# Chapter 9
# The Evolution of Decommissioning Planning: Tracing the Requirements to Consider Radioactive Wastes and Social Risk of Nuclear Power Plants


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## Contents



**Abstract** In Canada, nuclear power plant operators are required to have decommissioning plans and financial guarantees as conditions of licensing, which plan for radioactive and non-fuel wastes and identify risks to natural and social environments post-closure. However, decommissioning plans were *post hoc* licensing requirements, introduced when the *Nuclear Safety and Control Act* (*NSCA*) came into force in 2000. Thus, for over thirty years Canada's first nuclear power reactor operated absent considerations of decommissioning planning. While the *NSCA* sought to combat these gaps, residual challenges remain. Therefore, this chapter traces the evolution of decommissioning regulations and policy since the *NSCA*'s introduction and compares decommissioning guides among proponents, since their development in 2000. As the nuclear sector enters an era of decommissioning—with over 60% of all operating reactors now exceeding 30 years of age—this chapter also highlights

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J. L. Black-Branch and D. Fleck (eds.), *Nuclear Non-Proliferation in International Law - Volume VI*, https://doi.org/10.1007/978-94-6265-463-1_9

the challenges caused by the historic lack of preventative planning and foresight. Ultimately, we find that the failure of Canada's legal frameworks to pre-emptively consider and establish reliable and socially acceptable methods of managing long-lived radioactive wastes before commercial nuclear stations were made makes it unlikely that Canadian nuclear sites will be successfully decommissioned within the foreseeable future.

**Keywords** Decommissioning · Legislative Gaps · Nuclear Non-Proliferation · Nuclear Power · Nuclear Waste · Oversight · Public Dialogue · Transparent Decision-Making

## 9.1 Introduction

The decommissioning of nuclear reactors is among the foremost challenges of today's nuclear sector, yet paradoxically decommissioning was seldom if ever considered during the planning, designing and building of our current nuclear power stations.[1] As nuclear reactors worldwide are approaching the end of their operational lifespans, and the shutdown of reactors continues to outpace new development,[2] considerations about a reactor's end of life is gaining attention within industry, the regulatory sector and the public. According to the most recent World Nuclear Industry Status Report, a 'massive shutdown of plants' is forecasted between now and 2057. Of the 173 reactors already in permanent shut down, 216 are expected to follow by 2030 and an additional 111 by 2057.[3] By 2050, almost 400 reactors will be shut down.[4] Canada is on a similar trajectory, with nine of its twenty-two CANDU reactors to be permanently shut down by 2024.

Decommissioning a nuclear plant is not synonymous with *dismantling* a reactor, but rather encompasses final shutdown, deactivation, and decontamination[5]—all undertakings which respectively require the continued oversight and management of radioactive substances and exposures to the public and workers. Accordingly, the International Atomic Energy Agency (IAEA) defines decommissioning as the 'administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility'.[6] However, decommissioning operations also create long-lived radioactive wastes, which must be moved to another regulated site if decommissioning is to be fully completed and all regulatory controls removed from the facility. As we will discuss, the failure of Canada's legal frameworks to pre-emptively consider and establish reliable and socially acceptable methods of managing long-lived radioactive wastes before commercial nuclear

[1] The World Nuclear Industry Status Report 2018, https://www.worldnuclearreport.org, at 134.
[2] *Ibid*.
[3] *Ibid*.
[4] Soloveva et al. 2018, 4.
[5] Laraia 2012.
[6] IAEA 2007.

stations were made makes it unlikely that Canadian nuclear sites will be successfully decommissioned within the foreseeable future.

While the advent of nuclear technology in the 1950s led to states establishing new legal and regulatory systems to oversee their emerging nuclear energy industries, and the new and unique environmental, human health and security risks,[7] only recently have legal frameworks begun contemplating the retirement of nuclear stations and the risks reactor operations create after operations have ceased. Indeed, at the time of reactor design and development, considerations of risk beyond immediate operations and decommissioning were rarely considered.[8]

Today, procedural and technical challenges plague decommissioning decision-making. As a result, of the nearly 200 nuclear reactors currently shut down, less than twenty have completed the decommissioning process.[9] Globally, there are another 162 units which are awaiting decommissioning.[10] Civil society observers have also alleged that guidance and requirements from the Canadian nuclear regulator often lags the challenges faced by nuclear licensees.[11] Thus, it is critical to examine the reasons which have led to the sector's inability to successfully complete decommissioning.

In this chapter, we focus on the final stage of the nuclear lifecycle, exposing the weaknesses within the legal oversight of reactor decommissioning in Canada. Specifically, we examine how the failure to require upfront consideration of the factors needed to restore a nuclear site to a state where it can be removed from regulatory oversight have been imprinted in nuclear law and will consequently stymy the sectors' ability to complete decommissioning within the foreseeable future. In Canada, requirements for decommissioning planning and the related financial planning to decontaminate and restore a nuclear facility for other uses were *post hoc* licensing requirements following approximately thirty years after the reactors had commenced operations. Thus, we seek to review how Canadian nuclear safety and environmental laws have subsequently sought to combat these historical deficiencies.

*First*, we review the historical underpinnings of Canada's nuclear sector and initial nuclear laws to understand what, if any, role decommissioning considerations played in the siting and construction of Canada's nuclear reactors.[12] *Second*, we draw on two case studies of Canadian nuclear generation facilities that have announced reactor retirements to highlight how matters of significant public value, like the social and economic impacts of decommissioning and accompanying waste management issues,

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[7] Laraia 2012.

[8] The World Nuclear Industry Status Report 2018, https://www.worldnuclearreport.org, at 134.

[9] *Ibid*.

[10] The World Nuclear Industry Status Report 2019, https://www.worldnuclearreport.org.

[11] 2006 Report of the Commissioner of the Environment and Sustainable Development of Canada, https://www.oag-bvg.gc.ca/internet/English/att_c20060905xe03_e_14622.html, Petition No. 173, Federal Oversight of the Nuclear Industry in Canada.

[12] The term 'nuclear reactors' as used in this chapter refers to nuclear reactors used for the purpose of commercial electricity generation.

have yet to be considered in an open and transparent way by Canada's nuclear regulator. *Third*, we consider options for remedying these procedural and legislative gaps, within current nuclear and environmental law frameworks. Ultimately, we argue that the lack of precautionary and preventive decommissioning planning has created significant challenges which can no longer be eliminated and at best, the residual, yet-to-be-remedied challenges can only be mitigated.

## 9.2 The Advent of Nuclear Power in Canada: A Non-precautionary Approach

The development of nuclear technology in Canada was triggered by military motivations. At a conference in Quebec City in August 1943 U.S. President Franklin Roosevelt and the United Kingdom's Prime Minister Winston Churchill agreed to collaborate to develop an atomic bomb.[13] Subsequently, Canada, the United States and Britain agreed Canada would build a heavy water reactor to produce plutonium, which was needed for the development of atomic weapons. This lead to the Zero Energy Experimental Pile (ZEEP) going into operation in September 1945,[14] just days after the formal end of World War II and a month after the Hiroshima and Nagasaki atomic explosions alerted the world to secret research carried out by the Allied powers. The ZEEP was built at what would become known as Chalk River Laboratories and the hub for Canada's state-financed nuclear research and development programs.

At the end of World War II, Canada was one of three countries with nuclear technology. However, in the months immediately following World War II, the wartime collaboration that established and strengthened Canada's nuclear expertise came to an end and with it, the departure of many scientists who returned to the United Kingdom or United States to support their domestic nuclear research programs. The Federal Government was then left to determine how it would leverage its head start in the nuclear sector in the national interest. This required establishing how it would oversee Canada's significant uranium resources, which needed to be controlled due to their use in the production of atomic bombs, and the speculated potential lucrative use of nuclear technology for energy production.[15]

Among the subsequent announcements was an Order-in-Council issued by the Canadian federal government declaring the 'peaceful' use of nuclear energy to be for the general advantage of Canada. Having been advised by industry that it would not participate without measures to limit their exposure to liability for damages arising from accidents, the Order-in-Council also provided protection of the private sector from liability.[16] Later constitutional amendments and legislative developments have

[13] Sims 1980.

[14] *Id.*, 12–13.

[15] *Ibid.*, 14.

[16] Blaise et al. 2019.

further entrenched this approach, which is now embedded in the division of powers under *Canada's Constitution Act* (1982).

It is within this context that Canada's first nuclear law, the *Atomic Energy Control Act, 1946* (*AECA*) came into force on 31 August 1946 and with it, the establishment of Canada's first nuclear regulator, the Atomic Energy Control Board (AECB). At the time, the Board had a dual mandate; First, the Board had authority to 'control' atomic energy, including the licensing regime for atomic energy production, its application and use.[17] Second, the Board had a mandate to 'develop' atomic energy and accompanying jurisdiction to undertake atomic energy research, acquire mining deposits and claims, and make regulations 'encouraging' atomic energy research.[18] Subsequently, it has been critiqued that the Board had a conflicting mandate as it was vested with regulating and promoting the industry.[19]

True to the Board's mandate of promoting atomic energy, within the Board's first full year of operation a research reactor at Chalk River Laboratories was completed and put into operation, isotope production was 'well under way', a program to stimulate uranium mining was announced, and universities across Canada had made 'good progress' toward their major nuclear research tools.[20] The first regulations were also brought into force, aimed at overseeing the control of radioactive substances and inventions relating to atomic energy. And, by the 1950s, the uranium boom was well underway and Elliot Lake, Ontario, had claimed the title of 'uranium capital of the world'.

Evidently, the Board was looking to grow a sector in its infancy—hence the Board's references to projects which were 'well underway' or 'making progress' and announcements intended to encourage nuclear applications and grow the uranium mining sector.[21] However, there were major omissions in both the Act and the Atomic Energy Regulations of Canada, passed in 1947, which foreshadowed the challenges faced today. *First*, there was no mechanism for public participation, as there were few statutory controls on the Board's functions which would have provided for parliamentary hearings; nor did the Board hold public hearings as part of their licensing function.[22] As acknowledged in a text reflecting on the history of the Board,

> It is apparent that the importance of atomic energy and its evolution for the good of Canada made the Government of the day feel that the controlling body should have wide powers so that its development should occur only under the tightest possible control, and that the secrecy of the process should not be compromised by public intervention or public hearings.

*Second*, the Act and 1947 regulation did not have a lifecycle view of nuclear reactors, and considered a truncated timeframe with regulations and oversight related

[17] *Atomic Energy Control Act, 1946,* c 37, s 8.

[18] *AECA 1946,* s 9.

[19] Johannson and Thomas 1981 at 433–443.

[20] Atomic Energy Control Board of Canada (1948), Second Annual Report 194-48, in Sims 1980.

[21] *Ibid*., Appendix A.

[22] *Id.*, 36.

to construction and operation but not decommissioning and abandonment. Relatedly, there was no reference to the management of hazardous materials, radioactive substances and its storage. Instead, the focus was on controlling prescribed substances, such as requiring those who discovered uranium or thorium deposits to report to the Board immediately, and information, such as putting in force security provisions restricting the disclosure of atomic energy information.[23]

*Third*, for decades, amendments to the Act did not change this initial oversight and failure to consider decommissioning or nuclear waste management. For instance, in 1954 the Act was amended, transferring the responsibility for nuclear research and exploitation from the Board to a Crown-corporation, the Atomic Energy of Canada Limited. Otherwise the Board's mandate and licensing powers remained unchanged by statute.[24] As a 1983 manual from the AECB confirms, components of an operating license *did not* include considerations of decommissioning, financial guarantees or waste management and instead, were comprised of 'a Final Safety Report, completion of a previously approved commissioning program, examination and authorization of senior personnel, approval of operating policies and principles, preparation of plans and procedures for dealing with radiation emergencies, and a specific program for operations quality assurance'.[25]

On 31 May 2000, the *Nuclear Safety and Control Act* (*NSCA*) came into force, replacing the *AECA*[26] with a 'stronger, more modern legislative basis'.[27] The *AECA*'s prescription that the Board could regulate the production of atomic energy expanded, enabling the Commission under the *NSCA* to regulate the decommissioning of nuclear facilities.[28] For the first time, regulations under the *NSCA* required licensees who sought to construct or operate a nuclear reactor to include in their licence application information about 'the effects on the environment and the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects'.[29] Thus, nearly 50 years after establishment of Canada's nuclear regulator and its first nuclear laws, it became a general licensing requirement of all nuclear reactor facilities that a proposed plan for decommissioning be set out.[30]

Regulations pursuant to the *NSCA* also introduced record keeping requirements requiring licensees to track items including the nature and amount of radiation, nuclear substance and hazardous substance within the facility and the manner in which any nuclear or hazardous waste was managed, stored or disposed of.[31] While

[23] *Id.*

[24] *AECB, 1946*, RSC 1985 Chapter A-16.

[25] Sims 1980, at 16.

[26] *Nuclear Safety and Control Act*, SC 1997, c 9 [*NSCA*].

[27] Canadian Nuclear Safety Commission (2017), Canada's Nuclear History, http://nuclearsafety.gc.ca/eng/resources/canadas-nuclear-history/index.cfm.

[28] *NSCA,* s 44.

[29] Class I Nuclear Facilities Regulations, SOR/2000-204, ss 5(i) and 6(h) [Class I Regulations].

[30] Class I Regulations, s 3(k).

[31] *Ibid.*, s 14(1)(d), 14(3)(c).

formerly the Board under the AECA and the 1947 regulation set out requirements of record keeping for tracking prescribed substances, it did not extend to their waste or hazards resulting from nuclear facility operations.

Other laws affecting nuclear power reactors failed to remedy these gaps. This is particularly significant given nuclear powers plants constructed in the 1960s and 70s did not undergo environment assessments evaluating how the site would be remediated, nor review approaches to decommissioning which were cognizant of social and environmental considerations. As reviewed in greater detail in Sect. 9.4, the end stage of the nuclear power plant life cycle is similarly not subject to a federal EA. Thus, to the extent that challenges to decommissioning may be recognized with the sector, legislative mechanisms which provide for public debate and open government on these critical end of life decisions continue to be missing from nuclear law and policy.

The historical deficiencies of nuclear law, wherein nuclear regulation was used to encourage the development of atomic energy but not consider other lifecycle factors, is also telling of attempts to trigger the nuclear renaissance of the 2000s and present rhetoric surrounding small modular reactors (SMRs). As we have previously argued,[32] during the promised nuclear renaissance of the 2000s, the government attempted to adjust legal frameworks to promote the expansion of nuclear power in Canada. This was done by shielding industry from the liability for accidents and radioactive waste, and by reducing the requirement for projects to undergo sustainability analysis.

Similar techniques are again being used in relation to SMRs, with legal frameworks being realigned to *exclude* new SMR technology from environmental assessment review and accompanying considerations of the need for, purpose of and alternatives to the projects, in line with social, economic, environment and Indigenous rights considerations. Thus, we observe history repeating itself: just as the non-precautionary legal framework of the *AECA* in 1946 vesting the Board with the promotion of the development of nuclear power has limited our present day ability to mitigate the social and economic impacts of reactor closure and decommissioning, the exclusion of SMRs from EA law is foretelling of the challenges the sector will face regarding proliferation, intergenerational risk and its social licence to operate.

## 9.3 Entering the Decommissioning Era: The Canadian Experience

The operating and design life of reactors is well known[33] and thus we are able to forecast the number of reactors in a given year that will be decommissioned. While the life-extension of nuclear power plants in Canada has served to postpone

[32] Blaise and Stensil 2020.

[33] Soloveva et al. 2018, 1.

considerations of decommissioning at some plants,[34] we are inevitably entering an era of decommissioning and with it, coming face to face with the organizational, technical and procedural challenges which for decades have been pushed aside.[35]

As with other stages of a nuclear facility's life-cycle, reactor decommissioning is impacted by risk and uncertainties, related to schedules, cost and radiation risks. Nuclear power plants create risk. The nuclear fuel and fission process reactor for producing electricity create radioactive sources that are both short and long-lived. These radioactive sources require measures to protect workers, the public and the environment during both the operational-life of a reactor and long-after operations have ceased due to the long-lived nature of radioactive waste. Thus, although the radiation risks may change following the end of CANDU reactor operations—which were typically designed for a 30-year life span—measures are still required as long as radioactive sources produced by the facility remain.[36]

While there is no universal definition of nuclear decommissioning, the term 'decommissioning' summarizes a range of technically complex and challenging actions undertaken in the final stage of a reactor's lifecycle. Decommissioning also implies the removal of 'some or all' of the regulatory controls from a facility,[37] with the end goal of eliminating the need for measures and oversight in order to protect the public and the environment from radiation.[38] As used in this chapter and nuclear policy and guidance, it most often refers to a reactor's defueling, deconstruction and dismantling,[39] the decontamination of the facility's buildings and lands, and the management of resulting radioactive waste.[40] Notably, to remove a site from regulatory oversight requires the establishment of a new waste management facility. As will be discussed, the lack of such waste management facilities appears to be the determining factor—as opposed to social or economic impacts—in how reactor operators choose their approach to decommissioning.

The IAEA provides the following policy guidance and principles which should inform decommissioning strategies.[41] Accordingly, the decommissioning of a nuclear facility should:

- Provide protection of people and the environment both now and in the future;
- Include a long-term commitment to ensuring that sites and waste from them are properly managed;
- Provide efficiency in the use of resources;
- Provide open and transparent interactions with stakeholders;

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[34] *Ibid*.

[35] The World Nuclear Industry Status Report 2019, https://www.worldnuclearreport.org, at 158.

[36] Soloveva et al. 2018, 1.

[37] IAEA 2018, s 1.2.

[38] *Id.*, s 2.6.

[39] The World Nuclear Industry Status Report 2018, https://www.worldnuclearreport.org, at 134.

[40] IAEA 2018.

[41] IAEA 2011.

- The public should be able to participate in decision making, where relevant (per the Aarhus Convention); and
- The needs of the present must be met without compromising those of future generations[42]

In applying these principles, the IAEA suggests two decommissioning strategies: first, the immediate decommissioning of a nuclear station and second, deferred dismantling, which involves putting a station into a safe storage state for several decades.[43] While entombment, in which all or part of the facility is encased in matter like cement, was formerly recognized by the IAEA as a decommissioning strategy, it is only to be considered a 'last option' for sites damaged in an accident or if no other options exist due to high exposures of workers or technical difficulties.[44]

However, as will be discussed in the following sections, the IAEA's two suggested approaches to decommissioning—immediate and deferred—have differing environmental, economic and social impacts. Although these impacts may not be within the historic purvey of nuclear regulators, which generally seek to limit radiation and related risks to human health and the environment, they may be of significant concern to the communities that have hosted these nuclear facilities. At present, there are no legal mechanisms in Canada for nuclear host communities to review the social, environmental, and economic effects of reactor decommissioning, nor consider alternatives or propose approaches which may mitigate adverse effects.

Furthermore, as demonstrated by the closure of the Gentilly-2 and Pickering Nuclear Generating Stations (NGS), profiled below, the historic failure of the Canada's legal framework to pre-emptively consider and require credible plans for the management of long-lived radioactive wastes has become the determining factor in the industry's choice of a decommissioning approach. Without an accepted and reliable plan for the management of the radioactive wastes created by the operation and dismantling of nuclear stations, reactor operators' only are choosing deferred decommissioning in hope that waste management options will be available in the future.

### *9.3.1 Gentilly-2 Nuclear Generating Station*

The Gentilly-2 nuclear station was the first commercial power production site to be permanently closed in Canada. In 2012, a newly elected provincial government directed its state-owned electricity generation company to shut down the reactor by the end-of-the year. This overturned an approval the previous government as well as the federal regulator had given to proceed with extending the operational life of

[42] United Nations Conference on Environment and Development (1992) Rio Declaration on Environment and Development, https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

[43] IAEA 2018.

[44] *Ibid*., s 5.17.

the nuclear station for another twenty-five years. While welcomed by many civil society organizations, this about-face revealed the gaps in the government oversight of reactor decommissioning, such as mitigating the social and economic impacts of closure. It also highlighted that the feasibility and social acceptability of nuclear station decommissioning is also contingent on the acceptance and implementation of plans for the management of long-lived radioactive wastes.

Notably, the CNSC reviewed and renewed Hydro-Quebec's operating license for the Gentilly-2 nuclear station one year before the station's closure in 2011. During the plant's relicensing hearing in April 2011, Hydro-Quebec asserted that it would continue to proceed with extending the operational life of the station. However, environmental organizations asserted it was likely that the station would be closed the following year due to the increasing costs of life-extension and the reduced social acceptability of nuclear power due to the Fukushima accident, which began just a month before the re-licensing hearings. Civil society organizations requested the nuclear regulator, the CNSC, to require Hydro-Quebec to review and propose solutions to mitigate the negative social and economic impacts of the station's closure.[45] The CNSC, however, dismissed these public requests and approved Hydro-Quebec's license renewal without conditions.

Thus, in 2012 when the provincial government announced it would direct Hydro-Quebec to shut down the reactor by the end of the year, it did so without the station having any pre-prepared or accepted plans on how to mitigate the social and economic impacts of the station's closure. Acknowledging the significant economic impact the plant's closure would have on the host community, the government also announced a two-hundred million dollar economic diversification fund to mitigate the impacts of the station's closure.[46] Nevertheless, this triggered a wave of public protests by plant workers and unions who were rightly concerned by the lack of worker transition planning. Without clear transition planning, the plant closure was a shock to the community. Notably, such planning was precisely what had been requested by civil society organizations during relicensing hearings the previous year.[47] As we discuss later in this chapter (see Sect. 9.4), there continues to be no legal requirements to ensure the environment, social and economic impacts caused by the closure of a nuclear station are considered and mitigated.

In response to the public concern, a Parliamentary Commission was mandated to review and make recommendations on how to mitigate the impacts of the station's closure. A focus of the Commission was the overall approach to Hydro-Quebec and its supporting federal regulatory framework. Similar to other reactor operators in Canada, Hydro-Quebec proposed 'deferred decommissioning', which involves putting the station into storage for several decades before dismantling the reactor

[45] Canadian Nuclear Safety Commission (2011), Public Hearing Transcript—Bécancour, Quebec, 14 April 2011, 74–81, http://nuclearsafety.gc.ca/eng/the-commission/pdf/2011-04-14-Transcription-Audience.pdf.

[46] Radio-Canada (2012), Fonds de diversification économique post-Gentilly-2 : des prêts plutôt que des subventions, https://ici.radio-canada.ca/nouvelle/589369/fonds-economie-gentilly.

[47] Trahan 2012.

and cleaning up the site.[48] Although arguably economically advantageous to Hydro-Quebec, which meant it could defer its costs, this approach has significant social and economic impacts because it involves reducing employment at the site from several hundred to a minimal staff over just a few months.

After hearing from workers, civil society and industry representatives, the Parliamentary Commission recommended that a feasibility study of accelerated decommissioning be carried out, noting the possibility of employment and the need to not impose problems for future generations.[49] It also recommended the Quebec Government request the immediate decommissioning of Gentilly-1,[50] an experimental reactor at the Gentilly site that has been in safe storage since it was shut down in the 1970s.

To our knowledge, Hydro-Quebec's feasibility study was never released to the public. Like other reactor operators in Canada, Hydro-Quebec, the state-owned operator of Gentilly-2, had always expressed its preference for deferred decommissioning. In 2013, a new government was elected in Quebec and returned the political party to power that had originally approved Hydro-Quebec's proposal to rebuild and extend the operational life of the Gentilly-2 reactor. We speculate this change in political direction may have lifted the obligation for Hydro-Quebec to provide the public with options on its approach to decommissioning, as recommended by the Parliamentary Committee under the previous government.

In 2015, Hydro-Quebec applied to the CNSC for a new license to allow it to put the Gentilly-2 nuclear station in safe storage state (SSS) in preparation for the station going into 'dormancy' for several decades. This application was approved by the Commission.[51] According to Hydro-Quebec's preliminary decommissioning plan '…it is considered a reasonable planning approach for a reactor not scheduled to [sic] be dismantled for 45 years'.[52] Otherwise put, the dismantling of the Gentilly-2 nuclear reactor would not begin until approximately 2060. The plan is unclear on when the Gentilly site could be sufficiently decontaminated to be removed from regulatory oversight and used for other purposes.

However, Hydro-Quebec's deferred decommissioning strategy is still contingent on a key assumption: the existence of offsite facilities for the long-term management of all radioactive waste types produced during the operation and dismantling of the station. As the company's decommissioning plan states: 'Currently, no such facilities exist in Canada. Dismantling the facility without a known disposal option would present certain difficulties that are avoided by the use of the deferred removal

[48] TLG Services Inc (2015), Gentilly-2 Nuclear Station Preliminary Decommissioning Plan, Prepared for Hydro-Quebec, March 2015, Section 4, p. 1. Obtained through Access to Information [Gentilly-2 Decommissioning Plan].

[49] Report, La Commission de l'agricultures (2013), Des pecheries, de l'energie, et des ressources naturelles, 5.

[50] *Ibid*., 6.

[51] Canadian Nuclear Safety Commission (2016), Record of Decision, https://nuclearsafety.gc.ca/eng/the-commission/pdf/2016-05-05-Decision-Hydro-Quebec-Eng-edocs5065391.pdf.

[52] Gentilly-2 Decommissioning Plan.

strategy'.[53] It goes on to state: 'The used fuel will be kept on site, in the fuel bay and into the CANSTOR, until their transportation to the national final disposal site in the 2060 timeframe'.[54]

In our view, presuming the availability of a suitable long term waste option underlines how historic, non-precautionary policy made with the intent of promoting the development of nuclear power continues to limit our present ability to mitigate the social and economic impacts of reactor closure and decommissioning. It also highlights how reactor decommissioning choices of reactor operators are implicitly scoped by the sufficiency of federal radioactive waste policies.

What remains unsaid is the significant uncertainty related to the existence of an offsite waste storage option being available as promised. Indeed, assurances from the NWMO that a site suitable for a Deep Geological Repository would be approved by 2023[55] remain aspirational. As all of Canada's nuclear waste projects have encountered delays, resulting in subsequent stages of environmental assessment review being deferred, many industry observers doubt the ability for NWMO to meet these timelines given the nuclear industry's inability to site or build radioactive waste sites historically. However, among the proposed disposal sites undergoing federal environmental assessment by the CNSC, in all cases, they involve disposal strategies that are either completely untested or have failed elsewhere, and involve radioactive wastes that can remain toxic for hundreds and thousands of years.[56]

Hydro-Quebec's decommissioning plans for Gentilly-2 have also exposed other gaps in Canada's radioactive waste policies: the failure to proactively identify and develop plans for the management of non-fuel radioactive wastes. During the operation of a nuclear plant reactor components become radioactive. Thus, the dismantling of a reactor creates radioactive wastes. Although less radioactive than nuclear fuel wastes, many of these wastes are long-lived and should be isolated from the environment for thousands of years.

During provincial environmental assessment hearings on Hydro-Quebec's proposal to rebuild and extend the operational life of the Gentilly-2 nuclear station, public intervenors asked how Hydro-Quebec would manage the wastes produced by the life-extension as well as the life-extension of the reactor. In response, Hydro-Quebec asserted these wastes would be stored in a Deep Geological Repository (DGR) proposed by Ontario Power Generation (OPG) to store the low- and intermediate level wastes produced by its fleet of twenty reactors. However, OPG denied this claim.

In light of this gap in Hydro-Quebec's waste management plans, the Quebec environmental assessment board recommended in 2006 that Hydro-Quebec find a

[53] *Ibid*., s 4, 2.

[54] *Ibid*., s 4, 4.

[55] World Nuclear News (2020) Canada's NWMO outlines repository plans, https://www.world-nuclear-news.org/Articles/Canadian-organisation-sets-out-long-term-repositor.

[56] Blaise et al. 2019.

'realistic' and 'socially acceptable' means of managing these wastes.[57] While the company has still produced no such plan, it did tell the nuclear regulator in 2011 that it had asked the Nuclear Waste Management Organization (NWMO)—the government created, industry led organization tasked with finding a storage solution to Canada's nuclear fuel waste—for 'space' in the proposed fuel disposal site for the long-term management of moderately radioactive waste.[58]

As of 2020, Hydro-Quebec still had not developed a plan for the management of the long-lived radioactive wastes produced by the decommissioning of Gentilly-2. However, its 2015 decommissioning plan acknowledges this gap, and states that it is working with other Canadian reactor operators to find a long-term management option. It states:

> HQ recognizes that long-term management of low and intermediate waste is the responsibility of the producer and is not covered by the Nuclear Fuel Waste Act. Each producer must develop their own management method. The amount of waste produced by the single reactor at the Gentilly-2 Station represents only a small portion of that type of waste produced in Canada. HQ has therefore joined a committee formed by members of the industry, including the NWMO, NRCan, AECL and NBP, in order to identify common options and strategies. Consequently, HQ will actively take part in the committee's discussions to help identify an appropriate method for the long term management of its low and intermediate level waste.[59]

Notably, New Brunswick Power, which like Hydro-Quebec operates a single unit CANDU-reactor, assumes in its 2015 decommissioning plan for the Point Lepreau nuclear station that its low- and intermediate-level radioactive wastes will be shipped to an out-of-province repository. Its plan states a 'Low and Intermediate level waste repository [will be] available by Apr[il] 2050'.[60] The site of this non-fuel waste DGR also appears to be Ontario, as the plan states that the DGR will be within 2500km of Point Lepreau.

As noted, OPG—which has operated up to 20 reactors—had proposed a DGR for its low- and intermediate-level radioactive wastes. In 2020, however, OPG announced it was abandoning its proposal to build a DGR for its low- and intermediate-level radioactive waste. OPG had initiated an environmental assessment of this proposal in 2005 and received approval by a Joint Review Panel assigned to review the project under the Canadian Environmental Assessment Act (CEAA, 1992). The company abandoned the proposal, despite over a decade of planning and public consultations, due to opposition from an impacted Indigenous community.

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[57] The BAPE noted that 'La commission constate qu'en plus du combustible irradié l'exploitation de la centrale de Gentilly-2 génère un important volume de déchets radioactifs pour lesquels aucune solution de gestion à long terme n'a encore été déterminée. Elle note que la réfection éventuelle de la centrale et la poursuite de l'exploitation pendant 25 ans augmenteraient substantiellement ce volume', BAPE (2005), 67–71.

[58] Canadian Nuclear Safety Commission (2011), Record of Proceedings in the matter of Hydro-Quebec Application to Renew the Gentilly-2 Nuclear Generating Station and its waste management facility operating licences for a period of 5 years, 29 June 2011, 33.

[59] Gentilly-2 Decommissioning Plan, 4.

[60] *Ibid*., 10.

As Canada's first commercial nuclear station to be retired in Canada, the Gentilly-2 facility is among the first to foretell the trials and tribulations of decommissioning. Its end-of-life brought to the fore the environmental, social and economic challenges of decommissioning which, because of being excluded from Canada's legal framework, remained *in abstentia. First*, local employment is a key contributor to a nuclear station's social license during operation, but under Canada's current legal framework there are no requirements for mitigating the negative social and economic impacts when a station retires. Although some argue a prompt decommissioning approach could mitigate these social and economic impacts, the case of Gentilly-2's closure suggests that historic government failures to pre-emptively consider and secure plans for the long-term management of the radioactive wastes produced by Gentilly-2 foreclosed on this option.

*Second*, there remains no reliable plans for the long-term management of Gentilly-2's radioactive wastes. This appears to be the key justification for Hydro-Quebec to choose a 'deferred' decommissioning strategy for the station, which means any jobs created through dismantling the plant will be at some undetermined date in the future. Finally, without any credible plan to move Gentilly-2's radioactive waste to another long-term management facility the site is likely to stay under the oversight of the CNSC for the foreseeable future. Thus, the asserted goal of decommissioning—the removal or regulatory oversight and restoration of the site for other uses—remains unfulfilled.

### *9.3.2 Pickering Nuclear Generating Station*

The Pickering Nuclear Generating Station (NGS) is Canada's second commercial nuclear station to be retired in Canada. Its shutdown and decommissioning poses equally as unique challenges, as it is one of the largest plants in the world,[61] and located in the most populous areas of Canada. The plant also serves as a main employer for the region and is located on the shores of Lake Ontario—the drinking water source for over 40 million Canadian and Americans.[62] Resultantly, the station's closure could reasonably cause significant economic impacts and incite public concern. The fate of the stockpiles of high-level radioactive waste stored on site also raises questions of ongoing environmental risks and the social license for the site.

There are eight reactors at the Pickering NGS—four at the older Pickering 'A' reactors and four Pickering 'B' reactors. The Pickering 'A' reactors are the oldest

[61] Ontario Power Generation (2018) Pickering Nuclear Generating Station, https://www.opg.com/generating-power/nuclear/stations/pickering-nuclear/Pages/pickering-nuclear.aspx.

[62] Canadian Environmental Law Association (2019), Submission by the Canadian Environmental Law Association to the Canadian Nuclear Safety Commission Regarding the Regulatory Oversight Report for Canadian Nuclear Generating Sites: 2018, https://cela.ca/wp-content/uploads/2019/11/1303-CELAs-Submission-to-CNSC-Regulatory-Oversight-Report-for-Nuclear-Generating-Stations-2018.pdf.

commercial reactors in Canada, beginning operation between 1971 and 1973. The Pickering 'B' reactors became operational between 1983 and 1985. The eight reactors share common safety systems and thus operate as one station.

Like all CANDU reactors, the Pickering nuclear station would require significant repairs after about thirty years to continue long-term operation. In 2010, OPG also announced that it would not proceed with rebuilding the four Pickering 'B' reactors due to the prohibitive costs. OPG had previously attempted to rebuild and restart the four older Pickering 'A' reactors, but after significant cost overruns during the refurbishment of two of the units announced in 2005 it would permanently the remaining 'A' reactors.

The station was originally set to close between 2014 and 2016 to coincide with the nominal end-of-life of Pickering 'B' reactors. However, OPG gained approval from the provincial government and the nuclear regulator to operate the plant until 2020. The justification for this life-extension was to ensure there was enough electricity supply until proposed new reactors came online.[63]

Despite acknowledging the eventual closure of the station no process was undertaken to assess the potential social, economic and environmental impacts of the station's closure or how these impacts could be mitigated or avoided. Similar to the public concerns and protest expressed when Gentilly-2 was suddenly shut down without a plan, this lack of planning has allowed uncertainty related to local employment become a political issue. The eventual closure of the Pickering reactors will not be insignificant. Approximately 3000 people work at Pickering. According to the Ontario government, Pickering is 'the largest employer in Durham Region'.[64]

In 2016, OPG announced that it would seek to operate the Pickering reactors for an additional four years.[65] OPG's shareholder, the province of Ontario, maintained it would permit an additional life-extension if it gained approval from the CNSC. However, the CNSC held hearings in 2018 to consider OPG's request to operate to 2024 instead of 2020. Thus, without an approval from the CNSC the plant would close in 2020 and several thousand workers would lose their employment. Also, as the CNSC hearings in 2018 occurred during a provincial election, they quickly became a focus of political debate with competing political parties asserting they would protect the thousands of jobs.[66]

Meanwhile, impacted communities and civil society organizations participating in the 2018 licensing hearings requested the CNSC to require OPG to assess the impacts of the station's closure and consult on how they could be mitigated. Durham Region, the host community of the Pickering NGS, requested an environmental assessment (EA) be carried out on the decommissioning of the Pickering nuclear station and that

[63] Ferguson R (2010) Blueprint extends the life of the Pickering, Darlington plants, Toronto Star, 10 February 2010.

[64] Ontario Ministry of Energy Press Release: Ontario Moving Forward with Nuclear Refurbishment at Darlington and Pursuing Continued Operations at Pickering to 2024, 11 January 2016.

[65] *Ibid*.

[66] Canadian Press, Pickering nuclear plant to stay open until 2024 under Doug Ford Government, 21 June 2018.

the '… CNSC to commit that the Region of Durham will be formally notified of and engaged in the decision-making process with respect to conducting an EA for PNGS decommissioning since our community will be directly affected for decades by the decommissioning process'.[67]

Durham Region had also previously requested the federal government ensure reactor decommissioning would be reviewed under the then-proposed *Impact Assessment Act* (IAA). In its submission to the government, the Region outlined its concerns related to the station, noting:

> In the case of Pickering, the uncertain fate of the nuclear wastes that OPG proposes to store onsite for several decades is a key concern. Their preliminary decommissioning plan assumes these wastes will be removed to an offsite facility before demolition begins. Plant demolition and restoration of the site is contingent on the removal of all nuclear wastes in advance. The removed of wastes depends on a successful conclusion of a separate siting and EA process led by the Nuclear Waste Management Organization (NWMO) for a deep geological repository (DGR). However, there is no guarantee that the NWMO process will produce a willing host, an acceptable site or federal approval to construct the DGR for the used fuel. Nor is there any certainty that the repository proposed for low and intermediate level waste at Kincardine will be available when needed to accept demolition wastes from Pickering.[68]

The Region also acknowledged that the question was not whether to decommission but how to decommission to reduce the negative impacts on the community and the environment. It stated:

> The only choices related to the methods used, the duration and the mitigations available. In absence of a broadly-scoped impact assessment with robust community engagement, OPG and the CNSC will lose a key opportunity to build social licence for nuclear facilities in general.[69]

During relicensing hearings on OPG's request to renew its license for the Pickering nuclear generating station in 2018, civil society organizations also raised concerns regarding the lack of a clear framework for consulting and considering on how to mitigate the social, economic and environmental impacts of decommissioning the Pickering nuclear station. The organizations requested the CNSC direct OPG to 'carry out an environmental impact assessment of its plans to decommission the Pickering NGS under the Impact Assessment Act, including long-term waste storage options, before it applies for a decommissioning licence under the Nuclear Safety and Control Act'.[70] They argued that there was a '…legislative lacuna related to environmental assessment means there is no venue provided for citizens and affected communities to evaluate the technical or social desirability of OPG's preferred decommissioning

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[67] Durham Region (2018) Submission from the Regional Municipality of Durham regarding the application of Ontario Power Generation (OPG) to renew the Power Reactor Operating License for the Pickering Nuclear Generating Station (PNGS) from 1 September 2018 to 31 August 2028, at 16.

[68] O'Connor (2018) Letter to C. McKenna (Minister of the Environment), 15 October 2018, 3.

[69] *Ibid*., 4.

[70] Request for Ruling, 25 June 2018, https://cela.ca/wp-content/uploads/2019/07/1196-RequestForRuling-DecommissioningAtPickeringNGS.pdf.

approach early in the assessment process'. They also asserted that '… the Pickering site will evolve into a de facto long-term radioactive waste management facility without an appropriate, upfront and transparent process to develop contingency plans that could mitigate or protect the social, economic and environmental conditions at the Pickering site'.[71]

In response to the requests made by the host community and civil society organizations, the CNSC acknowledged that it did not review social and economic impacts from reactor operation. CNSC staff stated during the 2018 relicensing hearing for the Pickering NGS that 'as a nuclear regulator we don't look at the socioeconomic aspects, so in terms of sustainability and the NSCA we wouldn't be examining those aspects'.[72] The CNSC ultimately denied the requests of civil society for the decommissioning of the Pickering nuclear station to be considered under Canada's proposed environmental impact legislation.[73]

It is noteworthy and also troubling that Durham Region, the host community for the Pickering nuclear station, continues to raise the inadequacies of the CNSC's approach to reactor decommissioning even after the CNSC rejected its requests in 2018. For example, in comments on the CNSC's revised guidance on decommissioning, (REGDOC 2.11.2) Durham Region noted that while the CNSC's decommissioning approach stays focused on activities related to the facility, the community was concerned with impacts 'beyond the fence line'. As Durham Region stated to the CNSC: 'The imminent closure of the PNGS and the subsequent stages of safe storage and decommissioning will have significant physical, fiscal, emergency response and socio-economic consequences for the surrounding urban community for the next half-century'.[74]

In its comments, the Durham Region also identified why a legal framework was needed to deal with the offsite social, economic and environmental impacts of nuclear station's closure. This can be summarized by the municipalities lack power in relation to OPG and the lack of mechanisms to hold OPG accountable to the community that hosted the Pickering nuclear station for decades. The municipality stated:

> The CNSC suggested to the Region at the June 2018 hearing that socio-economic impacts are not their area of expertise and should be discussed with the operator outside the scope of the licensing hearing. While this is possible and has been pursued in the past, unfortunately, the regional municipality is not an equal partner in such a discussion. While OPG does consult with the Region, as a federally regulated provincial agency, it is largely exempt from municipal authority.[75]

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[71] *Ibid*.

[72] CNSC Transcripts, 2018.

[73] CNSC (2018) Record of Decision, Application to Renew the Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station, December 20, 2018, http://nuclearsafety.gc.ca/eng/the-commission/pdf/DetailedDecision-OPG-Pickering-2018-e.pdf.

[74] The Regional Municipality of Durham, Region of Durham Comments on CNSC Draft REGDOC 2.11.2, 16 October 2019.

[75] *Ibid*., 2.

Despite the concerted efforts of directly affected communities and civil society, decommissioning is omitted from the federal government's EA law and considerations of social licence and acceptability remain out of scope within the Commission's licensing process legal or regulatory oversight. Thus the closure of the Pickering nuclear station serves to highlight a number of unresolved social, economic issues related to the oversight of reactor decommissioning in Canada. Similar to the case of Gentilly-2, the lack of credible long-term waste management plan means the station may become a *de facto* long-term waste management facility under CNSC surveillance. It remains conjecture whether the site will ever achieve full 'decommissioned' status. Second, the offsite social, economic and environmental impacts which are of significant public concern and are not addressed under current regulatory frameworks. The result is that public interest considerations may be deprioritized in favour of the economic interests of the facility operator.

## 9.4 Remedying Legislative Gaps

### *9.4.1 Adding Precaution to Planning*

The precautionary principle is a well-established principle of Canadian law and applicable to the interpretation of environmental statutes.[76] Unfortunately, its advent postdates the nuclear laws in existence when Canada's nuclear fleet was licensed and developed. As set out earlier, we cannot eliminate the harm caused by the perpetual failure of nuclear law to consider reactor end of life but we can attempt to mitigate its effects. Thus, this chapter advocates for the reconciliation of the precautionary principle within decommissioning planning and decision making.

In considering the prevention of environmental harm, lawmakers and jurisprudence often invoke the precautionary principle. The application of this principle institutionalizes caution, whereby if there is sufficient evidence that an activity is likely to cause irreversible harm to the environment, decision makers are obliged to prevent or terminate the activity.[77] In Canadian law, the precautionary principle has

[76] *Spray-Tech*; Castonguay; *Croplife Canada v Toronto*, 2005 CanLII 15709 (ONCA), *Alberta Wilderness Assn v Canada (Minister of Environment)*, 2009 FCJ 876 (CanLII); *Environmental Defence Canada v Canada (Minister of Fisheries and Oceans)*, 2009 FCJ 1052 (CanLII); *R. v. Kingston (Corp. of the City)*, 2004 CanLII 39042 (ONCA); Alberta Foothills Properties Ltd. v. Director, Southern Region, Operations Division, Alberta Environment and Sustainable Resource Development (20 December 2013), Appeal No. 11-179-R (A.E.A.B.); *Atlantic Salmon Federation (Canada) v. Newfoundland (Environment and Climate Change)*, 2017 NLTD(G) 137 (CanLII); Centre québécois du droit de l'environnement c. Oléoduc Énergie Est Ltée, 2014 QCCS 4398 (CanLII); *Wier v. British Columbia (Environmental Appeal Board)*, 2003 BCSC 1441 (CanLII); *Dawber v. Ontario (Director, Ministry of the Environment)* (2007), 28 C.E.L.R. (3d) 281; affd. (2008), 36 C.E.L.R. (3d) 191 (Ont.Div.Ct.); leave to appeal refused (Ont. C.A. File No. M36552, November 26, 2008).

[77] Cameron and Abouchar 1990, 3.

been endorsed as a principle of statutory interpretation and in furtherance of international commitments, has in many instances been incorporated into specific sections of domestic legislation.

As the Supreme Court of Canada set out in its 2001 decision in *Spray-Tech*:

> The interpretation of By-law 270 contained in these reasons respects international law's 'precautionary principle', which is defined as follows at para. 7 of the Bergen Ministerial Declaration on Sustainable Development (1990):
>
> In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.[78]

As such, there is a positive obligation on decision makers to ensure the activities within their jurisdiction or control do not cause unacceptable harm to the environment.[79] For example, under Canada's leading statute for the management and oversight of toxic substances, the *Canadian Environmental Protection Act,* a risk is considered 'unacceptable' if it has or may have an immediate or long term harmful effect on the environment, or it poses a danger to human health or the environment on which life depends.[80] It also requires that laws and their application be forward looking, as the Supreme Court of Canada held in *Castonguay:*

> This emerging international law principle recognizes that since there are inherent limits in being able to determine and predict environmental impacts with scientific certainty, environmental policies must anticipate and prevent environmental degradation (emphasis added).[81]

As detailed in Sect. 9.2, aspirations to value the future and prevent harm were critically lacking during the advent of nuclear law in Canada. The temporal inertness of Canada's first nuclear laws—which failed to consider and anticipate decommissioning and accompanying issues of waste management—continues to shape the destiny of the nuclear sector, evidenced by the lag of decommissioned reactors worldwide.

Crucially, nuclear laws and decision making must be able to be responsive to future change such as new scientific knowledge, or changing community expectations and anticipate new threats, including climate change.[82] Indeed, it has been internationally recognized that the precautionary principle applies in the context of climate change, as set out in Article 3 of the United Nations Framework Convention on Climate that establishes that 'parties should take precautionary measure to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects'. For these reasons, not only does the precautionary principle allow for decision-making in

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[78] *114957 Canada Ltee (Spray-Tech) v Hudson (Ville)* 2001 SCC 40 (CanLII).

[79] Cameron and Abouchar 1990, 22.

[80] Environment Climate Change Canada 2005.

[81] *Castonguay Blasting Ltd. v Ontario (Environment),* 2013 SCC 52 (CanLII), para 20.

[82] Richardson 2017, 146.

uncertain and risky conditions, there is a legal obligation that it be relied upon within nuclear legal frameworks.[83]

Had the precautionary principle been applied when nuclear reactors were first planned and developed, throughout the 1960s and 70s, the severity and irreversibility of the contemplated harm, as well as the extent of impact on future generations and impacts on communities (and differentials based on age, income, community and location) resulting from its waste legacy and decommissioning would have been required considerations. Indeed, as noted in Sect. 9.3.2, these gaps may now result in nuclear power plant host communities evolving into *de facto* long-term waste management sites. Had these factors historically, received due consideration, there would have been a strong case for not creating the hazard in the first place[84] and the global nuclear trajectory may have looked much different. In applying the precautionary principle to contemporary nuclear and licensing decisions, we must be cognizant to remedy the near 50-year gap where considerations relating to types and quantities of 'acceptable' human induced harms to the environment were absent.

### *9.4.2 Environmental Assessment and Social License*

As mentioned in Sect. 9.2, nuclear stations were built in Canada without environmental reviews. While in theory, environmental assessment (EA) provides a solution to many of the gaps reviewed above, recent amendments to Canada's EA law—the *Impact Assessment Act*—have removed decommissioning from among the projects requiring EA review. Further, under international law, Canada is obligated to undertake an Environmental Impact Assessment when there is a risk of transboundary environmental harm. As a party to the Convention on Environmental Impact Assessment in a Transboundary Context (the 'Espoo Convention') Canada has committed to using its existing federal impact assessment process to implement its obligations should a project have the potential for transboundary impacts for other Parties to the Convention. As the majority of Canada's nuclear fleet is located along the shores of the Great Lakes, there is the potential transboundary effects given the shared waters with the United States. However, as the U.S. is not a party to the Espoo Convention, a transboundary effect on one of the other listed Parties would have to be found in order to trigger the convention's applicability. Thus, as we approach the age of decommissioning, it is deeply troubling that due to the current legislative lacuna, there will be no venue provided for citizens and affected communities to evaluate the technical or social desirability of preferred decommissioning approaches, early in the assessment process.

It is also noteworthy that the Finland government in 2020, notified Canada as a party of the Espoo Convention, of an environmental assessment of the life-extension

[83] *Ibid*., 150.

[84] McClenaghan 2017.

of its Loviisa nuclear power plant.[85] However, in addition to exempting decommissioning of reactors from environmental assessments, the Canada's federal government has also exempted the life-extension of nuclear power plant life-extensions from environment review. Thus, an equivalent notification under the Espoo Convention would not occur. As a means of improving public transparency and consultation requirements, Canada could align with international norms as set out in the Espoo Convention.

Unquestionably, the removal of decommissioning from EA processes also has negative implications for the public's trust in the oversight of nuclear safety. In Canada, this means decommissioning projects can be licensed without a social licence to operate and host communities, deprived of rights of access to information and public participation opportunities. Due to the expanded procedural rights and scope of review in an EA, there is no circumstance under which a narrow environmental *review* conducted by CNSC in the context of a licensing hearing (which would be required for a proponent to obtain a decommissioning licence) can be conflated with an environmental assessment under the *IAA*. Further, while the *Aarhus Convention* is the leading international convention providing that everyone has a right to receive environmental information and participate in environmental decision-making, Canada is not a signatory and has not ratified the agreement. More generally, the International Atomic Energy Agency encourages the release of documents, to increase institutional credibility. Both of these international standards would assist Canada in regards to its nuclear decision making. These participation rights could be adopted into domestic law without legislative action, by way of the doctrine of adoption. While such adoption is yet to occur, the Supreme Court of Canada has recognized that 'when an international practice develops from being intermittent and voluntary into being widely accepted and believed to be obligatory, it becomes a norm of customary international law'.[86]

A nuclear station's community acceptance—what we now call 'social licence'—has been based on the promise that a community would benefit from the economic benefits created by employment by the station's operation, but the disbenefits of the station's operation, such as the risks associated with radioactive waste, would be removed from the community. As evidenced by our research and analysis, this does not hold to be true. After several decades, it has become increasingly evident to some reactor host communities that radioactive waste may remain on-site for an extended period if not permanently. As noted, the Pickering and Gentilly-2 NGSs have closed or are retiring, but there remains no approved off-site plan for the long-term management of the long-lived radioactive wastes produced over their operational lives. Given its age and size, the Pickering NGS also houses the largest amount of high-level fuel waste in Canada at an interim storage facility. Durham Region has formally passed motions opposing the long-term management of radioactive waste within its

[85] Memorandum to the President (2020) Response to the Government of Finland Regarding EIA of Loviisa Nuclear Power Plant under the Espoo Convention obtained through ATI, EDOC# 14777139, A-2020-00038/CS, 1.

[86] *Nevsun Resources Ltd v Araya*, 2020 SCC 5*, para 81.*

boundaries in 2010 and 2015. In 2018, it asked 'to be compensated for the storage of nuclear waste until such time as nuclear waste is stored in a permanent nuclear waste site and compensation is then provided for the permanent waste storage host community'.[87]

Notably, Durham Region, which also hosts the ten reactors at the Darlington nuclear station has stated that the current environmental assessment process has not properly assessed the impacts of radioactive wastes. In line with this, Durham Region has asked the government to ensure that 'approval of a nuclear project should require a proponent to have a nuclear waste disposal solution available before the new/refurbished nuclear reactors are permitted to operate'.[88]

As confirmed earlier,[89] environmental or impact assessments are a recognized means of achieving sustainable development and indeed, fostering sustainability is recognized as a statutory purpose of Canada's federal environmental law.[90] However, so long as the decision to exempt decommissioning remains, the mechanism intended to assess a project's contribution or harm to sustainability, prior to development, will be of no force or effect.

## 9.5 Conclusion

This chapter's review of early nuclear laws demonstrates that the founding events and laws of Canada's nuclear sector are not independent of the present state of the industry. The intent of the *AECA*—whether derived from its regulation making powers or review powers for the Board—was with the immediate 'production of', 'application of' and 'research into' atomic energy. Absent was the intent to anticipate or prevent environmental risks of nuclear power and the associated social and economic impacts, which may have hindered the sectors' commercial development.

For the law to now remedy decades of deficient oversight and consideration of decommissioning, there must be a fundamental change in structure or intent of our current nuclear and environmental laws. Challenges of siting, assessment of alternatives, and identifying long-term storage options that are both technically feasible and socially acceptable should be fundamental to decommission planning. Unfortunately, the CNSC remains the decision-maker on these matters despite the obstacle having been created under their authority and predecessor. Further, the CNSC should not be the *sole* authority for decommissioning decision making when decommissioning activities pose high risk to the environment, human health and future generations.

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[87] Regional Municipality of Durham (2018), Submission from the Regional Municipality of Durham regarding the application of Ontario Power Generation (OPG) to renew the power reactor operating licence for the Pickering Nuclear Generating Station (PNGS) 7 May 2018, 13.

[88] Garry Cubitt, Chief Administrative Officer, Durham Region to Kevin Blair, Major Projects Management Office, Natural Resources Canada, (28 Aug 2017) Environmental and Regulatory Reviews Discussion Paper.

[89] Blaise and Stensil 2020.

[90] *Impact Assessment Act,* SC 2019, c 28, s 1, s 6(1)(a).

Although three of Canada's five nuclear generation stations are undergoing plans to extend their operational lives, the operators of the Gentilly-2 and Pickering nuclear stations have announced the stations will be retired and decommissioned. As discussed, the retirement of these stations has brought forward interconnected environmental, social and economic challenges that were not adequately considered when the federal government established the legal framework for the oversight of Canadian nuclear facilities following World War II. In particular, the failure of Canada's regulatory framework to require nuclear operators to consider how they will manage long-lived radioactive wastes will impact the feasibility of fully decommissioning Canadian nuclear facilities for the foreseeable future.

In our view, the risks related to decommissioning and restoring nuclear facilities in Canada underlines the value of integrating the precautionary principle into regulatory frameworks for new technologies. As discussed, the precautionary principle encourages public authorities to consider and proactively address potential activities that create 'irreversible harm'. Such irreversible impacts initially manifest themselves as environmental damage, but also have deleterious social effects in that they burden or limit agency of future generations. As discussed, the failure to pre-emptively consider how long-lived radioactive wastes produced by the operation and dismantling of nuclear reactors would be addressed has created what is effectively an irreversible environmental effect. These radioactive wastes, which require long-term regulatory oversight by the CNSC, are now creating social tensions and economic impacts because they pre-empt discussions of alternate approaches to reactor decommissioning.

Good policy results from careful consideration, where diverse stakeholders and the public have the benefit of access to all relevant information and expertise. However, our review of decommissioning to date at the Pickering and Gentilly-2 NGSs demonstrates that their host communities have been provided no legal mechanism to proactively consider the impacts of decommissioning, which would allow for an examination of alternatives and an opportunity to consider mitigation options. Decommissioning decision-making should not be able to escape public scrutiny when there *are* tools available under Canada's federal EA law to address issues of intergenerational, environmental and social significance and to the best extent achievable, remedy historical wrongs.

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