Executive Summary

1.0 Introduction

This sixth Canadian report demonstrates how Canada continues to meet its obligations under the terms of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management during the reporting period from April 2014 to March 2017. This report is a collaboration between the Canadian Nuclear Safety Commission (CNSC), federal government departments and industry. It focuses specifically on the progress of long-term management initiatives for spent fuel and radioactive waste in Canada, revisions and updates to Canada’s fifth national report, as well as comments and issues raised at the fifth review meeting, which took place in May 2015. Specifically, this report includes information on:

- Canada’s progress in developing and implementing solutions for the long-term management and disposal of different types of radioactive waste and/or spent fuel
- the restructuring of Atomic Energy of Canada Limited (AECL) and the progress AECL has made in advancing accelerated decommissioning and waste management plans and activities under a new government-owned, contractor-operated (GoCo) model
- the status of the Nuclear Waste Management Organization’s (NWMO) site-selection process for a deep geological repository for the long-term management of Canada’s spent fuel
- the status of Ontario Power Generation’s (OPG) application for a licence to prepare site and construct its Deep Geologic Repository for low- and intermediate-level radioactive waste (L&ILW)

2.0 Canada’s key highlights and current priorities

The following emerged out of the fifth review meeting as key highlights and current priorities for Canada:

- planning for Canada’s long-term management of spent fuel
- reviewing OPG’s application for its Deep Geologic Repository project
- completing the restructuring of AECL
- implementing the CNSC’s integrated action plan in response to the Fukushima Daiichi accident

2.1 Canada’s long-term management of spent fuel

In June 2007, the Government of Canada selected the NWMO-recommended Adaptive Phased Management (APM) approach for the long-term management of Canada’s spent fuel. The NWMO is responsible for implementing this plan. As of July 2017, seven of the original 22 interested communities were participating in the site-selection process. A number of First Nation and Métis
communities are also involved, which is facilitated through learning agreements. See section K.5 for more information.

2.2 Review of OPG’s Deep Geologic Repository project

The Canadian Environmental Assessment Agency (CEA Agency) and the CNSC established a joint review panel (JRP) in January 2012 to review OPG’s environmental impact statement in support of its application for a licence to prepare site for and construct a deep geological repository for its L&ILW. The JRP held public hearings in 2013 and 2014. On May 6, 2015, the JRP issued its environmental assessment report, which included 97 recommendations, to the Minister of Environment and Climate Change for review and decision under the *Canadian Environmental Assessment Act, 2012*. In this report, the JRP concluded that OPG’s Deep Geologic Repository project is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed, the commitments made by OPG during the review and the mitigation measures recommended by the JRP are implemented.

The Minister of Environment and Climate Change requested additional information from OPG in 2016 and 2017. The CEA Agency will review the additional information, which considers input from the federal review team, indigenous groups and the public. The phase after the review process includes the CEA Agency preparing a draft report for the minister followed by a 30-day public comment period on that draft report. Subject to the minister’s decision, the JRP under the *Nuclear Safety and Control Act*, would decide whether to issue a licence to OPG to prepare a site and construct the Deep Geologic Repository facility.

2.3 AECL restructuring

The restructuring of AECL, the federal Crown corporation responsible for enabling nuclear science and technology and managing federal radioactive waste liabilities, was completed in 2015. This included the creation of Canadian Nuclear Laboratories (CNL). All federal responsibilities related to decommissioning and waste management were transferred to AECL and included as part of the scope of work to be performed under the GoCo contractual agreements. As such, the Nuclear Legacy Liabilities Program (NLLP), which was discussed in previous reports, ended in 2015. Decommissioning and waste management work at AECL sites is now being implemented by CNL under the GoCo model. For further information, see section Annex 7.1.

Canada’s historic waste liabilities, including the Port Hope Area Initiative (PHAI), were also transferred to AECL and are being implemented by CNL under a contractual arrangement with AECL. Construction of the containment mound for the Port Hope Project commenced in the summer of 2016. The first cell will be completed in late 2017, with placement of waste from within the community expected to begin in 2018. On November 1, 2016, the first truckloads of low-level radioactive waste were transported away from the Lake Ontario shoreline to the newly built Port Granby Project long-term waste management facility, signifying the start of this significant environmental cleanup. The cleanup is scheduled to take place over three years, after which the mound’s cover system will be constructed (expected to be completed in 2021). For more information on the PHAI, see section K.7.3.1 as well as annexes 8.2.1.1 and 8.2.1.2.

2.4 CNSC post-Fukushima integrated action plan

Canada reported in the seventh *Canadian National Report for the Convention on Nuclear Safety* that the CNSC has completed implementation of its integrated action plan in response to the Fukushima accident. The CNSC action plan also included enhancements to the CNSC’s nuclear regulatory framework. Updates to regulatory documents were completed during the reporting period. Work is ongoing to amend the *Class I Nuclear Facilities Regulations* and the *Radiation Protection Regulations*.

3.0 Progress since the fifth review meeting

During the peer review of Canada’s fifth national report in 2015, contracting parties to the fifth review meeting identified long-term waste management challenges, suggestions and planned measures to
Canada’s progress on long-term management strategies

Canada continues to make progress on long-term management strategies in the areas of:

a) industry access to suitable skills and resources
b) resources to ensure regulatory oversight
c) finding an acceptable site in a willing host community for spent fuel repository
d) implementing GoCo management model and completing procurement process
e) develop an integrated strategy for non-OPG L&ILW disposal
f) CNL sites - accelerated decommissioning and remediation
g) development of radioactive waste management industry forum
h) consolidated waste and decommissioning regulations
i) federal environment minister decision for OPG's DGR project for its L&ILW
j) continue progress in engineered design and site selection process for the long-term management of spent fuel (APM)

(a) Industry access to suitable skills and resources

OPG, Bruce Power and New Brunswick Power Corporation (NB Power) use a number of strategies that focus on extensive workforce planning, succession management, staff development, advance hiring and knowledge management.

Hydro-Québec faced transitional challenges following the decision to permanently shut down the Gentilly-2 Nuclear Generating Station in 2012. Once defuelling the reactor and draining contaminated systems were completed, a permanent organization was put in place to ensure decommissioning activities are performed during the safe storage state with spent fuel in the wet storage bays (2015–20). This organization is composed of about 70 employees; 95 percent of whom worked at Gentilly-2 while it was in operation.

As part of the implementation of the GoCo model, the majority of AECL’s employees were transferred to CNL, allowing CNL to become a private-sector company, operator of the nuclear laboratories and the employer of approximately 3,000 people. Today, AECL is an expert-based Crown corporation that employs around 40 and has a new role of overseeing the GoCo agreements with CNL and the Canadian National Energy Alliance (CNEA). CNL is currently undertaking a skills assessment of all personnel in the organization, including in research and development (R&D).

For more information on industry access to suitable skills and resources, see section K.2.2.1.

(b) Resources to ensure regulatory oversight

The CNSC is now beginning to reap the benefits of the investment in strategic and operational workforce planning over the last two years. Attrition remains the most critical risk to manage and, as such, the CNSC has adopted a “build” strategy to protect core organizational capabilities and competencies that are essential to carrying out its mandate over the long term. Human resources management effort is
focused on four areas: organization design, recruitment and workforce renewal, learning and leadership development, and employee engagement and retention.

(c) Finding an acceptable site in a willing host community for spent fuel repository

Momentum has been sustained for implementing the long-term management approach for spent fuel since the NWMO received its 2007 mandate to implement the APM approach approved by the Government of Canada. Between 2014 and 2017, significant progress was made on the site-selection process (initiated in 2010) as the NWMO worked with interested communities. In 2014, the year began with 17 communities participating in the site-selection process.

As of July 2017, seven of the original 22 interested communities were participating in the site-selection process. A number of First Nation and Métis communities are also involved, which is facilitated through learning agreements. For more information, see section K.5.

(d) Implementing GoCo management model and completing procurement process

In 2009, the federal government embarked on a restructuring of AECL. The restructuring was undertaken in two phases, the first of which was completed in 2011 with the sale of AECL’s CANDU Division to Candu Energy Inc., a wholly-owned subsidiary of SNC-Lavalin Inc. The second phase focused on the remainder of the organization, the nuclear laboratories and associated waste management responsibilities, with the objective of implementing a GoCo model.

The implementation of the GoCo model was also completed in two phases. The first phase, completed in November 2014, consisted of creating and operationalizing CNL as a wholly-owned subsidiary of AECL. Through an internal reorganization, virtually all of AECL’s employees were transferred to CNL along with all of the necessary licences, permits and other authorizations, allowing CNL to become the operator of the nuclear laboratories and employer of the workforce. Following a procurement process led by Natural Resources Canada with support from Public Works and Government Services Canada, CNEA was selected as the preferred bidder to manage and operate CNL. Once AECL transferred the shares of CNL to CNEA, CNL became a private-sector organization.

As a result, today CNL is a private-sector company responsible for the day-to-day management and operation of all of AECL’s sites, facilities and assets. CNL employs approximately 3,000 people, most being previous employees of AECL.

(e) Develop an integrated strategy for non-OPG low and intermediate-level waste disposal

Canada’s radioactive waste owners – AECL, OPG, Hydro-Québec and NB Power – and other selected stakeholders have been meeting since 2014 under the sponsorship of the Canadian Nuclear Association’s Nuclear Leadership Forum to discuss opportunities for coordination and collaboration on long-term management matters, including relevant technologies and communication strategies.

Since the May 2015 Joint Convention review meeting, significant progress has been made in developing and implementing long-term solutions for L&ILW at AECL sites, which will address more than half of Canada’s inventory of these waste types. In addition to the long-term management facilities being constructed for the approximately 1.2 million cubic metres of historic low-level radioactive waste associated with the PHAI (see section K.7.3 for more details), CNL has proposed a project for a near-surface disposal facility at CRL with a total capacity up to one million cubic metres for low-level radioactive wastes and other suitable streams (see section K.7.2.2 for more details).

(f) AECL sites – accelerated decommissioning and remediation

With the implementation of the GoCo model at AECL sites, CNL has plans to significantly accelerate decommissioning and remediation activities. Following the appropriate regulatory approval, CNL anticipates that the following activities will be accomplished over the next eight to 10 years (i.e., by 2026):
The decommissioning of CRL will be accelerated, including the decommissioning and demolition of more than 120 redundant structures.

The National Research Universal reactor (which ends operation in March 2018) will be placed in a storage with surveillance state.

The National Research Experimental reactor will be decommissioned to an agreed end state.

The proposed near-surface disposal facility for low-level radioactive waste and other suitable waste streams will be constructed, with a total planned disposal capacity of one million cubic metres, pending regulatory approval.

Stored liquid wastes from several buildings at the CRL site will have been removed, immobilized and the structures decommissioned.

Interim soil action levels for radioactive and non-radioactive contaminants will have been developed based on proposed land-use scenarios.

Site remediation activities will progress and be coordinated with the propose near-surface disposal facility availability and need for cover material during that facility’s operations.

Decommissioning activities at the Whiteshell Laboratories and nuclear power demonstration prototype reactor sites will be completed, including the in-situ decommissioning of the reactor below grade at both sites, pending regulatory approval.

The PHAI will be completed, with only monitoring activities remaining.

Both the Port Hope and Port Granby long-term management containment mounds for low-level radioactive waste will be closed and capped.

Other non-Port Hope historic waste liabilities will have been remediated or substantially discharged.

(g) Development of radioactive waste management industry forum

Canada’s largest radioactive waste owners – AECL, OPG, Hydro-Québec and NB Power – and other selected stakeholders have been meeting since 2014 under the sponsorship of the Canadian Nuclear Association’s Nuclear Leadership Forum to discuss opportunities for coordination and collaboration on long-term management matters, including relevant technologies and communication strategies.

The current focus of the group is on the development of a coordinated and integrated communications program that supports major projects underway to establish L&ILW disposal facilities. The objective of collaborating and leveraging lessons learned across the industry is to ensure cost-effective, publicly acceptable and readily accessible long-term radioactive waste management facilities will be available in the future to support a sustainable Canadian nuclear industry.

(h) Consolidated waste and decommissioning regulations

The CNSC is conducting an analysis to determine if there is a need to develop radioactive waste and decommissioning regulations. To address this potential need, CNSC staff continue to work toward a consolidated regulatory framework for waste and decommissioning. A discussion paper on the proposed approach was published on May 13, 2016 to seek stakeholder feedback, which is now being considered.

(i) Federal environment minister decision for OPG’s DGR project for its L&ILW

OPG’s plan for the long-term management of its L&ILW is the Deep Geologic Repository, which would be located 680 metres below the ground surface in argillaceous limestone at the Bruce Nuclear Generating Station site in the municipality of Kincardine, Ontario. OPG’s Deep Geologic Repository would be adjacent to its Western Waste Management Facility, where OPG centrally stores all its L&ILW from OPG-owned nuclear reactors.
On May 6, 2015, the JRP issued its environmental assessment report to the federal government concluding that the project is not likely to cause significant adverse environmental effects, taking into account the implementation of the mitigation measures committed to by OPG together with the mitigation measures recommended by the panel.

The Minister of Environment and Climate Change has requested additional information from OPG. After the technical review process has been completed, the next phase includes the preparation of a draft report by the CEA Agency followed by a 30-day public comment period on that draft report. The CEA Agency will then finalize its report and submit a decision package to the minister.

(j) **Continue progress in engineered design and site selection process for the long-term management of spent fuel (Adaptive Phased Management)**

In 2014, NWMO’s engineering and design program completed a new engineered-barrier system design that received the Canadian Nuclear Society’s 2015 Innovative Achievement Award. Since that time, NWMO has further optimized that design, in part to take advantage of current manufacturing capabilities. A proof testing program was initiated to demonstrate that the engineered-barrier system can meet the project’s rigorous technical requirements.

The NWMO also updated the conceptual repository designs to reflect the new reference engineered-barrier system. Working collaboratively with communities, NWMO completed the first phase of preliminary assessments, initiated geoscientific and environmental fieldwork in several potential siting areas, and broadened engagement with First Nation, Métis and other communities to collaboratively explore the project and the extent to which it could fit in each of the areas. For more information, see section K.5.

### 4.0 Conclusion

In Canada, spent fuel and radioactive waste are currently managed in interim storage facilities that are safe, secure and environmentally sound. Interim storage facilities are continually monitored by the licensees and regulator to ensure fitness for service. Canada recognizes that enhanced, long-term management approaches will be required for all its spent fuel and radioactive waste and is progressing towards solutions.

This sixth *National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste* identifies several key initiatives that demonstrate Canada’s commitment to identifying and implementing long-term management approaches that do not place an undue burden on future generations.