: Significant progress is being made in advancing this complex remediation project. However, there continue to be challenges associated with the number of properties requiring remediation and the timelines associated with this. At the Port Granby Project, the total estimated waste volume increased by more than 30% from the original estimates due to the wider spread of contamination. That said, remediation was completed in the fall of 2020 and the facility is now capped and closed. Final restoration of the lands surrounding the facility and remediated areas will be complete in 2022-23.

As part of the Port Hope Project, activities resumed for the construction of the long-term waste management facility, after work stoppages due to COVID. Remediation of the waterworks east site and the Mill Street sites is complete. The remediation of the following sites is also complete: the Pine Street Consolidation site, the Strachan Street site, four temporary storage sites, and the Welcome Waste Facility. The project team has progressed to remediating the lands directly under and surrounding the railway viaducts. This is a large-scale remediation which will conclude early in 2022-23.

The largest challenge in this project relates to the scope and execution of the remediation of residential properties. As characterization activities have advanced, the number of properties requiring remediation work has increased. Port Hope property owners and residents have expressed dissatisfaction about the time it takes to remediate their properties. CNL's experience in the field has identified the fact that a significant number of property cleanups are being driven by the generic, conservative cleanup criteria for arsenic in soil. As such, CNL is recommending changes to the PHAI cleanup criteria for arsenic to minimize unintended negative environmental impacts and disruption to the community.

CNL submitted an application to the CNSC and is engaging federal and provincial regulators, the municipality, local Indigenous communities, and the public to move its application forward. A public hearing is not expected until late 2022.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Restore the Port Granby remediation site and place the long-term waste management facility into long term surveillance.	Port Hope Project: Complete large-scale industrial remediation projects.	Complete remediation of low-level radioactive waste for residential properties in Port Hope. Port Hope long-term waste management facility is closed and capped and in long-term surveillance.
Engage local Indigenous nations and communities to explore options and gather feedback on potential changes to the cleanup criteria for the Port Hope Project.		

Low-level Radioactive Waste Management Office

Overview: The Government of Canada, through AECL, has assumed responsibility for historic, low-level radioactive waste where the original owner no longer exists, and the current owner cannot reasonably be held responsible. Through CNL, AECL is managing these responsibilities which include the cleanup of historic low-level radioactive waste at various sites across Canada (excluding the Port Hope Area Initiative, discussed above). This includes ongoing interim waste management and remediation projects mostly in Ontario, Alberta, and the Northwest Territories.

Status: Planning, stakeholder and Indigenous engagement continue to enable the remediation of sites along the Northern Transportation Route. The field work planned for 2020 and delayed by COVID to 2021 has been completed. This includes the removal for disposal of the material stored in the temporary storage sites at the Fort Smith landfill in the Northwest Territories and at Fort Fitzgerald in Northern Alberta. Planning and design activities continue for the next phase of clean-up activities that will closely follow remediation of the temporary storage sites, as does engagement with the Indigenous communities and capacity-building through contribution agreements.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Engage local stakeholders and Indigenous communities to agree on phase 2 cleanup plans for sites along the Northern Transportation Route located in the southeastern Northwest Territories and northern Alberta.	Continue to engage local stakeholders and Indigenous communities. Complete phase 2 remediation activities for sites along the Northern Transportation Route located in the southeastern Northwest Territories and northern Alberta. Commence remediation for sites in the Sahtu region along the Northern Transportation Route.	Complete remediation for all sites along the Northern Transportation Route. Complete remediation of Greater Toronto Area sites where the Government of Canada has accepted the liability.

Decommissioning and Closure of the Whiteshell Laboratories

Overview: The Whiteshell Laboratories, located in Pinawa, Manitoba, is the second largest of AECL's sites operated by CNL. It was established in 1963 as a research laboratory, with a focus on the largest organically cooled, heavy water moderated nuclear reactor in the world, the WR-1. Facilities also included a SLOWPOKE reactor, as well as shielded hot cell facilities and other nuclear research laboratories. The site includes a radioactive waste management area which provides interim storage of radioactive waste created through operations.

In 1998, the Government announced the closure of the Whiteshell Laboratories, and decommissioning activities have been underway since then. With the implementation of the GoCo model and the increased emphasis placed on tackling its environmental and decommissioning responsibilities, AECL has asked CNL to accelerate and complete the decommissioning and closure of the site. As a result, CNL is proposing to decommission and close the site by 2027, approximately 30 years ahead of the previous schedule. The acceleration of the decommissioning of the site includes a proposal by CNL to decommission the WR-1 reactor *in situ*. That project is undergoing an Environmental Assessment.

Status: CNL has been progressing the decommissioning of the site, with several buildings being decontaminated and demolished. However, significant challenges have emerged with respect to the complexity and level of hazard related to the retrieval, processing and transport of radioactive waste stored in a radioactive waste management area known as the standpipes and bunkers. These are concrete structures, mostly below grade, which contain intermediate-level waste and potentially fissile nuclear material that cannot be fully characterized before retrieval begins. Given the level of risk involved with their remediation, CNL has had to adjust its approach which is now more complex and costly (as it is based on remote tooling and robotics), in order to protect workers and the environment.

CNL also continued its activities to engage the public and Indigenous communities on its proposal to decommission the WR-1 reactor *in situ*. This has included extensive engagement with Indigenous and local communities, providing funding for traditional knowledge studies, other capacity-building activities and liaison positions, hosting site tours, and open houses, etc. AECL has also been participating in many of these engagement activities, with a view to building long-term relationships. That said, higher-than-anticipated public and Indigenous engagement, as well as requests from the CNSC to provide additional technical studies, have led to delays in the project of almost three years. While these have had a financial impact on the project, they are allowing for more public and Indigenous engagement, and the development of additional studies in support of the project's safety case (which are also facilitating public and Indigenous engagement). CNL submitted a revised draft Environmental Impact Statement in early 2022 for a public licensing hearing expected in 2023-24.

Looking to the final site closure and being mindful of the impact on the local community, AECL will continue to work with local and Indigenous communities to discuss the future of AECL's lands, with a view to finding acceptable solutions to support economic development, which could include consideration for siting a small modular reactor at the Whiteshell site.

As with other AECL sites, decommissioning activities were paused at the Whiteshell site in March 2020. While working remotely, CNL attempted to mitigate schedule impacts by pivoting to necessary planning and design activities related to the standpipe remediation and other projects. While delayed physical works impacted the schedule, CNL is making every effort to recover this lost time to achieve closure in 2027.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Decommission the majority of buildings on the main campus by 2022.	Remove and transport all high-level radioactive waste and used fuel to the Chalk River Laboratories.	Complete Whiteshell site contamination remediation, as well as a long-term surveillance plan.
Prepare the retrieval system for the standpipes and bunkers to start operations.		Complete waste retrieval for all the standpipes in the waste management area.
Submit the final Environmental Impact Statement for the proposed *in situ* decommissioning of the WR-1 reactor.		CNSC accepts as complete all active decommissioning and waste management activities, with only long-term monitoring and surveillance activities remaining.

Closure of the Nuclear Power Demonstration Reactor Site

Overview: The Nuclear Power Demonstration reactor, located in Rolphton, Ontario, was the first Canadian nuclear power reactor and the prototype for the CANDU reactor design. For 25 years, the reactor produced low-carbon energy and operated as a training centre for nuclear operators and engineers from Canada and around the world. Operations ended in 1987, after which the first stages of decommissioning were completed, including the removal of all fuel from the site and the draining of the systems. The site has been in a safe shutdown state for the last 30 years. As part of its objectives to protect the environment and address its environmental and decommissioning responsibilities, AECL has asked CNL to propose plans to safely decommission and close the reactor site. As a result, CNL is proposing to decommission the reactor *in situ*, meaning that it would be immobilized in place by grouting (cementing) the reactor which is located below the surface. The project is currently undergoing an Environmental Assessment.

Status: Since the launch of the Environmental Assessment process in 2016, CNL has been developing its safety case and preparing scientific studies with a view to providing all necessary documentation and responding to stakeholders and Indigenous groups' concerns. A final draft Environmental Impact Statement will be submitted in early 2023. While the project is more than three years delayed, it has allowed for additional engagement of stakeholders and Indigenous communities on the project in order to gather input and adjust the proposed approach as necessary. Activities have included multiple meetings, site tours and outreach to Indigenous communities, including providing funding for capacity building and traditional knowledge studies, and to enable Indigenous communities to engage technical experts to comment on the Environmental Impact Statement.

TARGETS		
Short-term 1-2 years	Medium-term 3-4 years	Long-term 5+ years
Submit the final Environmental Impact Statement for the proposed in-situ decommissioning of the Nuclear Power Demonstration reactor.	Remediate reactor site contamination, with long-term monitoring and surveillance in place. CNSC accepts as complete all active decommissioning and waste management activities, with only long-term monitoring and surveillance activities remaining.	Ongoing long-term monitoring and surveillance.

Third-party Waste

AECL's sites and waste management capabilities are unique in Canada. Historically, AECL has accepted small amounts of radioactive waste from Canadian facilities, most notably hospitals and universities. CNL continues to provide these services to third parties for the handling, storage and disposal of radioactive waste. These activities are delivered on a full cost-recovery basis and do not require government funding. Budgets have been included for completeness.

Other Areas of Focus

Wrap-Up Office (Retained Liabilities from Former CANDU Reactor Division)

These activities relate to legal matters related to AECL's former CANDU Reactor Division, the assets of which were sold to Candu Energy Inc. in 2011. The few remaining claims and litigations that comprise the business of the Wrap-up Office are being managed by AECL's legal team, supported by external counsel. This includes the commercial and legal work required to defend, assert, and settle outstanding claims.

Annex 1 – Financial Overview

Financial Statements and Notes

This section presents AECL's financial statements reflective of AECL's role under the GoCo model, which include payments to CNL and its parent company, Canadian National Energy Alliance. The mission budgets (e.g., science and technology, environmental stewardship, and capital) include direct and indirect costs.

Under the GoCo model, AECL receives funding from the Government of Canada to deliver on commitments, priorities and objectives related to the nuclear laboratories (including nuclear science and technology and the revitalization of the Chalk River site), as well as environmental stewardship. CNL manages and operates AECL's sites and undertakes the necessary activities to respond to AECL priorities as per its contractual arrangement with AECL. Revenue from third-party work performed by CNL using AECL sites, facilities and assets is recognized by AECL. Revenue is generated from work to support the nuclear energy industry, the sale or lease of heavy water, and research and development services provided to third parties.

Statement of Financial Position

(millions of Canadian dollars)	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27
Financial Assets							
Cash	159	159	159	159	159	159	159
Long-term disposal of waste fund	48	53	58	63	69	74	80
Investments held in trust	58	60	62	64	66	68	70
Trade and other receivables	43	45	45	45	45	45	45
Appropriations receivable	123	140	160	165	165	130	120
Inventories held for resale	129	113	97	81	64	48	31
	561	571	582	578	569	524	505
Liabilities							
Accounts payable and accrued liabilities	37	38	37	36	36	35	34
Employee future benefits	16	14	12	10	8	6	4
Due to Canadian Nuclear Laboratories	176	195	215	220	220	185	175
Decommissioning and waste management provision	7,362	7,036	6,568	6,107	5,615	5,245	4,956
Contaminated sites liability	790	1,444	1,229	965	737	550	401
	8,381	8,727	8,062	7,338	6,617	6,021	5,570
Net Debt	(7,821)	(8,156)	(7,480)	(6,760)	(6,048)	(5,497)	(5,064)
Non-Financial Assets							
Tangible capital assets	787	879	979	1,077	1,196	1,303	1,417
Prepaid expenses	1	1	1	1	1	1	1
	787	880	980	1,078	1,197	1,304	1,418
Accumulated Deficit	**(7,033)**	**(7,276)**	**(6,500)**	**(5,682)**	**(4,851)**	**(4,193)**	**(3,647)**
Accumulated deficit is comprised of:							
Accumulated operating deficit	(7,035)	(7,276)	(6,500)	(5,682)	(4,851)	(4,193)	(3,647)
Accumulated remeasurement gains	2	–	–	–	–	–	–
	(7,033)	**(7,276)**	**(6,500)**	**(5,682)**	**(4,851)**	**(4,193)**	**(3,647)**

The long-term disposal-of-waste fund will increase as AECL sets aside funding to account for future waste disposal activities arising from the ongoing operation of the site which create radioactive waste and/or decommissioning liabilities.

The Decommissioning and Waste Management provision and Contaminated Sites Liability represent the obligation to address waste-management and decommissioning liabilities. The liability is expressed as the net present value of future expenditures required to discharge the obligation. AECL's Decommissioning and Waste Management provision and Contaminated Sites Liability are adjusted annually to reflect progress to date, new estimates as they become available and new waste liabilities arising from ongoing CNL operations.

The year-over-year change in these accounts represents the increase in the net present value with the passage of time (accretion) offset by the reduction in the liability from the spending incurred each year. The Contaminated Sites Liability, representing liabilities of PHAI and LLRWMO, has been provisionally increased here to reflect an expect increase to that liability in 2022 stemming from PHAI. Other liability changes may occur as CNL advances decommissioning activities. The assessment and planning of projects, which are understood in more detail as projects are undertaken, could result in adjustments to expected cost estimates, which would impact the value of the liability. This is particularly a known risk for the Contaminated Sites Liability as CNL works to re-estimate costs for residential property remediation in Port Hope.

However, as decommissioning work continues in the coming years, the liability will decrease. As the Decommissioning and Waste Management provision and Contaminated Sites Liability decrease, so will AECL's overall Accumulated Deficit. The above projections do not capture the impact of future changes in the interest rate used to derive the net present value changes of the reported liability.

Tangible capital assets are expected to increase in line with increased investment in infrastructure at the Chalk River site, as reflected by the important funding provided for revitalizing the Chalk River Laboratories in the coming years.

Accumulated deficit changes are largely reflective of changes in surplus for the period.

Statement of Operations and Accumulated Deficit

(millions of Canadian dollars)	Notes	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
Revenues									
Parliamentary appropriations	1	941	1,216	1,326	1,340	1,392	1,111	995	6,164
Commercial revenue		95	89	95	103	108	109	116	532
Interest income		4	4	4	4	4	4	4	20
		1,039	1,309	1,425	1,447	1,504	1,224	1,115	6,715
Expenses									
Cost of sales		71	62	67	72	76	77	81	372
Operating expenses	2	71	68	69	65	60	56	56	306
Contractual expenses	3	213	276	219	220	286	207	222	1,154
Decommissioning, waste management and contaminated sites expenses	4	678	1,144	295	273	250	227	210	1,254
		1,033	1,550	649	630	672	566	569	3,086
Surplus for the year	5	7	(241)	776	818	832	658	546	3,629
Accumulated operating deficit, beginning of year		**(7,041)**	**(7,035)**	**(7,276)**	**(6,500)**	**(5,682)**	**(4,851)**	**(4,193)**	
Accumulated operating deficit, end of year		**(7,035)**	**(7,276)**	**(6,500)**	**(5,682)**	**(4,851)**	**(4,193)**	**(3,647)**	

1 Parliamentary appropriations have been updated to reflect AECL's current projection of spend and required funding.

2 These amounts represent AECL's operating expenses associated with its oversight activities and amortization.

3 Contractual expenses include payments to CNL (less payments for decommissioning and waste management, cost of sales and capital) and contractor fees.

4 Decommissioning, waste management and contaminated sites expenses represent the accretion expense on the decommissioning and waste management provision and Contaminated sites liability, as well as any revisions in estimate and timing of expenditures.

5 Large early surpluses are a result of Capital and DWM funding received for which there are smaller corresponding accrual expenses. Capital funding received is partially offset by amortization expense, and DWM funding is partially offset by accretion expense.

Reported contractual expenditures are expected to decrease over the planning period as a result of decreased spending for the National Research Universal reactor, as the reactor is now shut down.

Decommissioning, waste management and contaminated sites expenses include the increase in the net present value (accretion of discount) of the Decommissioning and Waste Management provision and Contaminated Sites Liability. As these obligations decrease, the decommissioning, waste management and contaminated sites expenses will decrease as well. There are also estimates for any expected revisions in estimate and timing of expenditures.

Statement of Cash Flows

(millions of Canadian dollars)	Notes	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
Operating transactions									
Cash receipts from Parliamentary appropriations	1	918	1,199	1,306	1,335	1,392	1,146	1,005	6,184
Cash receipts from customers		147	89	95	103	108	109	116	532
Cash paid to suppliers		(258)	(312)	(259)	(279)	(353)	(307)	(303)	(1,501)
Cash paid to employees		(13)	(13)	(14)	(14)	(14)	(14)	(14)	(70)
Cash paid for decommissioning, waste management and contaminated sites activities		(588)	(818)	(978)	(1,000)	(971)	(786)	(650)	(4,385)
Cash invested for future waste management and disposal activities		(5)	(7)	(7)	(7)	(7)	(8)	(8)	(37)
Interest received		2	4	4	4	4	4	4	20
Cash provided by operating transactions		203	142	147	142	158	145	150	742
Capital transactions									
Acquisition of tangible capital assets		(124)	(142)	(147)	(142)	(158)	(145)	(150)	(742)
Cash applied to capital transactions		(124)	(142)	(147)	(142)	(158)	(145)	(150)	(742)
Increase in cash		**79**	–	–	–	–	–	–	
Cash at beginning of year		**80**	**159**	**159**	**159**	**159**	**159**	**159**	
Cash at end of year		**159**	**159**	**159**	**159**	**159**	**159**	**159**	

1 Parliamentary appropriations have been updated to reflect AECL's current projection of spend and required funding.

Operating Budget And Notes

Government of Canada Federal Funding Requirements Including Unapproved Funding - Operating

(millions of Canadian dollars)	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
AECL								
Environmental stewardship	646	818	978	1,000	971	786	650	4,385
Nuclear laboratories – Operating	183	256	201	198	263	180	195	1,036
Total Government Funding – Operating	**829**	**1,074**	**1,179**	**1,198**	**1,234**	**966**	**845**	**5,422**

Approved Government of Canada Funding – Operating

(millions of Canadian dollars)	Notes	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
AECL									
Environmental stewardship		646	818	978	1,000	971	451	80	3,480
Nuclear laboratories – Operating		183	256	201	198	263	102	17	780
Total Government Funding – Operating	1	**829**	**1,074**	**1,179**	**1,198**	**1,234**	**552**	**97**	**4,260**

1 The current GoCo contract ends September 2025 and current approved funding only extends up until this point.

Note that the above table includes only currently approved funding and does not include assumptions made in other areas of this document regarding submitted or expected funding requests or assumptions surrounding the unfunded period in 2025-26.

Decommissioning and waste management funding has increased due to a ramp up of activities at the Port Hope Area Initiative and accelerated decommissioning and waste management at the Chalk River Laboratories, in particular the planned construction of the NSDF. Nuclear Laboratories funding is expected to decline as a result of the shutdown of the National Research Universal reactor in March 2018.

Capital Budget And Notes

Government of Canada Federal Funding Requirements Including Unapproved Funding – Capital

(millions of Canadian dollars)	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
AECL								
Capital	107	142	147	142	158	145	150	742
Total Government Funding – Capital	**107**	**142**	**147**	**142**	**158**	**145**	**150**	**742**

Approved Government of Canada Funding – Capital

(millions of Canadian dollars)	Notes	Actual 2020-21	Budget 2021-22	Plan 2022-23	2023-24	2024-25	2025-26	2026-27	5 Year Total
AECL									
Capital		107	142	147	142	158	81	–	529
Total Government Funding – Capital	1	**107**	**142**	**147**	**142**	**158**	**81**	–	**529**

1 The current GoCo contract ends September 2025 and current approved funding only extends up until this point.

Note that the above table includes only currently approved funding and does not include assumptions made in other areas of this document regarding submitted or expected funding requests or assumptions surrounding the unfunded period in 2025-26.

More details on the capital plan are provided in Annex 2.

Annex 2 – Revitalization of the Chalk River Laboratories

AECL's plan to revitalize the Chalk River Laboratories is based on CNL's ongoing assessments of infrastructure needs, including consideration for health, safety, security and environmental risks, current facility conditions, regulatory requirements and ongoing business needs. All investments are in support of the renewal and revitalization of the Chalk River site, to create a world-class nuclear science and technology campus that serves the needs of the Government of Canada and of commercial customers.

Revitalization activities are meant to address two main areas:

- **New and Renewed Science Infrastructure –** These investments are part of a longer-term plan to revitalize the Chalk River site and construct new and renewed science facilities to build a modern, world-class nuclear science and technology campus that serves the needs of government and industry.
- **Site Support Infrastructure –** Immediate investments are required to renew existing and aging infrastructure systems and facilities at the Chalk River site such as potable water, storm sewer, sewage treatment, electrical system and other utilities. These investments are necessary to respond to regulatory, health, safety, security and environmental requirements, as well as to maintain a cost efficient and reliable site.

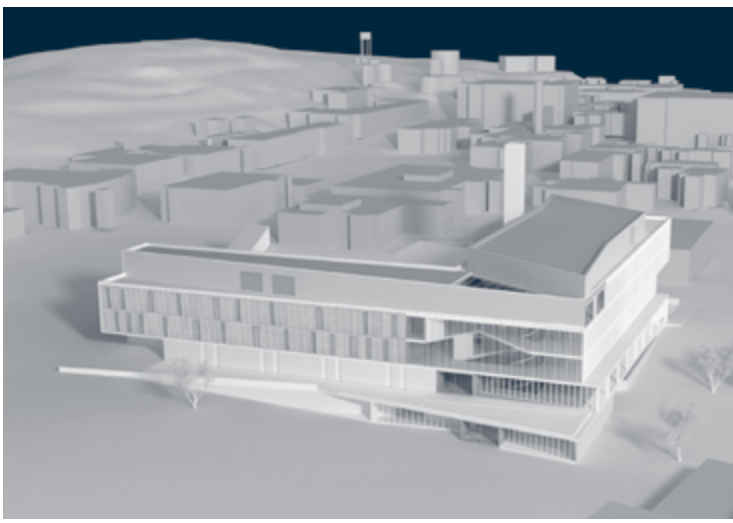
Further details on specific projects for the planning period are presented below.

New and Renewed Science Infrastructure

Projects in this category include modern, world-class science facilities and infrastructure to enable delivery of the commitments established in the long-term plan. The projects to be undertaken are aligned with the strategy to revitalize the Chalk River site.

Advanced Nuclear Materials Research Centre

Overview: This represents the most significant capital investment at the Chalk River Laboratories and a critical facility to enable nuclear science and technology activities for the coming decades. The objective is to combine the capabilities of existing but outdated facilities into a modern shielded facility and laboratory research complex. This new facility will allow further advancements in the nuclear science and technology program, including targeted alpha therapy research, small modular reactors, advanced fuels fabrication, nuclear forensics and response, as well as ongoing work in support of utilities and their reactor life extension and reliability.



Status: The project is being delivered through an Integrated Project Delivery approach, whereby the design and construction teams collaborate at all stages of the project. Concept design is complete and detailed design is now well underway. Construction of the facility will commence in 2022.

The Minwamon building at Chalk River. Photo courtesy of CNL IPD NB Poly Party Team © 2020 Kevin Belanger

Conventional New Builds

Overview: Conventional or non-nuclear new builds are under construction at Chalk River Laboratories to enable the revitalization of the site by consolidating work and enabling the demolition of outdated buildings.

Status: Two of the three facilities, a logistics and warehouse building and a support and maintenance facility, have been built and are operational. The logistics building facilitates shipping and receiving, improves security at the site entrance, and reduces the need for non-CNL staff to be on site. Similarly, the support facility consolidates maintenance resources and equipment into a single location, allowing CNL to achieve efficiencies and provide safer, more cost-effective support to its programs. A third building, the Science Collaboration Centre, is under construction to consolidate office space as other outdated buildings on site are being decommissioned.

Revitalization

Overview: Numerous facilities at the Chalk River site require revitalization to enable long-term reliability and compliance with regulatory and licensing requirements. Over the past few years, efforts were focused on the refurbishment of the Chemistry and Radio Analytical Lab (exterior work), Biological Research Facility, Nuclear Fuel Fabrication Facility and Waste Treatment Center, while seeing that fume hoods across the site remained compliant with applicable safety and environmental requirements.

Status: During 2022-23, it is expected revitalization work will come to an end as work in the Biological Research Centre is expected to close out. This work has been focused on the facility's mechanical systems in an effort to obtain the Good Laboratory Practice designation for the facility.

Site Support Infrastructure

Part of the revitalization of the Chalk River site includes the implementation of new utilities and services as a key enabler to the site's transformation. These are necessary to respond to regulatory requirements, address risks and hazards and reduce overall site operating costs. Projects include:

Information Technology (IT) Investment Projects

Overview: Investments in IT infrastructure include upgrades, replacements and implementation of hardware, software, applications, networks, and communications technologies throughout the CNL organization. The multiple improvements being implemented are broken down as follows:

- Base infrastructure: to upgrade current hardware and software company-wide.
- Business enablement: mostly focused on business intelligence solutions to provide dynamic reporting capability in finance, procurement and human resources.
- Collaboration: mostly focused on providing collaborative IT workspace through the implementation of solutions such as SharePoint.
- Security: the outcome of a comprehensive cyber program assessment, this project is focused on delivering a strong cyber security framework.

Status: In 2021-22, activities continued to modernize and integrate IT applications and systems, automate business system processes, and improve reporting capabilities. A new business-intelligence system was launched, a number of services were moved to the Cloud and voice service upgrades were made across site. Looking ahead, work is planned to upgrade to fiber optic service and increase cyber security through the selection and use of a managed security service provider.

Site Utilities Bridging

Overview: The objective is to further enable reliable electrical power and other essential utility services, continuing the upgrades to aging infrastructure at the Chalk River site.

Status: Recent activities have been focused on utilities' distribution systems for the newly constructed facilities and upgrades to existing distribution networks. Work has been completed on relocating the storm water system piping and installation of the sanitary sewer line for the Advanced Nuclear Materials Research Centre. Planning activities will also take place for the larger investment required to upgrade ageing infrastructure beyond the current contract and planning horizon.

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