

Plan for the Long-Term Management of Canada's Used Nuclear Fuel

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The end-point of Canada's nuclear fuel cycle requires eventual safe isolation of used nuclear fuel in a suitable geologic formation where it will be monitored and could be retrieved if necessary. It also requires the facility to be located in an informed and willing host community.

Used fuel has continued to accumulate and Canada now has just over 2 million bundles or 30,000 tonnes of used CANDU fuel bundles in safe interim storage at licensed facilities in seven locations in Canada where it is produced. The majority of used fuel is in Ontario where there is the greatest amount of nuclear power generation. This volume is equivalent to six hockey rinks filled to the boards. Nuclear power plant operators generally have adequate future capacity for decades to come and, with care and maintenance, the storage containers can safely store used fuel for 100 years. Canada has a once-through fuel cycle; when it is removed from a reactor it is considered a waste product that requires careful management.

Like many countries with nuclear power programs, Canada has been advancing plans for the long-term safe, secure management of used nuclear fuel. This submission addresses the development of Canada's approach and progress to date in implementing these plans.

I. Development of Canada's Used Fuel Management Program

Initiation of Canadian Nuclear Fuel Waste Management Program

Work on used fuel disposal in Canada was initiated in the 1980s after the 1978 Ontario Royal Commission on Electric Power Planning recommended that nuclear capacity be capped pending progress on nuclear waste disposal. This led to the governments of Ontario and Canada establishing the Canadian Nuclear Fuel Waste Management Program where AECL were assigned responsibility for developing geological disposal.

In 1989, in response to public concern about siting a repository, the concept of geological disposal was referred to a Federal Environmental Assessment Panel and a moratorium placed on siting activity pending this review.

Seaborn Panel Report and *Nuclear Fuel Waste Act*

The Federal Environmental Assessment Panel chaired by Blair Seaborn (known as the "Seaborn Panel") conducted a comprehensive review of AECL's disposal concept. Following a decade of review of the disposal concept, the Panel reported in 1998 that from a technical perspective, safety of the AECL geologic disposal concept had been adequately demonstrated at a conceptual level, but from a *social* perspective it had not. The Panel concluded that the concept in its current form lacked the required level of acceptability and public support to be adopted as Canada's approach for managing nuclear used fuel.

The Panel made 52 recommendations that were largely translated into the 2002 *Nuclear Fuel Waste Act* that constitutes the framework of accountability for Canada's used fuel program.

Governance of Long-Term Used Fuel Management

The 2002 *Nuclear Fuel Waste Act (NFWA)* establishes clear roles and responsibilities. In accordance with the requirements of the *NFWA* significant progress has been made since 2002.

- The *NFWA* required Canada's nuclear energy corporations to establish the NWMO as the organization that would develop and implement Canada's long-term plan for used nuclear fuel. Waste owners must serve as Members of the organization.
 - The NWMO was formed in 2002 by Ontario Power Generation, Hydro Quebec and New Brunswick Power with a mission to collaboratively develop and implement a socially acceptable, technically sound, environmentally responsible and economically feasible plan for Canada's used nuclear fuel. NWMO has the responsibility to manage all of Canada's used nuclear fuel for the long term: that which exists today and that which is generated in the future.
 - The NWMO is set up under the *Canada Corporations Act*, operating on a not-for-profit basis.
 - The three founding companies form the Membership (shareholders) of the organization, maintain membership agreements and convene annual general meetings.
- The nuclear energy corporations appointed the NWMO Board of Directors.
 - At present there are 9 directors on the Board. Membership includes directors from the member organizations as well as directors from outside the nuclear industry with expertise in business ethics, Aboriginal relations and finance. Minutes of Board meetings are published on the NWMO website.
- The *NFWA* requires the Board to appoint an Advisory Council to provide independent comment on NWMO's study of management options (2005) and NWMO's triennial reports. The *NFWA* sets out the diversity of expertise to be reflected in Council membership, including technical and scientific disciplines related to the management of nuclear fuel waste, public affairs, traditional aboriginal knowledge, and other social sciences as needed. As site selection advances, Council membership must evolve to include representatives nominated by affected local and regional governments and aboriginal organizations.
 - The Council was established in 2002 in accordance with the *NFWA*. It is presently chaired by the Honourable David Crombie and has ten members. Council convenes at least quarterly, with minutes published on the website.
- The *NFWA* established NWMO's mandate.
 - NWMO's first mandate was to undertake a three-year study of options for the long-term management of used nuclear fuel, with engagement of Canadians and Aboriginal people. NWMO was to recommend a approach to the Minister. (2002-2005)
 - Following selection of a management approach by the federal government, NWMO is to implement that approach.
- The *NFWA* requires NWMO to report to the federal government, through the Minister of Natural Resources.
 - As required, NWMO submits annual Reports to the Minister which are made public at the same time.

- The Minister tables the reports in both houses of Parliament.
 - NWMO submits a triennial report every three years, reporting on progress and the strategic plan for the next five years.
 - The Minister must issue public statements on NWMO's annual and triennial reports.
- Project implementation will be subject to an extensive framework of approvals and regulation, oversee by the Canadian Nuclear Safety Commission.
 - The *NFWA* requires that the major waste owners provide the financing for all aspects of the long-term management of used nuclear fuel. Waste owners must establish trust funds and make annual deposits to those funds. The funds may only be accessed by NWMO and only after such time as a construction licence has been issued by the CNSC. NWMO is required to maintain updated total program costs and a funding formula which specifies on an annual basis trust fund deposits required of each company, to ensure monies are available as needed to implement the plan.
 - Segregated trust funds were established in 2002 by each of Ontario Power Generation, Hydro-Quebec, New Brunswick Power and AECL.
 - NWMO proposed a funding formula that has been approved by the Minister of Natural Resources Canada. The accumulated balances of these NFWA trusts, together with additional segregated funds established by the used fuel owners, now exceed \$5 B.
 - Prior to receipt of a construction licence, NWMO's annual operating budget is cost-shared by the waste owners according to an agreed funding formula.

II. Study of Options and Selection of the Canadian Approach

Study of Alternatives (2002-2005)

The NWMO designed its three-year study as a dialogue conducted through phases, with the issuance of discussion documents to support deliberation and input at each milestone in the study. The dialogue process sought direction from Canadians at each key point:

- Identifying the questions to be asked and answered, and issues to be addressed
- Confirming the range of technical methods to be studied
- Assessing the risks, costs and benefits of each option
- Designing the overarching management structure and implementation plan.

Significant efforts were made by the NWMO studies to address societal aspects of nuclear fuel management. The NWMO engaged across the country, in every province and territory. 18,000 Canadians including 2500 Aboriginal people were engaged and contributions were received from 500 experts. A broad range of dialogue and engagement techniques were adopted to understand the social and ethical considerations that citizens brought to bear on the issues, such as: a national citizen dialogue on values; a roundtable on ethics; dialogues led by Aboriginal people; e-dialogues, expert workshops and roundtables; and 120 information and discussion sessions convened across all provinces and territories.

Following consideration of a range of approaches, the decision was taken to focus the study on the three approaches of most interest to Canadians, and required by study in the *NFWA* as a minimum:

- Deep geological disposal
- Storage at nuclear reactor sites
- Centralized storage, above or below ground.

Without dismissing future options and possibilities, the study suggested that NWMO might maintain a watching brief and developments in other areas, such as reprocessing, partitioning and transmutation and placement in deep boreholes.

The assessment framework for considering technical options was developed through the extensive dialogue, building on the values and priorities of Canadians. Detailed assessment of the three options was developed around the objectives identified by citizens: public health and safety, worker health and safety, security, fairness, community well-being, environmental integrity, economic viability and adaptability of the approach.

Emergence of a Recommendation

Through the three-year study, NWMO heard a wide diversity of views. However, there was common ground that emerged among citizens and experts alike:

- Safety and security is top priority
- This generation must take action now to manage the waste we created
- We must take advantage of best international practice
- And the approach must be adaptable to allow for changes in technology and societal priorities.

The NWMO study of alternative storage and disposal options was completed and submitted to the Government of Canada in 2005, along with a recommendation. That recommendation was for a plan called “Adaptive Phased Management”.

Adaptive Phased Management

NWMO’s recommendation for Adaptive Phased Management (APM) emerged as the approach that would best meet the priorities and values of Canadians. This is the plan approved by Government of Canada in 2007. APM is both a technical method and a management system.

- The technical method is isolation in a deep geological formation where used fuel can be monitored and can be retrieved if necessary. It will be highly regulated at each stage of construction and operation.

Retrievability is an important component of the social licence to proceed – Canadians feel strongly that used fuel must be accessible, should society wish to take advantage of new waste management technologies in future, or new opportunities for re-using the used fuel.

- Equally important is how the plan is implemented. Implementation is specifically tailored to Canadian values and priorities and requires:
 - Flexibility in the pace and manner of implementation and responsiveness to new developments, societal priorities and traditional Aboriginal knowledge.
 - Openness, transparency, and staged decision making with the involvement of Canadians at every step of the way
 - The facility to be located in an informed and willing host community
 - A commitment to continuous learning and adaptive management. As the plan is implemented over many decades, there will be opportunities to reduce uncertainty, enhance effectiveness and address evolving public policies and societal priorities. NWMO is prepared to act on new knowledge, re-evaluate decisions and change course as appropriate.

III. Implementation of the Chosen Path

Federally-Mandated National Infrastructure Project

The Government of Canada accepted NWMO's recommendation in June 2007 and NWMO is now responsible for implementing this national infrastructure project that will have substantial economic benefits for the host community and region. It will involve an investment of \$16 B by the owners of used fuel. This is a high technology project with skilled employment for hundreds over many decades and will operate as a centre of expertise for international collaboration. It will involve a long-term partnership between the NWMO and the host community, and will foster community well-being. It will be highly regulated, with strict scientific and technical criteria assure safety, meeting requirements of the Canadian Nuclear Safety Commission.

Adaptive Phased Management Implementation Plan

Following a Government decision in 2007 to accept the NWMO recommendation, NWMO published an Implementation Plan in 2008 that has guided steady progress in advancing Canada's plan..

Since 2008, has NWMO has published annually a rolling-five year Implementation Plan. The Plan charts directions and milestones for Canada's plan, against NWMO's current strategic directions:

- Building long-term relationships with interested Canadians.
- Furthering repository design and safety cases.
- Collaboratively defining and implementing a process for site selection.
- Regularly updating the formula for trust fund deposits by nuclear waste owners to ensure that those that benefit from nuclear energy pay for the long-term cost.
- Tracking and researching alternative technical methods, evolving public policy and societal expectations and international best practice, to ensure our plans adapt as necessary.
- Continuously improving NWMO's governance structure and organizational capability.

NWMO's strategic directions and Implementation Plans have been developed through public engagement and are continually reviewed and updated to reflect the expectations of Canadians for progress in long-term used fuel management.

Building Relationships and Involving Canadians in Decision Making

Building relationships and involving interested Canadians in decision making is a fundamental part of NWMO's plan. NWMO very much sees itself as working on behalf of Canadians to implement APM and that we can only succeed by maintaining a social license to proceed. Several mechanisms have been established to earn and maintain trust and confidence in NWMO as the implementer, and to confirm the legitimacy of processes and decision-making supporting Canada's plan. We seek to build the societal foundation for our work through engagement on many fronts:

- A forum of Municipal Associations and frequent dialogues with reactor site communities
- A forum of Aboriginal Elders and projects with several Aboriginal organizations.
- A diversity of dialogues to invite the perspectives of a range of interested organizations and the public at large – multi-party roundtables, workshops, citizen panels, youth roundtables, dialogues led by Aboriginal groups, public information sessions, surveys and research and briefings on request.
- Ongoing briefings of Provincial and Federal Governments

These mechanisms are used on a frequent basis to seek input on implementation plans and most recently, on plans for site selection.

Collaborative Design of Process for Site Selection

One of the most challenging aspects to implementation will be the process of site selection. An important early milestone was to develop a sound foundation to guide the selection of a safe, secure site for the used nuclear fuel repository that met societal expectations for a fair and appropriate process. The site selection process was developed through a collaborative process from 2008 to 2010. The process engaged experts and regulators in outlining the criteria to ensure safety of people and the environment, consistent with federal and international regulatory agencies. Through two years of public dialogues, NWMO invited participation and perspectives of interested individuals and a diversity of organizations.

Through this process, Canadians expressed the values, objectives and principles they expect to see guiding this process. The process adopted by NWMO to guide site selection is built upon the requirements expressed by citizens, which are key to the social licence to proceed:

- Safety first. Site selection should be guided by safety and security, for people and the environment, and be subject to rigorous regulatory review and approvals.
- The selected location must be in an informed and willing host community.
- Assessments of candidate sites should be made in stages, through shared decision-making and a partnership approach with communities. Communities should have opportunities to withdraw from the process for many years.
- NWMO should commit to foster the long-term well being of the host community, and seek to avoid or minimize disruptive impacts of the project.
- The siting process should be inclusive, involving all those potentially affected, with respect for Aboriginal rights and treaties. Essential to the process will be extensive and early engagement of citizens, surrounding communities and regions, Aboriginal communities, provincial governments and transportation communities.

Community-Driven Site Selection

In May 2010, NWMO published the collaboratively-developed Site Selection Process that sets out the steps in the community-driven siting process and the criteria that will guide decision-making on a location. NWMO has been actively building awareness of the project and the siting process. A capacity-building program offers a number of opportunities for communities to request to learn more about Adaptive Phased Management and site selection.

Since May, NWMO has received requests for information from communities. As part of the program to learn more, some communities in Ontario and Saskatchewan have requested initial desk-top screenings as part of the learning process. These high-level screenings, now underway, will inform the communities as to whether there are known technical or geological factors for excluding those areas from further consideration as potential candidate sites for the repository. Upon request of communities, NWMO will continue to provide initial screenings.

For communities electing to explore the feasibility of their areas for hosting the repository, sites will be evaluated through a series of progressively more detailed scientific, technical and socio-economic assessments over a number of years. Later phases of detailed site characterization will be undertaken to demonstrate the robust safety case required for regulatory approvals. As communities engage, and

consider their interest in pursuing more detailed feasibility studies, NWMO will encourage community discussion, visioning and understanding of the project, and involvement of surrounding communities, regions and Aboriginal people.

IV. Summary

Following the introduction of the legislative framework in 2002, Canada's plan has moved forward with the implementation of plans for long-term management of used nuclear fuel. Governing bodies are in place to oversee the plan's implementation. Trust funds and mechanisms are in place to ensure that financial burdens will not be passed on to future generations. A plan for used fuel management has been developed that reflects the priorities of many Canadians.

Implementation is moving forward, carrying forward the spirit of collaboration. Interested individuals and organizations shaped the design of the site selection process initiated in 2010, and communities are beginning to learn more about the project. Canada, together with international partners, has the technology for the safe long-term isolation in a geological formation.

As a result of successive reviews, extensive dialogue and a government decision over the past 25 years NWMO now has a mandate that is consistent with the expectations of Canadians who expect to see action taken. The Adaptive Phased Management plan enables Canada to move forward with a responsible plan for managing used fuel, mindful of the importance of adaptability so that new knowledge may redirect and shape the path as we look to the future.