

BACKGROUND

NWMO's Final Study Report

RECOMMENDATION IN BRIEF ADAPTIVE PHASED MANAGEMENT

- Canada should proceed in a deliberate and collaborative way to isolate the used fuel in a deep underground repository.
- The waste would be safely and securely contained by engineered barriers and the surrounding geology.
- It would be monitored and remain retrievable over time.
- How the technical method is implemented is crucial.
- NWMO intends to seek an informed, willing host community.
- The process is phased, and transparent, with explicit decision points where citizens are provided with genuine opportunities to influence progress and outcomes.

BACKGROUND

The Issue

- Nuclear energy produces 15 percent of Canada's electricity; Ontario – 50%, New Brunswick – 30%, Quebec – 3% (CNA, 2004)
- Since the beginning of its nuclear energy program, Canada has accumulated almost 2 million used fuel bundles; approximately 36 thousand tonnes of uranium. Stacked tightly, all of it could fit in 5 hockey rinks, filling from the ice surface to the top of the boards.
- If all of Canada's existing CANDU reactors operate for an average of 40 years, they will produce a total of approximately 3.6 million used fuel bundles.
- Used nuclear fuel is highly radioactive and must be contained and isolated from humans and the environment, essentially indefinitely.
- Canada's used fuel is now safely stored on a temporary basis at facilities where the waste is produced.
- Like most other nuclear energy producing countries, Canada has not yet adopted a long-term nuclear waste management plan.

History

- 1977: Hare report recommends underground disposal of nuclear wastes
- 1978: Canada/Ontario Nuclear Fuel Waste Management Program initiated to research nuclear waste management
- 1989: Environmental Assessment (Seaborn Panel) of the AECL concept of geological disposal in the Canadian Shield begins
- 1998: Seaborn Panel reports AECL concept had not been demonstrated to have broad public support; recommends creation of a waste management agency to study options
- 2002: *Nuclear Fuel Waste Act* passed; NWMO established

The NWMO

- The NWMO was established in October, 2002 to conduct a study and develop a recommendation within 3 years for the long-term management of Canada's used nuclear fuel.
- In accord with the "polluter pays" principle, the NWMO shareholders are the producers of used nuclear fuel: Ontario Power Generation, Hydro Quebec, NB Power and AECL Ltd.
- The NWMO has an independent Advisory Council chaired by the Honourable David Crombie. Its comments on the NWMO study are made public as part of the NWMO's Final Study Report.
- Elizabeth Dowdeswell is the president of the NWMO

THE STUDY

- The NWMO was required by the *NFWA* to study at least three technical options for long-term nuclear waste management:
 - deep geological disposal in the Canadian Shield (updated AECL concept)
 - continued storage at nuclear reactor sites (where used fuel is currently safely stored)
 - centralized storage, above or below ground, anywhere in Canada
- The NWMO mission is to develop a management approach that is socially acceptable, environmentally responsible, technically sound and economically responsible.
- The NWMO study was an iterative process, responsive to expectations expressed by citizens, and supported by three milestone documents, each followed by a round of public engagement and dialogue:
 1. Asking The Right Questions
 - describes the issue
 - proposes key questions to assess the options
 - invites comment
 2. Understanding the Choices
 - describes the management options
 - outlines the assessment framework
 - presents a preliminary assessment for discussion
 3. Draft Study Report
 - proposes a fourth option – Adaptive Phased Management
 - invites further dialogue to refine the recommendation

Engagement

- More than 18,000 citizens contributed to the NWMO study, including more than 500 specialists in natural and social sciences and technical disciplines.
- 2,500 Aboriginal people participated in dialogues organized and delivered by 15 national, regional and local Aboriginal organizations.
- The NWMO utilized traditional and innovative engagement activities including:
 - An interactive website: visited almost 300,000 times by more than 50,000 people
 - A National Citizen's Dialogue on Values: over 400 people in 12 communities
 - Dialogues with nuclear host communities
 - National and Regional Stakeholder dialogues
 - e-dialogues on risk and uncertainty, the assessment framework, and the Draft Study Report
 - 120 Information and Discussion Sessions in every province and territory: 880 participants
 - Dialogues on the Draft Study Report in Saskatchewan, Manitoba, Quebec, Ontario and New Brunswick.
 - Open Houses in reactor site communities
 - Public Attitude Research: 3 nation-wide surveys and 54 focus groups

The Assessment

- Assessment process incorporates technical considerations provided by specialists, and social and ethical considerations which emerged from dialogue with citizens
- Eight objectives emerged from dialogue: fairness, public health and safety; worker health and safety; environmental integrity; security, community well-being, economic viability and adaptability.
- Two important requirements became evident: the approach must be safe and secure for people, communities and the environment – and it must be fair – both to current and future generations.
- Canadians feel strongly that this generation which benefits from nuclear power should implement a solution, but future generations must not be precluded from taking advantage of new learning.
- When assessed, each of the three options prescribed for study by the *NFWA* has distinct advantages but no one perfectly addressed all of the objectives above.

THE RECOMMENDATION

Adaptive Phased Management is both a technical method and a management approach. Key attributes are:

- Ultimate centralized containment and isolation in an appropriate geological formation
- Phased and adaptive decision-making
- Optional shallow storage at the central site as a contingency
- Continuous monitoring
- Provision for retrievability
- Citizen engagement

The Project

- Phase 1: Preparing for Central Used Fuel Management
 - Used fuel stored and monitored at reactor sites while citizens are engaged to develop and conduct site selection process
 - Site selection, characterization, and environmental assessment
 - Construct underground characterization facility
 - Construct shallow storage if this option is chosen.
- Phase 2: Central Storage and Technology Demonstration
 - Begin transport of used fuel to shallow storage (if selected)
 - Research and demonstration to confirm site suitability
 - Citizen engagement to assess site, technology and decide timing for used fuel placement in deep repository
 - Construct and licence deep repository
- Phase 3: Long term containment, isolation and monitoring
 - Move used fuel from shallow storage or reactors for repackaging
 - Place used fuel containers in deep repository
 - Engage citizens in ongoing monitoring; maintain access
 - Future generation decides when to close the repository and the nature of ongoing monitoring

Implementation

How any technical method is implemented is of great importance to Canadians.

- NWMO will be the implementing agency.
- Implementation plans will be designed in collaboration with many communities of interest.

- The cost is estimated at \$24-billion (2002 \$) over the life of the project; \$6.1-billion present value (2004 \$) – approximately 1/10th cent per kilowatt hour of nuclear-generated electricity.
- As required by the *NFWA*, used fuel producers have established and are making annual contributions to trust funds to pay for the long-term management of used fuel; current deposits total \$770-million.
- In choosing a location, NWMO intends to seek an informed, willing host community.
- The site selection process should focus within the provinces that are directly involved in the nuclear fuel cycle – Ontario, New Brunswick, Quebec and Saskatchewan.
- The NWMO will respect Aboriginal rights, treaties and land claims.
- All potentially affected parties must be afforded fair and equitable treatment in assessing and managing potential significant socio-economic effects.
- Continuous learning and adaptive management will require a vibrant and robust research and development effort.

RATIONALE FOR RECOMMENDATION

Adaptive Phased Management tries to find an optimal balance of competing objectives. It embraces the precautionary principle and adaptive management. Societal goals and objectives and successful technology demonstration will determine the pace of implementation. We believe this approach is the strongest possible foundation for managing the risks and uncertainties that are inherent in the very long time frames over which used nuclear fuel must be managed with care.

- It commits this generation of Canadians to take the first steps now to manage the used nuclear fuel we have created.
- It recognizes that over the long term, it would be imprudent to rely on a human management system alone with its changing forms of institutions and governance.
- It will meet rigorous safety and security standards through its design and process.
- It allows sequential and collaborative decision-making, providing the flexibility to adapt to experience and societal change.
- It provides genuine choice by taking a financially conservative approach, and providing for capacity to be transferred from one generation to the next.
- It promotes continuous learning, allowing for improvements in operations and design that would enhance performance and reduce uncertainties.
- It builds confidence in the technology and supporting systems before the final phase is implemented.
- It provides a viable, safe and secure long-term storage capability, with the potential for retrievability of used fuel which can be exercised until future generations have confidence to close the facility.
- It provides for continuous monitoring and contingency against unforeseen events, either natural or man-made.
- It is rooted in values and ethics, and engages citizens allowing for societal judgements as to whether there is sufficient certainty to proceed with each step.

NEXT STEPS

- The Government of Canada will decide on a long-term nuclear waste management approach.
- The NWMO will implement the approach chosen by the Government of Canada subject to all of the necessary regulatory approvals.