Chapter 12
Nuclear Law, Oversight and Regulation: Seeking Public Dialogue and Democratic Transparency in Canada

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Contents

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Abstract To begin public discourse on acceptable policies and strategies surrounding Canada's continued reliance on nuclear energy and the waste legacy it generates, this chapter explains the work of the Canadian Nuclear Safety Commission (CNSC), the regulatory body which oversees Canada's nuclear industry. The authors describe the federal laws surrounding nuclear licensing and environmental approvals. They comment on current plans relating to radioactive waste disposal and emergency planning in light of the Fukushima Daiichi accident. They conclude that to strengthen the independence of the CNSC, opportunities for meaningful public participation should be developed, Indigenous engagement in CNSC decision-making processes be affirmed, and the federal government's role and responsibilities for nuclear emergency management clarified.

Keywords Environmental Protection · Human Health · Nuclear Legacy · Nuclear Oversight · Nuclear Power · Nuclear Waste · Public Dialogue · Transparent Decision-Making

12.1 Introduction

One of six Canadians live within sixty kilometres of a nuclear power plant. Even more people work or travel in areas transected by the annual transportation of approximately 1 million packages containing radioactive substances.[1] While North America witnesses a decline in operable nuclear reactors—triggered by a growing awareness of safety problems, the rising cost of operating aging reactors and competition from new forms of energy generation, such as renewables—Canada continues to pursue the refurbishment of its nuclear reactors and operations into the 2060s.[2]

Accompanying Canada's continued reliance on nuclear power, is a regulatory process which effectively expedites the approval of nuclear licences and radioactive waste repositories without meaningful engagement with the Canadian public and Indigenous peoples. In order to begin a long overdue nation-wide discussion on acceptable policies and strategies surrounding Canada's continued reliance on nuclear energy and the waste legacy it generates, it is necessary to first understand the regulatory body which oversees Canada's nuclear industry (Sect. 12.2); the laws surrounding nuclear licensing and environmental approvals (Sects. 12.3 and 12.4); current plans relating to radioactive waste disposal (Sect. 12.5); and emergency planning in light of the Fukushima Daiichi accident (Sect. 12.6).

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[1] Canadian Nuclear Safety Commission, Regulatory Oversight Report on the Use of Nuclear Substances in Canada: 2016 (January 2018), http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/DNSR-Report-Use-of-Nuclear-Substances-2016-eng.pdf.

[2] Canadian Nuclear Safety Commission, CMD 18-H4, A Licence Renewal—Bruce Power Inc., Bruce Nuclear Generating Station A and B—Environmental Assessment Report (12 February 2018), p. 11.

12.2 Nuclear Regulation and Oversight in Canada

When Canada first undertook active participation in the nuclear fuel chain, it was to support the UK and US in their efforts during World War II. The first research facilities in Canada were established for that purpose. Subsequently the federal government decided to support the development of nuclear power generation, but was advised by industry that it would not participate without governmental measures to limit their exposure to liability for damages arising from accidents. The federal government then issued an Order-in-Council declaring the 'peaceful' use of nuclear energy to be for the general advantage of Canada, and provide protection of the private sector from liability. Later constitutional amendments and legislative developments further entrenched this approach, which is now embedded in the division of powers under Canada's *Constitution Act* (1982). As a result, federal regulation of nuclear power use and safety is currently undertaken by the Canadian Nuclear Safety Commission (CNSC), the successor to the former Atomic Energy Control Board (AECB).

The CNSC functions both as a quasi-judicial licensing tribunal under its enabling statute, the *Nuclear Safety and Control Act*, and as a regulator that performs monitoring, inspections and enforcement activities to ensure compliance by the nuclear sector. As an administrative tribunal, the CNSC generally operates in an inquisitorial, rather than an adversarial trial-like manner, where adjudicators act together as fact-finder and make decisions on consensus.

As a result of its inquisitorial approach, the CNSC lacks the rules of procedure necessary for hearing participants to fairly and effectively test the factual, technical and scientific evidence often presented at licencing hearings. For instance, at CNSC licencing hearings, there are no requirements for duly qualifying experts who wish to present opinion evidence, and no provisions that enable participants to cross-examine experts or other witnesses under oath. As a result, Commissioners appear to presuppose the validity and rigour of the evidence which is provided primarily by the licence applicant, but evaluated internally by CNCS technical and professional staff. Similarly, disclosure of key information can be particularly difficult for public intervenors to obtain at CNSC hearings, as licence applicants frequently withhold documents on the basis that they are 'proprietary', while the Commission may assert privilege over the requested information on the grounds that it is 'security sensitive'. Since there is no process before the Commission that allows requested documents to be disclosed to the hearing participants in strict confidence (i.e. a 'sealing order'), intervenors are routinely limited to making submissions based only on publicly available information.

The CNSC's regulatory approach also creates challenges for public disclosure and transparency of decision-making. As the majority of CNSC regulatory documents and standards are not prescriptive, licensees can 'put forward a case to demonstrate that the intent of a requirement is addressed'.[3] This negotiated approach to regulation between the CNSC and licensees results in consultations which are neither transparent nor open to broader dialogue with Canadians. This in turn limits the extent of recommendations which can be made by public intervenors appearing before the Commission at licensing hearings.

By controlling the dissemination of information and relying predominantly on its internal staff, the CNSC is able to centralize oversight of the nuclear sector in a single entity. This in turn creates the preconditions for regulatory capture, a phenomenon wherein the regulatory agency becomes beholden to the interests of the business or sector it is supposed to regulate.[4] While other federal regulators have recently undergone extensive public review in an effort to rebuild public trust, Canada's nuclear regulator has been insulated from this review.[5]

International obligations requiring the nuclear regulator be indeed, fully independent, also directly bear on the CNSC's mandate and decision-making authority. As a member of the International Atomic Energy Agency (IAEA), Canada is required to 'take appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body …concerned with the promotion … of nuclear energy'[6] and 'ensure that the regulatory body is effectively independent in its safety related decision making'.[7] As further discussed in Sects. 12.3 and 12.4, to address the risk or apprehension of regulatory capture and ensure compliance with international obligations, Canada's nuclear laws must be modernized and the procedural safeguards for the public and intervenors enhanced.[8]

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[3] Canadian Nuclear Safety Commission, Canadian Perspective on Risk-Informed Regulation (27 March 2018), http://www.nuclearsafety.gc.ca/eng/pdfs/Presentations/CNSC_Staff/2018/20180328-doug-miller-international-smr-advanced-reactor-eng.pdf.

[4] Mahar 2015, p. 9.

[5] Minister of Environment and Climate Change, Building Common Ground: A New Vision for Impact Assessment in Canada (2017), https://www.canada.ca/content/dam/themes/environment/conservation/environmental-reviews/building-common-ground/building-common-ground.pdf, pp. 50–51 [Expert Report]; Natural Resources Canada, Forward Together: Enabling Canada's Clean, Safe and Secure Energy Future (2017), https://www.nrcan.gc.ca/19667.

[6] IAEA, Convention on Nuclear Safety, Article 8. Regulatory Body.

[7] IAEA Safety Standards, *Government, Legal and Regulatory Framework for Safety*, GSR Part 1 (Rev 1), Requirement 4.

[8] Canadian Environmental Law Association, Consultation on Draft RegDoc 3.2.1 Public Information and Disclosure (2017), http://www.cela.ca/CELAcommentsonREGDOC3.2.1.

12.3 Modernizing Canada's Nuclear Laws

It has been over twenty years since Canada's *Nuclear Safety and Control Act* (NSCA)[9] was passed by Parliament to replace the previous *Atomic Energy Control Act*. However, a number of stakeholders maintain that further modernization of Canada's nuclear legislation is necessary to remedy the CNSC's widely criticized lack of institutional independence from the community it regulates,[10] and to address the issue of regulatory capture. The CNSC's predecessor, the Atomic Energy Control Board (AECB), had a legislated mandate to 'promote' nuclear power. While this mission statement was removed from the CNSC's mandate under the NSCA, there remains the public perception that the CNSC continues to be a promoter of the industry it regulates.[11]

The need for legislative reform becomes more acute in light of the findings from the Japanese Parliamentary panel's report following the Fukushima Daiichi nuclear disaster. Although the earthquake and tsunami are often typically portrayed as the cause of the accident in Canadian media, the Japanese government's investigation concluded that the nuclear accident resulted from government-industry 'collusion' and it was clearly 'manmade' due to a lax and industry-friendly nuclear regulator.[12] The report found that while the Japanese regulator and Fukushima's operator were aware of the tsunami risk, they did not adequately act on the information.

To address the human and institutional causes of the Fukushima disaster, Japan and the European Union increased legal requirements for the independence and transparency of their nuclear regulators. Similar action is required in Canada in order to modernize Canada's nuclear laws. Among other things, this requires a detailed review and revision of the CNSC's mandate, decision-making procedures and processes for public engagement. It is also necessary to review the criteria upon which the CNSC makes its decisions, ensure that the information that the CNSC relies upon is publicly available and accessible, and evaluate whether—or to what extent—participants in licencing hearings felt that their evidence and submissions were heard and respected.

As the Auditor General of Canada found in its examination of the CNSC and its management of nuclear power plants:

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

[10] Letter by the Canadian Environmental Law Association et al to the Right Honourable Justin Trudeau (Office of the Prime Minister), 8 March 2016, http://www.cela.ca/sites/cela.ca/files/Trudeau-NuclearReview.pdf.

[11] Letter by Michael Binder (President of the CNSC) to the Honourable David Heurtel (Minister of Sustainable Development, Environment and the Fight Against Climate Change), 27 July 2015, http://www.nuclearsafety.gc.ca/eng/pdfs/letters/BAPE-letter-eng.pdf; Expert Report, *supra* note 5.

[12] The National Diet of Japan, The official report of The Fukushima Nuclear Accident Independent Investigation Commission, 2012, p. 16 [Fukushima Report].

> Overall, we found that the Canadian Nuclear Safety Commission (CNSC) had insufficient or incomplete documentation to support or explain its planning decisions. For example, it could not show how it had taken risks into account when making decisions about which inspections it would and would not carry out each year. We recognize that the CNSC's planning process must be flexible enough to respond to unforeseen events or issues. However, that does not preclude the need for a systematic, well-documented process so that the CNSC can demonstrate that its planning considers risk and that it allocates enough staff at the levels needed, commensurate with risk.[13]

In another recent report, a federal expert panel tasked with updating Canada's laws relating to environmental assessment found the following:

> The apprehension of bias or conflict of interest, whether real or not, was the single most often cited concern by participants with regard to the … CNSC. The apprehension of bias …eroded confidence in the assessment process.[14]

A legislative review of Canada's *Nuclear Safety and Control Act* is both timely and necessary to ensure an independent and robust licensing process in the public interest. This requires strengthening the independence of the Commission, improving transparency and accountability in CNSC decision-making, enhancing opportunities for meaningful public participation, and affirming the necessity for Indigenous engagement in CNSC decision-making processes. The federal government's role and responsibilities for nuclear emergency management must also be clarified, and the CNSC's oversight shifted to a Ministry without a mandate to promote nuclear power.

12.4 Environmental Assessment Law

12.4.1 Canada's Nuclear Regulator Has the Authority to Conduct Environmental Assessments

In addition to licensing and regulating the nuclear industry in Canada, the CNSC is one of only two federal authorities[15] apart from the Canadian Environmental Assessment Agency empowered to conduct environmental assessments (EAs) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).[16] However, allowing the CNSC to conduct EAs under the current law has proven problematic in fundamental ways. For instance, CNSC-led EAs of designated

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[13] Office of the Auditor General of Canada, Report 1—Inspection of Nuclear Power Plants—Canadian Nuclear Safety Commission (2016), http://www.oag-bvg.gc.ca/internet/English/att__e_41721.html.

[14] Expert Report, *supra* note 5, p. 48.

[15] The other authority that is currently empowered to conduct federal EAs is the National Energy Board.

[16] *Canadian Environmental Assessment Act, 2012,* SC 2012, c 19, s 52, s 15 [CEAA 2012].

nuclear projects have been undertaken in a manner that public interest participants have found to be narrowly focused, insufficiently robust and procedurally unfair.

More generally, the CNSC has an industry-specific mandate which does not allow it to address more broadly scoped environmental planning issues (including the rigorous consideration of alternatives) which are necessary in the EA process. For instance, hearings for the re-licensing of nuclear power plants under the NSCA —which typically occur every 5–10 years—focus largely on technical issues rather than environmental planning considerations or social acceptability (e.g. issues such as whether there is a demonstrable public need for more nuclear power, or whether there are there better, cheaper or safer ways of meeting or managing electricity demand). This is exacerbated by the Commission's view that it is not the CNSC's role to adjudicate upon the suitability of nuclear power, or the choice to use nuclear power as opposed to renewable energy sources, or the determination of what is the optimum mix of different energy sources and conservation measures. The Commission opines that these matters generally fall within the purview of the relevant provincial energy officials, and that the CNSC is limited to acting as a safety regulator. This narrow view stands in the way of proper environmental planning under federal law, as demonstrated in recent EA cases where CNSC members had the statutory duty to consider the need for, or to consider alternatives to, the proponent's proposed nuclear project, but did not adequately discharge that duty in the view of public interest intervenors.

In light of these and other fundamental concerns, the federal government established an Expert Panel in 2016 to conduct a review of the federal EA process and to recommend reforms that would restore public trust, protect the environment, and advance reconciliation with Indigenous peoples. Public interest groups, including the Canadian Environmental Law Association (CELA), welcomed this consultation by the Expert Panel which promised to 'restore robust oversight', 'introduce new, fair processes', and 'provide ways for Canadians to express their views and opportunities for experts to meaningful participation'.[17]

The 2017 report produced by the Expert Panel reflects the views it heard from numerous Canadians, and finds that the CNSC has not operated in a transparent way, nor demonstrated a commitment to public engagement and the rigorous testing of evidence, within federal EA processes. The Panel's report also cites public concerns about the perceived lack of independence and objectivity because of the close relationship between the CNSC and the nuclear industry. Because Canadians felt that public trust was lacking in the federal EA process, so too, was the social acceptance necessary to facilitate projects being assessed under CEAA 2012.

Throughout the EA reform public engagement process, CELA recommended that the federal government should repeal CEAA 2012, start with a clean slate, return to first principles, and develop an integrated package of forward-looking statutory, regulatory, policy and administrative reforms aimed at ensuring

[17] Expert Report, *supra* note 5, p. 5.

sustainability.[18] It was imperative, CELA argued, for the Government of Canada to establish a new impact assessment authority that by law is required to conduct robust reviews, hold procedurally fair proceedings, and deliver credible, transparent and evidence-based decisions.

In February 2018, the federal government tabled its proposed revised EA law entitled the *Impact Assessment Act* (IAA).[19] On the day that Bill C-69 was introduced, federal Ministers fanned out across Canada to hold press conferences praising the new legislation, and extensively using social media to claim that the IAA represented 'Better Rules'. However, a close reading of the IAA reveals that in many key aspects, the IAA is not demonstrably 'better' than CEAA 2012. To the contrary, the IAA replicates many of the same significant flaws and weaknesses found within the widely discredited CEAA 2012.

For example, Bill C-69 advances an ill-conceived model that permits CNSC members to be appointed to review panels that will conduct impact assessments of designated projects that require licencing under the NSCA, contrary to the Expert Panel's recommendation that regulators should not conduct assessments.[20] In particular, the IAA specifies that 'at least' one member from the CNSC must be appointed to the review panel when assessing a designated nuclear project. The skewed membership of review panels that could be established to assess energy projects under these provisions of the proposed IAA would essentially repeat the same contentious types of regulator-led assessments that occurred under CEAA 2012, and that resulted in a loss of public trust which prompted the above-noted commitments by the federal government to review and revise the national EA regime. Public confidence cannot be regained by creating a system that still allows regulators to lead, control or otherwise dominate assessments of projects that the regulators also happen to licence under other statutes.

12.4.2 Major Nuclear Projects Lack Environmental Assessments

A regulation under CEAA 2012 lists a small number of physical activities that currently trigger the CNSC's obligation to conduct a federal EA. While the construction of a new nuclear waste facility or the construction of a new nuclear reactor triggers an EA, projects such as reactor life extensions and refurbishments, or end of life decommissioning do not.[21] Therefore, unless a project is designated by regulation as a physical activity to which CEAA 2012 applies, then a federal EA is not required as a matter of law before the CNSC issues a licence under the NSCA.

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[18] Lindgren 2017.

[19] Bill C-69, *An Act to Enact the Impact Assessment Act*, 1st Sess, 42nd Parl, 2018 [IAA].

[20] Lindgren 2018.

[21] Regulations Designating Physical Activities, SOR 2012-147.

As the proposed IAA is being debated in Parliament at the present time, the federal government has not released a draft projects list to identify which nuclear-related activities will trigger an impact assessment. However, the government is currently consulting on the criteria that should be used to designate projects under the IAA, which indicates that the proposed Act will continue the narrow project-listing approach utilized under CEAA 2012.

It is noteworthy that under the predecessor to CEAA 2012,[22] changes to the operating licences of nuclear power plants constituted an EA trigger, and therefore nuclear projects such as power plant refurbishment were automatically subject to federal EA requirements. For example, Bruce Power, the licensee which operates an 8-reactor nuclear station on the shores of Lake Huron, Ontario, is currently seeking approval from the CNSC to refurbish its reactors, allowing its operating life to be extended to 2064. Although previous refurbishment projects triggered federal EA requirements under the prior version of the law, this latest proposal is not a designated project under CEAA 2012, and would therefore be Canada's first nuclear power plant rebuild to *not* undergo a federal EA.

Even if Canada's proposed IAA was amended to either remove its project-listing approach, or to specifically include refurbishment and life extension projects within its scope, there has been no indication that any currently proposed nuclear refurbishment and life extension projects would be transitioned into the new Act.

The end stage of the nuclear power plant life cycle is similarly not subject to a federal EA nor proposed to be a designated project, requiring review under the IAA. 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.

While the host municipality of the Pickering Nuclear Generating Station has expressly requested it be notified and engaged in the decision-making process with respect to conducting an EA for the plant's decommissioning,[23] their involvement is moot as decommissioning is so far, not a project requiring an EA either federally or provincially. The Municipality has also expressed concerns related to the socio-economic impacts of station closure and has requested they be considered in an environmental assessment. Only an EA conducted pursuant to Canada's federal environmental assessment legislation would allow authorities to review the socio-economic and cultural values and effects associated with decommissioning, as the *Nuclear Safety and Control Act* is too narrow a regulatory statute to permit this review.[24]

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[22] *Canadian Environmental Assessment Act*, SC 1992, c 37.

[23] Durham Region, Submission from the Regional Municipality of Durham regarding the application of Ontario Power Generation to renew the Power Reactor Operating Licence for the Pickering Nuclear Generating Station (7 May 2018), http://www.nuclearsafety.gc.ca/eng/the-commission/hearings/cmd/pdf/cmd18-h6/CMD18-H6-67.pdf, p. 16.

[24] See IAA, *supra* note 19, s 6(1); CEAA 2012, *supra* note 16, s 19.

If appropriate changes to Canada's proposed IAA are not implemented, then Parliament will lose an important opportunity to strengthen and improve Canada's approach to assessing nuclear projects. While the CNSC should be able to participate (like any other federal authority) in the impact assessment process, the CNSC should not lead, nor co-lead, assessments under the new regime for the very reasons that precipitated Canada's federal review of its broken EA process.[25]

12.5 Canada's (Growing) Waste Legacy

Planning for the long-term storage and disposal of radioactive waste should be a prerequisite to any proposal seeking to extend nuclear reactor operating life, refurbish infrastructure or introduce new reactor technology.[26] The worst environmental 'legacy' issues in Canada exemplify this requirement, where there are five ongoing nuclear waste cases, four of which are being evaluated in ongoing federal EA processes. Scholars have noted that the identification and construction of suitable storage and disposal sites not only poses technological challenges but lacks general social acceptance.[27] Local communities are very worried about short- and long-term impacts on adjacent waterways, drinking water quality, environmental and ecosystem health, and the potential failures of the proposed 'solutions'.

All four EA cases, discussed below, involve approaches that are either completely untested, or have failed elsewhere, and involve radioactive wastes that can remain toxic for hundreds and thousands of years. The fifth proposal involves the underground disposal of used nuclear fuel—highly toxic, long-lived radioactive waste that results from the fissioning of the CANDU fuel pellets during power production. This proposal has not yet been assessed in a federal EA process, but has been undergoing a lengthy siting process to find a geologically suitable location and a willing host community under the auspices of the Nuclear Waste Management Organization pursuant to the federal *Nuclear Fuel Waste Act*. The other four proposals deal with non-fuel radioactive waste, much of which is still highly toxic and long-lived, and all of which still needs to be managed to separate the waste from the living environment.

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[25] CELA Review, *supra* note 18.

[26] Sudbury Star Staff, Mining research corporation exploring mini reactors for North, in Sudbury Star (9 April 2018), online: http://www.thesudburystar.com/2018/04/08/mining-research-corp-exploring-mini-reactors-for-north.

[27] Odendahl 2016, p. 282.

12.5.1 The Waste Bunker—Also Known as the Deep Geological Repository

The first of Canada's long-term disposal plans for low- and intermediate-level nuclear waste to undergo an EA process (which is still underway) is the Deep Geological Repository (DGR) in Kincardine, Ontario. According to the proposal, this nuclear waste, much of which is very long-lived and/or quite hazardous despite being styled 'intermediate-level' radioactive waste, would be placed in a deep rock excavation just one kilometre from Lake Huron. A lack of proper evaluation of alternatives, failure of similar technology elsewhere in the world, and irreversibility of this proposal are among the reasons that people are calling for Canada's federal environment Minister to deny the approval.

The federal decision on whether to approve the DGR is currently on hold since the Minister of the Environment and Climate Change, Catherine McKenna, has requested further information from the proponent, Ontario Power Generation, particularly about 'the potential cumulative effects of the project on physical and cultural heritage' of the Saugeen Ojibway Nation.[28] To date, Ontario Power Generation remains confident the DGR 'will have no impact on the surrounding environment'.[29]

12.5.2 Entombing Nuclear Plant Structures and Its Waste—Also Know as In Situ Decommissioning

The second and third nuclear waste disposal cases are among the first nuclear EA matters to trigger the CNSC's assessment role, as lead agency, under CEAA 2012. These two cases both propose to 'grout and abandon' radioactive wastes at the Whiteshell Reactor in Pinawa, Manitoba and the Rolphton nuclear power demonstration reactor in Chalk River, Ontario.

A 'government-owned/contractor operated' contract, unprecedented in Canada, has charged Canadian Nuclear Laboratories (CNL) with implementing solutions to nuclear legacy wastes owned by the Atomic Energy of Canada Limited (AECL). The AECL is a Crown-owned corporation which is now a shell of its former self, and serves as the intermediary corporation between its government shareholders and the contracted managers. CNL has proposed to leave everything from these two

[28] Minister of Environment and Climate Change, Letter to Ontario Power Generation (21 August 2017), http://www.ceaa-acee.gc.ca/050/documents/p17520/120087E.pdf.

[29] Ontario Power Generation, The Deep Geological Repository (2016), http://opgdgr.com/.

reactors on-site (exclusive of used fuel and heavy water which were removed from the body of both reactors) alongside the Winnipeg and Ottawa Rivers respectively, and fill the buildings and cavities with grout and cement.

The proposed *in situ* decommissioning (also known as entombment) of these sites would result in the subsurface reactor systems, components, structures and their associated hazards being permanently buried, and encased with grout. At Whiteshell, high quantities of radionuclides will remain inside the facility despite it being shut down in 1985, in part because of the 'approximately 150 documented fuel failures in the reactor between 1966 and 1983'.[30]

Despite the proposed *in situ* decommissioning of these sites, current international standards indicate that, short of an emergency scenario, *in situ* decommissioning should be limited to nuclear facilities that only contain short-lived or limited concentrations of long-lived radionuclides. The IAEA does not recognize entombment or in-situ confinement as strategies for decommissioning, noting:

> Entombment is not relevant for a facility that contains long lived isotopes because these materials are not suitable for long term surface disposal. Consequently, reprocessing facilities, fuel fabrication facilities, enrichment facilities or facilities that use or process thorium or uranium would not be appropriate for entombment. However, entombment could be a viable option for other nuclear facilities containing only short lived or limited concentrations of long lived radionuclides, i.e. in order to comply with the site release criteria.[31]

Worrying facts also emerge from the review of documents for the planned decommissioning of the Rolphton reactors in Chalk River, Ontario. For instance, the current environmental impact statement provided by the proponent notes that the buried reactor vault will become flooded after 40–60 years and the nuclides will travel underground to the Ottawa River where they will be diluted. This proposal adopts the outdated and unacceptable assumption that dilution and dispersion is an acceptable method of dealing with radionuclides (the oft-asserted, 'dilution is the solution to pollution'), and it fails to consider the cumulative effects from the project, with a near surface waste facility also proposed for the site. As discussed below, to date no study has been undertaken to review the combined environmental effects caused by the Rolphton entombment and the proposed Chalk River near-surface facility on the Ottawa River, its downstream residents and ecosystems.

[30] Canadian Nuclear Laboratories, In Situ Decommission of Whiteshell Reactor 1 Project—Decommissioning Safety Assessment Report (2017, Revision 2), para 5.3.1.1.1.

[31] IAEA, *Decommissioning Strategies for Facilities Using Radioactive Material*, SRS 50 (2007), s 3.2.2.

12.5.3 The Radioactive Landfill—Also Known as a Near Surface Disposal Facility

The fourth EA case is the 'Near Surface Disposal Facility' also proposed by CNL. Once again, the regulator— the CNSC—is conducting the federal EA process under CEAA 2012. An extremely large volume of nuclear waste from Chalk River's past activities, and from other locations in Ontario, would be placed in a 'near surface' mound with a liner and cap similar to domestic landfills, in close proximity to the Ottawa River.

The EA currently underway does not consider the two major nuclear accidents which occurred at Chalk River in the 1950s and their resulting wastes. A partial meltdown occurred in 1952 at the National Research Experimental reactor operated by the AECL. The second event occurred in 1958, involving a fuel rupture and fire in the National Research Universal reactor building. It appears likely that highly radioactive debris from these accidents still exists in some of the waste targeted for this facility, given the long long-half lives of the nuclides on-site.

As noted by many concerned groups, international guidelines do not recommend the use of near surface facilities for wastes other than those with short half-lives and low toxicity (i.e. low-level waste). While a recent change by the CNL to its proposal removes 'intermediate' level waste from the proposal, much of the waste destined for this site is still long-lived and toxic radioactive waste that does not meet the international guidelines for near surface radioactive waste facilities. As the IAEA's Specific Safety Guide for near surface disposal facilities outlines:

- Neither Intermediate Level Waste (ILW) (i.e. lasting more than a few hundred years) or High Level Waste (HLW) should be placed in these facilities;
- Near-surface disposal is an appropriate disposal option only for very low-level wastes; and
- ILW and HLW, which contain larger quantities of long-lived radionuclides, should not be stored in surface or near surface facilities.[32]

Despite this guidance, the NSDF is proposed to contain ILW. By volume, ILW will constitute 1% of total waste and given the sites total capacity of 1,380,000 m^3,[33] the resulting amount of IWL is not negligible, at 13,800 m^3.[34]

[32] IAEA, *Near Surface Disposal Facilities for Radioactive Waste*, Safety Standard, SSG-29 (2014).

[33] CNL Performance Assessment for Near Surface Disposal Facility to support the Environmental Impact Statement. Report 232-509240-ASD-001, amended Table 4-2.

[34] CEAA, Consolidated Near Surface Disposal Facility Project EIS Review Comment Tables, http://www.ceaa-acee.gc.ca/050/documents/p80122/119841E.pdf.

12.6 Emergency Planning and Preparedness

12.6.1 The Planning Basis and Accompanying Response Measures

Given Canada's current and future reliance on nuclear power, we must ask: if a large-scale nuclear accident with off-site releases of radioactive substances were to occur at any of Canada's nuclear power plants, would we be able to prevent widespread adverse health, safety and environmental consequences?

The Pickering Nuclear Generating Station in the Province of Ontario is one of the largest plants in the world.[35] In comparison to other nuclear power plants, the Pickering facility also has one of the largest populations surrounding such a plant, in its immediate vicinity. This region has also been designated a 'place to grow' by the province—meaning the population may increase from over 650,000 people currently, to 1.4 million people in the next twenty years.[36] The operator of the Pickering station recently received a licence extension to allow the plant to continue operating until 2024. While this application did not trigger a federal EA, during the licensing hearings conducted pursuant to the NSCA, members of the public, mindful of the Fukushima accident, submitted that nuclear power plants should not be re-licensed until emergency plans are in place and *proven* to be effective for a catastrophic accident.

Fundamentally, the magnitude of a nuclear accident chosen as the reference accident for emergency planning determines the consequences and risks which can be averted. The planning basis is the baseline upon which detailed off-site emergency response plans are based and therefore, it must reflect a large, off-site release, such as that which occurred at Fukushima. All emergency plans should be ready for an accidental radioactive release on par with Level 7 accident on the International Nuclear Event Scale (INES). This is not what is planned for in Canada. Instead, planners assume only smaller accident scenarios, involving the release of short-lived radionuclides. This reduces the area in which detailed off-site emergency preparedness measures are required.

Currently, Canada's nuclear response plans do not account for a Fukushima-level accident (e.g. a severe multi-reactor accident with large off-site releases of radioactive substances). Therefore, there is no detailed planning, resourcing or testing for catastrophic events that cause large releases into the atmosphere. Instead, current emergency plans are based on a scenario in which plan operators *would* likely be able to contain and control the radioactive releases in the initial hours and days.

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

[36] Ministry of Municipal Affairs, Release of the Growth Plan for the Greater Golden Horseshoe, 2017 (18 May 2017), https://placestogrow.ca/index.php?option=com_content&task=blogcategory&id=4&Itemid=36.

While emergency preparedness requires cooperation between the regulator, provincial authorities and licensee, as the licensing body and regulator of an activity under federal jurisdiction, the CNSC's regulatory jurisdiction extends to verifying the sufficiency of emergency response plans. Not only does the CNSC have authority to require, review and approve emergency plans which are in the purview of its licensees, it also has authority to review emergency plans in place for off-site response. The CNSC can use its assessment of the adequacy of those plans as part of its determination as to whether a nuclear power plant may operate, and under what terms and conditions, by reason of its obligation to ensure that licensees do not cause unreasonable risk to the environment or to the health and safety of persons. As endorsed by a March 2017 ruling from the Maebashi District Court in Japan, both the government and operator of the Fukushima nuclear plant were responsible for the disaster, as a result of their failure to take preventative measures. The judges found that the major risks from the plant were foreseeable by the government, but were ignored and not acted upon.

We have learned since Fukushima that planning for emergency response and evacuation should be extended beyond current emergency planning zones.[37] This was affirmed by an independent investigation commission, which concluded that the Fukushima Daiichi nuclear power plant accident could not be 'regarded as a natural disaster. It was profoundly a manmade-disaster that could and should have been foreseen and prevented'.[38]

However, despite this global experience, current emergency measures are geographically limited to areas close to nuclear stations due to the current small-scale reference accident. For instance, the current planning zones around Ontario's three nuclear power plants include a 10 km Detailed Planning Zone (DPZ—formerly referred to as the primary zone), a newly introduced 20 km Contingency Planning Zone (CPZ)—which is meant to address the possibility for expanded evacuations in the event of a more severe accident—and a 50 km Ingestion Planning Zone (IPZ—formerly known as the secondary zone). Only in the immediate 10 km zone surrounding a plant, however, is detailed planning required for default protective actions, such as evacuation and the pre-distribution of potassium-iodide (KI) pills. Outside of this boundary, off-site emergency plans list response measures such as KI pill distribution, public awareness and monitoring as 'considerations' only. The efficacy of the emergency response 'considerations', however, crucially depends upon the level of preparedness and planning undertaken *prior* to a radiological emergency.

[37] Handl 2016, p. 332.

[38] Fukushima Report, *supra* note 12.

12.6.2 Canada's International Standing

At a minimum, in order to reflect the global experience of severe off-site accidents that have occurred in other jurisdictions, the Detailed Planning Zone in Ontario must expand its existing 10 km radius to a distance of 20 km, and likewise and extend the Contingency Planning Zone from 20 to 100 km. In order to reflect the impacts and lessons arising from the Fukushima accident, expanded emergency zones are needed.[39] This requires, for instance, that radiation monitoring programs exist out to the 100 km boundary in order to determine in the event of an accident, whether additional evacuations, sheltering or KI pill consumption is required.

Ontario has also not yet modelled projected radiation doses or exposure to vulnerable individuals (i.e. children and pregnant women) within 100 km of Ontario's reactors, nor has modelling being completed to study weather contingencies based on 'worst case' weather scenarios.[40]

Furthermore, Ontario's emergency planning zones do not align with IAEA guidance (see Table 12.1). A side-by-side comparison of Ontario's response zones and emergency measures and those proposed by the IAEA reveals the following deficiencies. First, the response measures recommended for the IAEA's Precautionary Action and Urgent Protective Action Planning Zones extend to a distance of 30 km. In Ontario, similar levels of detailed planning and response only extend to a distance of 10 km with response measures out to 20 km zone being implemented on an *ad hoc* basis. Secondly, the Ontario's Contingency Planning Zone extends to a distance of 20 km, while the IAEA in its Extended Planning Distance zone recommends a size of 100 km. Lastly, where the Ingestion Planning Zone in Ontario is based on a 50 km radius, the analogous zone in IAEA guidance, the Ingestion and Commodities Planning Distance, extends to 300 km.

12.6.3 Response Planning and Public Input

In the latter part of 2017, Ontario's emergency response plans were updated. However, the need to extend the size of planning zones remains outstanding and currently subject to technical review.

The advisory committee tasked with reviewing public comments on Ontario's proposed changes to the nuclear emergency response plans found that 'planning zones may require revision' if the planning basis was to include a multi-unit failure event.[41] The advisory committee's examination of planning zone effectiveness also

[39] Greenpeace et al. 2017.

[40] McClenaghan 2017.

[41] Office of the Fire Marshal and Emergency Management, Update on Emergency Management in Ontario and the Provincial Nuclear Emergency Response Plan (PNERP), Presentation—Commission Meeting (4 April 2018), p. 15.

Table 12.1 Emergency Planning Zones and Accompanying Response Measures per IAEA Guidance [*Source* Canadian Environmental Law Association, Supplemental Submission on Emergency Planning (2018) http://www.cela.ca/SupplementalSubmissionOnEmergencyPlanning]

Zone	Size (km)	Description	Response Measures
Precautionary Action Zone	3–5	Area within which arrangements should be made to implement precautionary urgent protective actions before or shortly after a major release with the aim of preventing or reducing the occurrence of severe deterministic effects[a]	Urgent protective actions include: isolation of a contaminated area or radioactive source; prevention of inadvertent ingestion; evacuation; Sheltering; respiratory protection and protection of skin and eyes; decontamination of individuals; prophylaxis with stable iodine; protection of the food supply and prevention of the consumption of significantly contaminated foodstuffs and water; management of the medical response; and, protection of international trade[b]
Urgent Protective Action Planning Zone	5–30	Area where preparations are made to promptly shelter in place, to perform environmental monitoring and to implement urgent protective actions on the basis of the results of monitoring within a few hours following a release[c]	
Extended Planning Distance	100	Distance around a nuclear power plant where arrangements are made to conduct early monitoring of deposition to locate hotspots with dose rates warranting (1) evacuation within a day following a release or (2) relocation within a week to a month following a release	Relocation, decontamination, replacement of food, milk and water[d]
Ingestion and Commodities Planning Distance	300	The distance around a nuclear power plant for the area within which arrangements are made, within hours of being notified by the nuclear power plant of the declaration of a General Emergency	Place grazing animals on covered feed; protect drinking water supplies that directly use rainwater (e.g. to disconnect rainwater collection pipes); restrict consumption and distribution of non-essential local produce, wildgrown products (e.g. mushrooms and game), milk from grazing animals, rainwater, animal feed; and, restrict distribution of commodities until further assessments are performed[e]

[a]IAEA Safety Standards, 'General Safety Requirements Part 7 - Preparedness and response for a Nuclear Radiological Emergency' (2015), p. 76
[b]International Atomic Energy Agency, *Arrangements for Preparedness for a Nuclear or Radiological Emergency No. GS-G-2.1* (2007) 2
[c]IAEA Safety Standards, *General Safety Requirements Part 7—Preparedness and response for a Nuclear Radiological Emergency* (2015), p. 77
[d]IAEA 2013, p. 102
[e]Ibid., p. 103

noted that models were 'confined to only a few weather patterns' and 'may not be appropriate for distances farther away' from nuclear generating stations. Consequently, as recommended by the advisory committee, technical studies, with an estimated completion date at the end of 2018 are now underway, to assess and identify changes to planning zones. In the meantime, the public expectation is that the additional technical study of off-site radioactive releases, multi-unit accidents, and 365-day meteorology monitoring (as was recommended by the advisory committee) will be released to the public for comment and result in further changes to planning zones and protection action levels. Both the City of Toronto and Durham Region, whose populations are adjacent to two of Ontario's nuclear power plants, have also requested the technical assessment be released and available for public review.[42]

Prior review of the provincial plans did not always include public input. The most recent review attempted to improve this situation with a public posting for comment and the appointment of an expert advisory committee to review the provincial proposal and all public comments. The current Provincial Nuclear Emergency Response Plan (PNERP) now calls for public review every five years. According to the updated PNERP, these public reviews are intended to 'uphold the province's commitment to transparency and accountability, and to ensure that these plans reflect current emergency response directives, legislation, lessons learned and improvements to emergency management methodologies'.[43]

The PNERP also includes a new administrative principle related to transparency, specifically, 'a policy of truth and transparency *should* be followed in providing information to the public and media prior to and during a *nuclear or radiological emergency*'.[44]

In other jurisdictions the importance of transparency in relation to the peaceful use of nuclear technology has been highlighted by civil society. For example, the European organization Nuclear Transparency Watch states:

> The Fukushima disaster has raised concerns about the risks and catastrophic potential entailed by civil nuclear activities. Nuclear electric generation, regardless of the opinion that one may have on its place in the energy mix, is a technology that requires a very high level of safety through extremely demanding conditions (financial, technical, social, political and legal).

[42] Toronto City Council, EX33.6—Emergency Management Program Update—2017, April 24 2018; Durham Region, Minutes from the Regional Council of Durham, April 11 2018, p. 13.

[43] Ministry of Community Safety & Correctional Services, Provincial Nuclear Emergency Response Plan, Master Plan 2017, https://www.emergencymanagementontario.ca/english/emcommunity/response_resources/plans/provincial_nuclear_emergency_response_plan.html, s 1.3.4.

[44] Ibid., s 1.2.12.

> These conditions can only exist if the civil society is really able to take part into the governance of nuclear activities. The vigilance of the civil society is not only requested at local and national levels but also at the European level where regulators, operator and experts cooperate more and more.[45]

Continued transparency on the topic of nuclear emergency planning is essential. Crucial to emergency planning is facilitating public awareness, building community trust in the underlying preparations, and ensuring that the potentially affected public in the vicinity of operating nuclear power plants in Canada understand how to respond quickly and appropriately in the event of an emergency. No reactor technology is immune from accident, human or otherwise. The occurrence of real world reactor accidents indicates that the likelihood of nuclear accidents is much higher than claimed in industry risk assessments.[46] Thus, in the wake of Fukushima, as well as previous nuclear accidents in Canada and world-wide, we must unfortunately heed the lesson that *any* likelihood of an off-site radiation release necessitates a detailed planned and tested emergency response.

12.7 Conclusion

Canada currently lacks the proper venue for meaningful public debate and consideration of the implications of continued reliance on nuclear power production in Canada, its environmental effects, and its legacy waste. The Fukushima disaster highlighted that nuclear regulators are vulnerable to regulatory capture. Transparency and public participation in regulatory oversight of the sector can assist in mitigating risks of regulatory capture.

Project-specific hearings conducted by the CNSC are too narrow a forum for Canada-wide discussion of larger policy issues. Canada's present and proposed EA legislation continues to promote a regulator-directed process that demonstrably results in the loss of public trust. In the face of increasing complexity and public concern, there should be a proportionate increase in opportunities to promote democratic transparency and decision-making accountability.

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[45] Nuclear Transparency Watch, 'Why Nuclear Transparency Watch' (2018), http://www.nuclear-transparency-watch.eu/why-do-we-need-nuclear-transparency.

[46] Wheatley et al. 2017, pp. 99–115.

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