

Advisory Council

to the NWMO

Mr. Kenneth Nash
Chairman of the Board of Directors
Nuclear Waste Management Organization
49 Jackes Avenue
Toronto, Ontario
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September, 2005

Dear Mr. Nash,

On behalf of the Advisory Council to the Nuclear Waste Management Organization (NWMO), I am pleased to submit our comments on the NWMO study.

Having examined the study, we provide comments on the study process and the management approaches, as required of the Advisory Council under section 8 of the *Nuclear Fuel Waste Act*.

Respectfully submitted on behalf of the members of the Advisory Council,



The Honourable David Crombie
Advisory Council Chair

Copy: NWMO Advisory Council:

Dr. David Cameron
Dr. Frederick Gilbert
Mr. Donald Obonsawin

Ms. Helen Cooper
Ms. Eva Ligeti
Dr. Daniel Rozon

Mr. Gordon Cressy
Dr. Derek Lister

September 22, 2005

Nuclear Waste Management Organization Advisory Council Final Report

Section 1 → Introduction

This report fulfills our obligations under the *Nuclear Fuel Waste Act (NFWA)*, as members of the Advisory Council, to comment on the process, report and recommendations of the Nuclear Waste Management Organization (NWMO).

Section 1 provides an overview of the mandate, process and approach taken by the Advisory Council. Section 2 provides our assessment of the process undertaken by NWMO. In Section 3, we provide our evaluation of the approach to nuclear waste management proposed by the NWMO. Finally, in Section 4 we offer some final thoughts and recommendations for future initiatives.

1.1 Background

The *Nuclear Fuel Waste Act* (an Act respecting the long-term management of nuclear fuel waste) aims:

“to provide a framework to enable the Governor in Council to make, from the proposals of the waste management organization, a decision on the management of nuclear fuel waste that is based on a comprehensive, integrated and economically sound approach for Canada.”

The Act required the NWMO, at the end of three years, to submit a study setting out its proposed approaches for the management of nuclear fuel waste and to recommend one of those approaches for adoption. The study was obliged by the *Nuclear Fuel Waste Act* to examine at least the following approaches: deep geological disposal; storage at nuclear reactor sites; and centralized storage, either above or below ground. The examination of other approaches was not precluded by the legislation.

The Act also established an Advisory Council charged with the responsibility of examining

the study and commenting on the approaches for the management of nuclear fuel waste contained in the study. The NWMO was required to submit those comments to the Minister along with its study.

The NWMO Advisory Council was established by the NWMO Board of Directors in the fall of 2002. It comprises nine individuals with a range of perspectives, knowledge and experience that includes nuclear engineering, environmental sustainability, public policy, Aboriginal affairs and citizen engagement (see list of members in Appendix 1 of NWMO *Final Study Report*).

1.2 Advisory Council Process

Over the past three years we have worked in a variety of ways to develop our assessment of the work of the NWMO. We have also provided advice on a continual basis in the interest of assisting the Organization to undertake the best possible process within the mandate and time limits established by the legislation. We learned from each other, invited experts in various fields to speak to us, made site visits to explore current nuclear waste management processes in various jurisdictions, observed public engagement activities, and debated numerous issues among ourselves and with others engaged in the NWMO process. These activities allowed us to develop shared knowledge and understanding about a wide range of technical, social, ethical, economic and political dimensions of nuclear waste management. They also allowed us to appreciate the complexity of the discussions that the Canadian public and decision-makers would need to have regarding the choice of an appropriate approach for nuclear waste management.

In January 2005 we issued a statement describing “How the Advisory Council of the Nuclear Waste Management Organization Intends to Fulfill its Mandate” (see Appendix A). The statement included a summary of the requirements of the *Nuclear Fuel Waste Act* pertaining to the Advisory Council and to the study being undertaken by the NWMO. We outlined our relationship with the NWMO (see section 1.2.1 below) and described four criteria that we would use to guide our evaluation of the NWMO process and study (section 1.3). In addition, we highlighted one other issue

that has been a source of ongoing concern and deliberation. We noted that:

“The legislation is silent on the question of the quantity of nuclear fuel waste that is to be managed by the recommended approach. In its examination and selection of management approaches, the NWMO will have to address the matter of capacity, and therefore of quantity. How much nuclear waste is it assumed that any given management approach will be able to handle? This question is tied to the larger policy question of the future of nuclear energy in Canada.”

“The Advisory Council would be critical of an NWMO recommendation of any management approach that makes provision for more nuclear fuel waste than the present generating plants are expected to create, unless it were linked to a clear statement about the need for broad public discussion of Canadian energy policy prior to a decision about future nuclear energy development. The potential role of nuclear energy in addressing Canada’s future electricity requirements needs to be placed within a much larger policy framework that examines the costs, benefits and hazards of all available forms of electrical energy supply, and that framework needs to make provision for comprehensive, informed public participation.”

We were not alone in raising these points. As the NWMO notes, many participants in the engagement process put forward impassioned arguments about energy policy and the future of nuclear power (Section 1.3 of *Final Study Report*). We note that the NWMO states that the “study process and evaluation of options was intended neither to promote nor penalize Canada’s decisions regarding the future of nuclear power”. Indeed the *Nuclear Fuel Waste Act* does not provide the NWMO with either the jurisdiction or the mandate to influence the future of nuclear power.

The NWMO also considered the issue of the quantity of used nuclear fuel to be addressed and Appendix 10 describes a number of potential scenarios, ranging from early

nuclear phase out to considerable expansion. The reference used fuel scenario employed in NWMO’s assessment of the four options is based on the existing and expected spent fuel associated with existing nuclear reactors. This would be approximately 3.6 million used fuel bundles assuming that the existing fleet of nuclear reactors in Canada have an average operational life of 40 years. With plant refurbishments, the average life cycle could increase to 50 years, bringing the total number of used fuel bundles to more than 4.4 million. This range is well within the provisions of the NWMO study.

An increase in the installed capacity of nuclear reactors in Canada beyond the current 16000 MW would lead to a significant increase in the quantity of used nuclear fuel. In addition, a nuclear expansion scenario would likely entail fuel enrichment and new reactor technology, with spent fuel possessing new characteristics. These could affect the performance of the disposal technology and introduce a change in the outlook on reprocessing. Such technical aspects were not considered by NWMO in its study, which focused on existing facilities using natural uranium fuel.

We conclude that it is appropriate to plan for the quantity and type of used nuclear fuel expected for NWMO’s reference used fuel scenario as well as refurbishments of the existing fleet of reactors, representing a range of 3.6 to 4.4 million bundles. However we emphasize, as did many other participants in the process, that any significant change in the amount or type of used fuel to be managed (whether due to phase out or expansion of the nuclear program) should trigger a review of the work undertaken by the NWMO to date.

1.2.1 Relationship between the Advisory Council and the NWMO

The legislation required us to provide independent commentary on the NWMO's study and its conclusions once they were completed. However, we felt that it would be most constructive to operate on a "no surprises" basis by providing ongoing advice about the NWMO process as it took place. Accordingly, we undertook to learn as much as possible about the NWMO's work and to meet regularly with NWMO management to provide comments and suggestions. Our Chair made regular reports about our work at Board meetings of the NWMO. The President updated us at each of our meetings on NWMO's activities and invited feedback, advice and suggestions on next steps. A detailed account of the advice provided by the Advisory Council and the actions taken by the NWMO in response is provided in a chart posted on the Organization's website (see "Advisory Council Tracking Matrix" at www.nwmo.ca/actracking). We found the NWMO to be very responsive to our advice, resulting in changes and adjustments in its process, communications and recommendations.

The Advisory Council Tracking Matrix provides information about the interactions between the NWMO and the Council in six broad categories:

1. Operations
2. Briefings/Site Visits
3. Workplan
4. Annual Reports
5. Discussion Documents and Study Reports
6. Engagement.

In the area of **Operations**, we created a framework for interactions between the NWMO and the Advisory Council, including in-camera meetings as well as discussions with NWMO staff and Board of Directors. This recognized our dual functions of providing independent comment and also ongoing advice to the NWMO.

Our **Briefings and Site Visits** were designed to allow us to learn as much as possible about the work of the NWMO, perspectives of various stakeholders, and current knowledge

and practices in Canada and overseas. Details are provided in sections 1.2.2 and 1.2.3 below.

Our advice on the **Workplan** included a wide range of discussions and comments on the NWMO's statement of vision, mission and values, annual business plans and research designs. For example, we encouraged the NWMO to incorporate more expertise in Ontario geology, to seek the perspectives of young people, to publish its workplan as a "roadmap", to arrange peer reviews of the Joint Waste Owners' work on concepts and costs, and to report on how the NWMO was responding to the findings of the Seaborn Panel.

We provided advice to the NWMO on the content and direction of its **Annual Reports**. In addition, we wrote independent letters to the Minister of Natural Resources on the work undertaken by the NWMO in 2003 and 2004 and tabled them at the same time as the NWMO's annual reports (March 2004 and March 2005 respectively).

We provided comments on the structure and content of NWMO's **Discussion Documents and Study Reports** to assist in ensuring that they provided appropriate information to increase public understanding and stimulate public dialogue. We emphasized the importance of describing how the public helped to shape the questions, process and findings addressed in NWMO's study. We suggested that the NWMO highlight the ways in which two parallel tracks of work with different participants – public engagement and expert analysis – led to convergence on many key findings. Council members also provided wording for specific areas of text, such as parts of Appendix 9 in the *Final Study Report* on reprocessing, partitioning and transmutation. We requested clarification on a number of points contained in *Choosing a Way Forward*, the *Draft Study Report* issued by the NWMO in May 2005. This resulted in adjustments in the *Final Study Report* in such areas as Aboriginal dialogue, ethics, suitability of sedimentary rock, cost estimation, nuclear liability, replicability of the assessment, socially acceptable standards of safety, the option of centralized shallow storage, the underground characterization facility and the definition of a willing host.

With respect to **Engagement**, Council members offered advice on ways to implement effective public engagement and ensure meaningful dialogue with Canadians. For example, we recommended benchmarking to track changes in opinions and views throughout the course of the NWMO's study. This was accomplished by NWMO's public opinion research. We also encouraged the NWMO to use a wide variety of engagement techniques, to develop interactive website capability, to convene dialogues in communities that do not host nuclear facilities, to use multi-media to communicate its work, and to incorporate opportunities for participants to learn about the intricacies of the assessment process.

The Council also established a Sub-Committee on Aboriginal engagement to examine how the contributions of Aboriginal peoples were being addressed in the NWMO's work, to provide advice on Aboriginal engagement, and to encourage the NWMO to incorporate the expertise that resides in traditional Aboriginal knowledge. See Section 2 for further elaboration of our views about the engagement initiatives and Aboriginal dialogue.

1.2.2 Meetings

During the past three years we convened regularly in full and half-day sessions as well as conference calls. Our meetings incorporated briefings and dialogues with NWMO staff, in-camera sessions, and guest presentations and discussions. The guests included people whom we invited, people who were suggested by the NWMO, and others who requested meetings with us. Our chairman, David Crombie, represented the Advisory Council at meetings of the NWMO Board of Directors, and the Council participated in a number of joint sessions with the Board.

Members of the Advisory Council attended, as observers, a number of the NWMO's citizen dialogues, national and regional meetings and public information and discussion sessions in various locations across the country in order to hear first hand the comments of Canadians.

The experts and stakeholders who met us to discuss a range of topics are listed in Table 1. For example, we held an early session in 2003 with Mr. Blair Seaborn, the former Chairman

of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel. This session allowed us to hear from Mr. Seaborn on the range of public concerns registered with his Panel and some of the key issues that were raised in his Panel's report, including comments on public consultations. We also met the Reverend Lois Wilson to benefit from her perspectives and reflections from the Panel process. We were particularly interested in exploring the ethical issues that arose in that process, including the issue of safety from both technical and social perspectives.

We received a briefing by the Joint Waste Owners on the scope of technical research those companies had undertaken with respect to the conceptual engineering designs, transportation systems and cost estimates for each technical method.

We received a presentation by the Canadian Nuclear Safety Commission regarding its roles and responsibilities and the role it will play in the licensing of any approach for the long-term management of used nuclear fuel.

Officials from the Energy Sector of Natural Resources Canada provided a briefing on the role of nuclear power in the context of Canada's energy supply. We also met officials from the Uranium and Radioactive Waste Division, Natural Resources Canada to provide them with an update on our work.

In March 2003, members of the Advisory Council participated in an NWMO meeting with the Minister of Natural Resources Canada at that time, the Honourable Herb Dhaliwal, sharing with the Minister some of their own perspectives and reflections on the NWMO process to date. In January 2005, a member of the Council accompanied NWMO Chair Ken Nash and President Elizabeth Dowdeswell to a meeting with the Honourable R. John Efford, current Minister of Natural Resources Canada, and reported on the Advisory Council's approach to its mandate and the ways in which the Council was providing ongoing guidance to the NWMO.

Table 1 Participants in Meetings of the Advisory Council

WHO	WHEN
Blair Seaborn, former Chairman of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel	January 2003
Ric Cameron, ADM, Energy Sector, Natural Resources Canada	January 2003
Jaime Watt, Chair and Dianne LeBreton, Consultant, Navigator (focus group research)	January 2003
Linda Keen, President and CEO, Cait Maloney, Director General, Directorate of Nuclear Cycle and Facility Regulation and Richard Ferch, Director, Director General's Office, Canadian Nuclear Safety Commission	March 2003
Senator Lois Wilson, former Commissioner on the Seaborn Panel	March 2003
Ken Nash, Chair and Frank King, Director, Nuclear Waste Engineering and Technology, Ontario Power Generation	May 2003
Judith Maxwell, President, Canadian Policy Research Network	January 2004, May 2004
Nuclear Waste Watch members – David Martin, Sierra Club of Canada; Marion Odell, International Institute of Concern for Public Health; Shirley Farlinger, Science for Peace / International Institute of Concern for Public Health / University Women's Organization; Theresa McClenaghan, Canadian Environmental Law Association; Nest Pritchard, Ontario Voice of Women	March 2004
NWMO Assessment Team Members – Michael Ben-Eli, President, Cybertec Consulting Group, and Tom Isaacs, Director, Office of Policy, Planning and Special Studies, Lawrence Livermore National Laboratory,	May 2004
NWMO Roundtable on Ethics Members – Andrew Brook, Professor of Philosophy, Carleton University Arthur Shafer, Director of the Centre for Professional and Applied Ethics, University of Manitoba, and Margaret Somerville, Professor of Law and Medicine, McGill Centre for Medicine, Ethics and Law, McGill University	October 2004
Joanne Barnaby, facilitator, Aboriginal Traditional Knowledge workshop	October 2004
David Hallman, The United Church of Canada and Climate Change Programme Coordinator and Mary Lou Harley, Member, Nuclear Issues Writing Group for Justice, Global and Ecumenical Relations Unit, United Church of Canada	October 2004
Murray Elston, President and CEO, Canadian Nuclear Association and Jeremy Whitlock, President, Canadian Nuclear Society	February 2005
Marvin Stemeroff, Principal, Gartner Lee Ltd. and John Davis, Principal, Golder Associates	February 2005
Peter Brown, Director, Uranium and Radioactive Waste Division and Carmel Létourneau, Senior Policy Advisor, Uranium and Radioactive Waste Division, Natural Resources Canada	March 2005

A member of Council attended the Euradwaste'04 meetings in Luxembourg to learn more about the collaborative research being conducted in Europe on a range of topics related to nuclear waste management, including community and socio-political considerations, stakeholder engagement, and research and development.

In 2004, the Advisory Council met with representatives of Nuclear Waste Watch, a network of 34 organizations concerned about high-level radioactive waste and nuclear power in Canada.

The convener of the 2003 Aboriginal Traditional Knowledge Workshop attended one of our meetings to address the topic of drawing on Aboriginal wisdom to formulate ethical guidelines.

Representatives of the United Church of Canada met us to provide their positions on nuclear issues and their views on some of the societal and ethical considerations.

We received a presentation from the Roundtable on Ethics, in order to understand and discuss the ethical and social framework they were developing.

The Canadian Policy Research Network reported on the findings from the National Citizens' Dialogue, a highlight of the NWMO's research into citizen values in 2004.

In May 2004 the Council received a presentation from members of the Assessment Team and discussed their methodology and findings. In February 2005 we met with representatives of Gartner Lee Ltd. and Golder Associates who briefed us on their comparative assessment of costs, benefits and risks associated with the three management options specified in the *NFWA*.

We met with representatives of the Canadian Nuclear Association and Canadian Nuclear Society to learn about the perspectives of these organizations on the long-term management of used nuclear fuel.

Our work is documented in records of discussion from our meetings as well as the chart we used to assist in tracking our activities and to support the preparation of this report. These documents are posted on NWMO's web site.

1.2.3 Site visits

In order to learn about current practices in Canada as well as relevant activities in the US and Europe, members of the Council participated in a number of site visits for research purposes.

Several Council members visited the Pickering Nuclear Generation Station in Ontario in May 2003 to tour Unit 3 of the plant and receive a briefing and tour of the station's wet and dry interim storage facilities for used nuclear fuel.

In May 2003 Derek Lister and NWMO President Elizabeth Dowdeswell toured the Underground Research Laboratory at Whiteshell, Pinawa, Manitoba operated by Atomic Energy of Canada Ltd. They also met with AECL staff and with the Mayor of Pinawa.

Several members of the Advisory Council visited the Yucca Mountain Disposal Project in Nevada to learn about the US Department of Energy's experiences with preparing a repository for used fuel. Discussions with DOE staff in Las Vegas provided valuable insights into their public engagement processes.

In November 2002, Fred Gilbert had an opportunity while in Helsinki, Finland, to meet with Dr. Juhani Vira, Director of Research at Posiva Oy (the agency implementing the Finnish program for the long-term management of used fuel) to review the site selection process and discuss the nuclear energy situation in Finland.

Eva Ligeti participated in a Canadian delegation (including NWMO representatives) that visited Rauma, Finland in October 2004. The site visit included meetings with officials from Posiva Oy to explore Finland's plans for long-term management of used nuclear fuel, in terms of both the policy underpinnings and the progress in implementation.

1.3 Evaluation Approach

In fulfilling our legislative obligations to provide an independent review of the work of the NWMO, we gave considerable thought to the criteria we would use for evaluation. In developing them, we considered the mandate of the NWMO, the requirements of the legislation, and the experience of the Seaborn Panel. The criteria were published in our January 2005 statement “How the Advisory Council of the Nuclear Waste Management Organization Intends to Fulfill its Mandate” (Appendix A).

The four criteria are:

- **Comprehensiveness.** Did the NWMO study properly consider all of the available reasonable alternative approaches? Did it thoroughly cover the three required options? Does the report adequately address all of the elements stipulated in the legislation with respect to each of the options?
- **Fairness and balance.** Has the analysis supporting the NWMO report given appropriate weight to all relevant evidence, neglecting none of significance? Does the study give adequate consideration to diverse points of view and recognize the interests of minority positions? Is there any evidence of bias or partiality in the analysis and recommendations? Does the recommended policy choice emerge logically out of the careful and considered weighing of the pros and cons of the respective alternatives?
- **Integrity.** Did the NWMO process provide sufficient opportunity for public engagement? Were Aboriginal peoples, concerned stakeholders, and potentially or actually affected communities given real opportunities to make their views known? Were these views responsibly considered and appropriately taken into account? Were available sources of expertise and specialized experience sought out and utilized effectively? Were ‘state of the art’ processes of public consultation, ethical reflection, socio-economic analysis, technical and scientific study, financial forecasting, and impact assessment employed? Was international comparative experience adequately considered?
- **Transparency.** Did the NWMO make its plans and timetable clear to the interested public? Did it share information with citizens in a timely fashion so that they had the capacity to participate effectively in the process? Did it simplify technical data and complex scientific matters honestly and effectively to assist in the development of public understanding? Did the Organization allow sufficient time for comment, input and reaction from stakeholders and the general public?

Section 2 → The NWMO Process

2.1 Overview of NWMO's Process

The NWMO undertook a complex and iterative process in four phases that involved (1) setting the expectations for the study, (2) exploring the fundamental issues, (3) assessing the options and (4) formulating the recommendation. Throughout these four phases, the NWMO engaged citizens to help develop an understanding of the requirements for an appropriate management approach for Canada, and specialists to help develop an understanding of the practicable options available to address these requirements. The NWMO's work can be described in terms of four linked streams of work: general public engagement, Aboriginal engagement, professional expertise, and the assessment process. All these streams of activity were informed by a set of ethical principles that were treated as over-arching considerations for NWMO's process and outcomes.

Engagement: The NWMO used a wide variety of engagement techniques, including workshops, public information and discussion sessions, open houses, youth workshops, public attitude research (focus groups and telephone survey), a scenarios exercise, an ethics roundtable, meetings with political representatives and international agencies, written submissions, e-dialogue and interactions with the Advisory Council.

Aboriginal engagement: The NWMO's Aboriginal engagement incorporated collaborative agreements with all six national Aboriginal organizations and seven regional/local organizations, an outreach program with First Nations of Ontario, involvement of Aboriginal peoples in all NWMO activities, a workshop on Traditional Knowledge and Aboriginal Wisdom, a program to increase Aboriginal language capacity regarding nuclear waste management, and an Elder's forum.

Professional expertise: More than 60 expert papers were commissioned on a wide range of topics including social and ethical dimensions, health and safety, science and environment, economic factors, technical methods, conceptual engineering designs, cost estimates, risk assessment, and institutions and governance.

Assessment: The NWMO formulated a list of 10 questions that their engagement initiatives suggested that Canadians wanted to have addressed, within the limits of the NWMO mandate. An ethical and social framework was developed based on citizen and Aboriginal values and concerns, ethical principles, future scenarios and societal context. Technical information was introduced from the background papers, engineering design work and cost estimates. Eight objectives were identified to guide the assessment of the four used nuclear fuel management options under consideration.

2.2 Advisory Council Evaluation of NWMO's Process

This section provides the Advisory Council's evaluation of the key elements of the NWMO's process according to the four criteria that we developed to guide our work – comprehensiveness, fairness and balance, integrity, and transparency (see Section 1). We also include some recommendations for future phases of the work of the NWMO, recognizing the opportunity to build on the work undertaken to date.

2.2.1 Engagement

The Advisory Council finds that the NWMO had an extensive and sophisticated engagement program, which was effectively conducted within the limits of the NWMO's mandate and the relatively short time frame allocated to the process by the *Nuclear Fuel Waste Act*. The public engagement program addressed one of the major deficiencies of previous work on nuclear waste management in Canada as identified by the Seaborn Panel, namely that there had been insufficient consultation with Canadians on the proposed management approach. The NWMO employed innovative techniques that were a significant advance in comparison with traditional methods of outreach and provided a great variety of ways for people to participate.

The NWMO process provided opportunities for participation by concerned stakeholders, potentially or actually affected communities and the general public. Despite the usual challenges of attempting to engage large numbers of people in consultations about public policy, we believe that the diverse participation provided

a good reflection of the range of different opinions to be found among stakeholders and the general public. The NWMO made an effort to engage citizens across the country, with a heavier emphasis on those communities that host existing nuclear facilities (Ontario, New Brunswick and Quebec) and uranium mines (Saskatchewan). We feel that this was an appropriate balance, recognizing that interest would be higher in the communities with direct experience and that the Provinces that have benefited most from the industry should bear most of the responsibility for dealing with its wastes.

NWMO went to great lengths to record and consider all points of view, and minority opinions are presented throughout the analysis. NWMO endeavoured to reach people other than those who have an expressed interest in nuclear waste management, particularly through the use of the National Citizens Dialogue and the public attitude research.

Although it is typically difficult to secure the participation of young people in engagement initiatives of this nature, the NWMO made an effort in this regard, including a workshop with young people who were participating in an International Youth Nuclear Congress, a youth dialogue convened in Saskatchewan, involvement of young people in the Aboriginal Elders Forum, presentations at universities, and the e-dialogue.

We observed that for the most part, information was generally shared with citizens in a timely fashion so that they could participate effectively in the process. On the whole, technical data and complex scientific matters were simplified and honestly presented to assist in the development of public understanding. However, we also observed that adequate technical and cost information was not always available when needed by participants in the engagement process, particularly in the early phases of the work.

Throughout the process, the NWMO went to great lengths to ensure transparency and open discussions of its work. It provided background documents and drafts of its reports for independent analysis and comment, and clearly demonstrated how it was responding to public and technical input.

2.2.2 Aboriginal Engagement

We found that the NWMO's engagement activities with Aboriginal peoples were slow to get started, but are now going in the right direction. The Advisory Council recognizes that the three year time constraint imposed on the NWMO by the federal legislation was a particular limiting factor in undertaking comprehensive consultations with Aboriginal peoples. Such consultations need adequate time to accommodate the consensual, measured processes that are traditional to Aboriginal peoples, as well as the large geographic distances, language barriers and cultural complexity involved.

The NWMO's work with the Elders, the development of discussion and technical background materials in Aboriginal languages, the traditional knowledge workshops, efforts to involve Aboriginal peoples in general NWMO activities, and the participation of over 3000 Aboriginal peoples over the past three years testify to the NWMO's numerous outreach efforts to Aboriginal peoples. It is noteworthy that the NWMO has been able to sign engagement agreements with six national and seven regional/local organizations. However the Advisory Council wishes that more regional/local agreements had been signed earlier in the process, especially with Aboriginal peoples in the Canadian Shield territories.

The Advisory Council recognizes that the current engagement activities with Aboriginal peoples represent only the beginning of a longer and more involved and inclusive relationship. As Justice Berger recently noted in his July 2005 memorandum to the NWMO, we must remember the statement of the 1987 World Commission on Environment and Development (Brundtland Commission) that tribal people "must be given a decisive voice in the formulation of resource policy in their areas". Justice Berger emphasized that it is the Aboriginal peoples who mainly live on a permanent basis in the more remote parts of the Canadian Shield. The Aboriginal peoples consider their ancient territories as the true dwelling place of generations and consequently will have an important contribution to make to any management processes involving the Canadian Shield. It will be important for the

NWMO to provide the necessary tools and processes required to achieve that goal.

In the next phases of the process, NWMO will have to proceed with more formal consultations with Aboriginal peoples, especially as the siting options become better defined and focused. The NWMO will need to be mindful of the evolving guidelines for consultations with Aboriginal peoples that are emerging from recent and ongoing decisions by the Supreme Court of Canada. For its part, the NWMO will need to better define its own legal and social requirements and expectations of future consultations with Aboriginal peoples.

There is also a need for greater clarification of the fiduciary obligations of the Federal Government in the consultation process with Aboriginal peoples. There should be greater clarity on the scope and purpose of any further consultations by the Federal Government in future phases, including an understanding of how those consultations might complicate, complement or enhance the engagement initiatives of the NWMO.

Engagement and consultation with Aboriginal peoples should become both more complex and more focused as the next phases of NWMO's work proceed. There is a great opportunity for the NWMO to build on its efforts to date and engage in a meaningful and inclusive consultation process with Aboriginal peoples in its future work.

2.2.3 Professional Expertise

The NWMO incorporated extensive professional expertise into its work and covered in depth a wide range of knowledge and experience within the time available. For the most part, all the key areas were covered, providing a satisfactory base for the conclusions of the study. Looking ahead, we believe that it would be advantageous for NWMO to increase the capacity of its own staff to provide more in-house expertise on the complex technical and scientific matters that must be addressed in future phases.

2.2.4 Assessment

The NWMO assessment process was thorough and covered all the key considerations. It identified 14 alternative approaches and provided justification for screening out unacceptable ones. The three required options, as well as the fourth recommended option, were carefully evaluated, and the NWMO addressed all elements stipulated in the legislation. The analysis supporting the NWMO report gave appropriate weight to all relevant evidence, neglecting none of significance.

We found that the recommended policy choice emerges logically out of the careful and considered weighing of the pros and cons of the alternatives. One area of focus for our deliberations was the replicability of the assessment process. The Assessment Team was composed of a diverse group of individuals with a broad range of expertise. This team designed the assessment process so that it was transparent, traceable and comprehensive. Various techniques were used to engage interested citizens in components of the process, including a simulation of the scoring process and detailed discussion of the objectives and findings of the assessment exercise. In addition, the NWMO engaged consultants Golder Associates and Gartner Lee Ltd. to further develop and enhance the work undertaken by the Assessment Team. The public discussions and the work of the Golder/Gartner Lee team provided substantial additional credibility to the assessment. Nonetheless, in future work, we recommend that assessments should be fully replicated to increase confidence in the results.

We also focused considerable discussion on social and ethical matters because of their critical importance in gaining acceptance for any proposed management approach. The NWMO's strategy of integrating social and ethical factors along with technical and economic considerations represents groundbreaking work in the international context of nuclear waste management. Continued public engagement will be required to build on this important element in the next phases of the process.

2.2.5 Conclusion

Overall, we conclude that, within the stipulated statutory limits to which it was subject, the NWMO conducted a process that was comprehensive, transparent, and clearly exhibits fairness, balance and integrity.

Section 3 → Adaptive Phased Management

3.1 Support for Adaptive Phased Management

The NWMO has made a thorough assessment of the three options mandated by the *Nuclear Fuel Waste Act* and developed an improved approach - Adaptive Phased Management (APM). Each of the four options studied by the NWMO has been shown through extensive analysis to possess various combinations of risks and benefits, from both a technical and a social perspective.

Our review of the risks and benefits associated with each option confirms that APM is the best of the options because it provides Canadians with a comprehensive roadmap for dealing responsibly with Canada's existing nuclear wastes. It retains major advantages of the original three options and minimizes risks and disadvantages. Recognizing that we are currently in the middle of the 40/50 year expected life span of existing nuclear reactors, APM provides a mechanism for a portion of their revenue to be allocated to dealing with their wastes, while not foreclosing on choices properly left to the best judgment of succeeding generations. APM also engages the Canadian public at key decision points along the way and provides a process to allow the NWMO to adapt the management system so that it achieves a socially acceptable standard of safety.

3.2 Benefits of Adaptive Phased Management

The most significant benefit of APM is that it is based on a progressive, adaptive process that, if given sufficient time, commitment, resources and leadership, has the potential to provide a socially acceptable solution for existing and expected used nuclear fuel from Canada's current fleet of reactors. We note that the importance of the process is clearly recognized

by NWMO in its statement that “the most profound challenge lies not in finding an appropriate technical method, but in the manner in which the management approach is implemented” (Section 8.2 on Streams of Analysis in *Final Study Report*).

APM also addresses one of the major conclusions of the Seaborn Panel – that social issues had not been adequately addressed in developing the concept for deep geological disposal of used nuclear fuel that was presented to the Panel. We believe that APM has the potential to address this limitation and achieve a standard of safety that is both technically sound and socially acceptable.

In the following text, we describe some specific benefits of APM. However, we emphasize that in order for APM to realize these benefits, the process must be implemented with integrity, requiring sufficient time and resources for each step to be undertaken fully.

Ethical Framework – APM is designed to be an ethical management approach that would engage a broad cross-section of society in informed dialogue and explicitly respond to societal values and concerns.

Fairness to Future Generations – APM recognizes that fairness requires that financial responsibility for the management of used fuel from existing nuclear facilities should reside with the generations that are benefiting from the power being generated. It also provides a management approach for both the short and long term, while ensuring that future generations will have opportunities to make genuine choices at appropriate points in the process.

Continuous Learning – the APM management approach is designed to incorporate continuous learning and the application of emerging science and technologies, both specific to the site and from work being undertaken in Canadian institutions and in other countries. In particular, the underground characterization facility will provide valuable opportunities to undertake research to further describe the site, experiment with relevant technologies, and demonstrate the safety and effectiveness of proposed methods for handling and monitoring the used fuel.

Addressing Uncertainty – the NWMO recognizes that some participants in the process questioned whether the current level of technical expertise is enough to make decisions on a solution that will have implications for many future generations. APM is designed to address uncertainties by providing time for continual development of technical expertise and a series of points at which important decisions can be made in an open and transparent manner with public accountability.

Security – the option of interim shallow storage of the used nuclear fuel at the centralized site in the near term provides the opportunity to reduce the risks (e.g. security) associated with above-ground storage at a number of current facilities in several Provinces. It also allows preparations to be made for the orderly decommissioning of existing nuclear facilities once their useful life is over. Over the long term, centralized containment in a deep geological repository will provide the most secure end-point currently identified. In addition, because containment in a deep geological repository relies on a combination of engineered and geological barriers to contain and isolate the used fuel, it has the potential to be effective in the event that social institutions that may be in place hundreds or thousands of years from today can no longer ensure the safety of the site.

3.3 Outstanding Considerations

We recognize the considerable amount of work undertaken by the NWMO to develop the APM approach. However, within the APM framework, there are still a number of outstanding questions that will need to be addressed as the NWMO proceeds to the next phases of its work. Some of the key questions are noted below.

- **Liability** – the *Nuclear Liability Act* is currently under review to improve victim compensation, clarify key provisions, clarify federal responsibilities and address technical problems. As decisions are made in the future regarding NWMO's liability, it will be necessary to adjust NWMO's cost estimates accordingly.
- **Rock Formations** – the NWMO has concluded that both the crystalline rock of the Canadian Shield and Ordovician sedimentary rock are potentially suitable for a deep geologic repository. However the option to use sedimentary rock was introduced relatively late in NWMO's study process, and limited work has been undertaken in Canada to date on Ordovician sedimentary rock to determine its suitability for this purpose. It is therefore premature to consider Canadian sedimentary and crystalline rock as equivalent options until more research has been undertaken on the former.
- **Cost Estimates** – the NWMO has undertaken a considerable body of work to identify the costs of each of the four management options. Future work will need to provide more details, for example to specify the incremental costs associated with managing smaller or greater amounts of used fuel, within the range established in the reference used fuel scenario described in Appendix 10.

Section 4 → Final Thoughts and Recommendations

In this section we draw on the experiences of the past three years to provide some final thoughts and recommendations on the following topics:

- Future governance of the NWMO
- Adaptive Phased Management
- Engagement
- Aboriginal engagement
- Advisory Council
- Energy policy

4.1 Future Governance of the NWMO

We found that the NWMO operated with integrity and transparency to manage a complex study process over the past three years, within the confines of the mandate and the deadlines provided. The characteristics of integrity and transparency will continue to be essential in the future to ensure that the NWMO has credibility and public trust.

In Section 10.7 of the *Final Study Report*, NWMO provides a good assessment of its future governance requirements. We emphasize the importance of expanding the Board of Directors to include a broader range of interests than those of the nuclear waste producers. This should provide diverse and independent viewpoints to assist the Organization as it moves into the operational phases of its work.

In addition, we recommend that, consistent with NWMO's public mandate:

- 1) The criteria used to define the composition of the Board should be communicated to the public.
- 2) The Board should adopt a policy of voluntarily adopting the standard of transparency required by the *Access to Information Act*.

4.2 Adaptive Phased Management

We conclude that NWMO's Option 4 – Adaptive Phased Management – is a progressive, adaptive process that, if given sufficient time, commitment, resources and leadership, has the potential to provide a socially acceptable solution for existing and expected used nuclear fuel from the current fleet of reactors. We emphasize that the process should be fully implemented with integrity, as designed by the NWMO. For example, it is possible that a decision will be made that a centralized shallow underground storage facility is not required, but such a decision should emerge from the anticipated process, including meaningful public engagement and full consideration of all social, ethical and technical factors.

Therefore, we recommend that:

- 1) APM should be implemented with the appropriate leadership, resources and time to undertake the process as described in NWMO's *Final Study Report*.

4.3 Engagement

NWMO's engagement process over the past three years was characterized by a wide range of techniques, openness and depth of discussion, and transparency.

As the NWMO moves into the next phase of work, we recommend that:

- 1) The NWMO should continue to meet the high standards of engagement established to date, reach out to a broad cross-section of Canadians and seek diverse opinions.
- 2) Intensive engagement efforts should be undertaken with communities of interest, including potential "willing host" communities.
- 3) Increased emphasis should be placed on reaching out to young people because the long time frame of nuclear waste management places important responsibilities on future generations.

- 4) A strong educational program should be provided to deepen public understanding and facilitate informed decision-making.

4.4 Aboriginal Engagement

The NWMO's engagement activities with Aboriginal peoples will continue to be a critical element of the process. Although Aboriginal engagement initiatives got off to a slow start, they are now going in the right direction, and will provide a good foundation for a more involved and inclusive relationship.

We recommend the following measures to build on this foundation:

- 1) Hire Aboriginal staff and set up an Aboriginal advisory committee with diverse membership to ensure that Aboriginal perspectives are integrated into NWMO initiatives and processes.
- 2) Continue to engage Aboriginal elders.
- 3) Improve communications, with communications tools and technical materials appropriate to Aboriginal peoples, in the languages of the Aboriginal peoples involved.
- 4) Involve traditional knowledge holders in the broader processes of the selected management approach.
- 5) Go beyond the "traditional knowledge" focus of Aboriginal involvement and better involve Aboriginal peoples in the broader discussions of the selected management approach.
- 6) Work with the Federal Government to ensure ongoing funding for local capacity building.
- 7) Continue to focus on appropriate consultation initiatives at the local level.

4.5 Advisory Council

The Advisory Council will continue to play an important role in the next phases of NWMO's work. As this work evolves from a study to implementation, it is appropriate to review the composition of the Advisory Council to ensure that it includes the appropriate range of knowledge, expertise and perspectives, including those of young people. For example, it will be especially important during the site selection process for the Advisory Council to be able to comment with a range of viewpoints on such issues as social acceptability, the public interest and transparency.

Section 10.7 of the *Final Study Report* recognizes the need to review the mandate and composition of the Advisory Council, and we, the current Advisory Council, will be pleased to assist the NWMO with this task.

4.6 Energy Policy

The NWMO Study Report provides a framework for proceeding to address existing and expected used nuclear fuel from the current fleet of reactors. However we emphasize, as did many of the participants in the engagement process, that it does not provide a green light for expansions of nuclear power production beyond the lifespan of the current fleet. As we said in Section 1, any significant change in the amount or type of used fuel to be managed should trigger a review of the work undertaken by the NWMO to date. Such a review should be undertaken in the context of a discussion of federal, provincial and territorial energy policies in Canada, not only for nuclear power, but also for all other forms of energy. Indeed, the need for a broad Canadian perspective was highlighted by the recent proposal of provincial and territorial leaders at their Council of the Federation meeting in Banff to develop a pan-Canadian energy strategy (11 August 2005 Communiqué).

We believe that a public policy discussion about energy in Canada is needed – regardless of any proposals for phase out or expansion of nuclear power. This was a recurring theme in NWMO's engagement activities, with many participants being reluctant to discuss processes to deal with wastes from the generation of nuclear power in the absence of an

understanding of the role of nuclear energy in Canada's future.

Recognizing that responsibility for energy in Canada is shared among the federal, provincial and territorial governments, we recommend that:

- 1) The federal government should work with the provincial and territorial governments to facilitate a national public policy discussion about future energy supplies in Canada.
- 2) There should be no expansion or reduction of nuclear power generation at the provincial or territorial levels without public policy discussion about future energy supplies within those jurisdictions.

Appendix A → How the Advisory Council of the Nuclear Waste Management Organization Intends to Fulfill its Mandate

January 22, 2005

The Legislation

The *Nuclear Fuel Waste Act* (an Act respecting the long-term management of nuclear fuel waste) aims:

“to provide a framework to enable the Governor in Council to make, from the proposals of the waste management organization, a decision on the management of nuclear fuel waste that is based on a comprehensive, integrated and economically sound approach for Canada.”

The Act requires the waste management organization, at the end of three years, to submit a study setting out its proposed approaches for the management of nuclear fuel waste and to recommend one of those approaches for adoption.

The Act also establishes an Advisory Council charged with the responsibility of examining the study and giving written comments on it to the Nuclear Waste Management Organization (NWMO). The NWMO, for its part, is required to submit those comments to the Minister along with its study. Section 12 of the legislation, which discusses the study, imposes an obligation on the Advisory Council to comment on the approaches for the management of nuclear fuel waste contained in the study. While it does not specifically require the Council to comment on the NWMO's recommendations, that requirement can be reasonably inferred from the obligation to comment on 'the study' and 'the approaches', which will of course contain the recommendations.

The NWMO Study

The NWMO's study is obliged to examine at least the following approaches: deep geological disposal; storage at nuclear reactor sites; and centralized storage, either above or below ground. The examination of other approaches is not precluded by the legislation. For each proposed approach the NWMO must include the following:

- Detailed technical description;
- Specification of an economic region for implementation;
- A comparison of benefits, risks and costs with those of the other approaches;
- The associated ethical, social and economic considerations;
- A description of the waste management services to be offered by the NWMO;
- An implementation plan (description of activities, timetable, means of avoiding or minimizing significant socio-economic effects on a community's way of life or its social, cultural or economic aspirations, and a program of public consultation);
- A summary of comments arising out of consultation with the general public and with aboriginal peoples;
- A financial formula to cover the costs;
- A cost-sharing formula allocating costs to waste producers; and
- The form and amount of any financial guarantees provided by the nuclear energy corporations.

Finally, the study is required to recommend one of the approaches thus described.

This, then, is the nature of the study on which the Advisory Council is obliged to provide written comments.

The Advisory Council's Approach

The legislation creating the Nuclear Waste Management Organization and its Advisory Council is very broad. Within the framework of the legislation, we – as members of the Advisory Council – see our responsibilities in the following way.

As part of our obligation to examine and give written comment on the NWMO's study at the end of the three-year period, we believe it is appropriate for the Council to learn about the ongoing work of the NWMO and for the Council to express its views about that work as it is being done. Accordingly, members of the Advisory Council decided at its establishment in October 2002 to meet regularly with NWMO management and to offer ongoing advice about the conduct of their undertaking. To date we have had 13 formal meetings with NWMO staff as well as four meetings with members of the NWMO Board of Directors. Our work is recorded in the minutes posted on the Organization's web site. At the end of the three-year process, we intend to post the Tracking Matrix we used to assist us in tracking our activities and in supporting the preparation of our written comments on the NWMO study.

In fulfilling its legislative obligations, the Advisory Council will offer written comments and observations on the work and study of the NWMO.

The Council will review and comment on the **comprehensiveness** of the NWMO study. Did it properly consider all of the available reasonable alternative approaches? Did it thoroughly cover the three required options? Does the report adequately address all of the elements stipulated in the legislation with respect to each of the options?

The Council will review and comment on the **fairness and balance** of the study. Has the analysis supporting the report given appropriate weight to all relevant evidence, neglecting none of significance? Does the study give adequate consideration to diverse points of view and recognize the interests of minority positions? Is there any evidence of bias or partiality in the analysis and recommendations? Does the recommended policy choice emerge logically out of the careful and considered weighing of

the pros and cons of the respective alternatives?

The Council will review and comment on the **integrity of the NWMO process**. Did the process provide sufficient opportunity for public engagement? Were Aboriginal peoples, concerned stakeholders, and potentially or actually affected communities given real opportunities to make their views known? Were these views responsibly considered and appropriately taken into account? Were available sources of expertise and specialized experience sought out and utilized effectively? Were ‘state of the art’ processes of public consultation, ethical reflection, socio-economic analysis, technical and scientific study, financial forecasting, and impact assessment employed? Was international comparative experience adequately considered?

The Council will review and comment on the **transparency of the process**. Did the NWMO make its plans and timetable clear to the interested public? Did it share information with citizens in a timely fashion so that they had the capacity to participate effectively in the process? Did it simplify technical data and complex scientific matters honestly and effectively to assist in the development of public understanding? Did the Organization allow sufficient time for comment, input and reaction from stakeholders and the general public?

In conclusion, there is one other issue that requires comment. The legislation is silent on the question of the quantity of nuclear fuel waste that is to be managed by the recommended approach. In its examination and selection of management approaches, the NWMO will have to address the matter of capacity, and therefore of quantity. How much nuclear waste is it assumed that any given management approach will be able to handle? This question is tied to the larger policy question of the future of nuclear energy in Canada.

The Advisory Council would be critical of an NWMO recommendation of any management approach that makes provision for more nuclear fuel waste than the present generating plants are expected to create, unless it were linked to a clear statement about the need for broad public discussion of Canadian energy policy prior to a decision about future nuclear energy development. The potential role of nuclear energy in addressing Canada’s future electricity

requirements needs to be placed within a much larger policy framework that examines the costs, benefits and hazards of all available forms of electrical energy supply, and that framework needs to make provision for comprehensive, informed public participation.