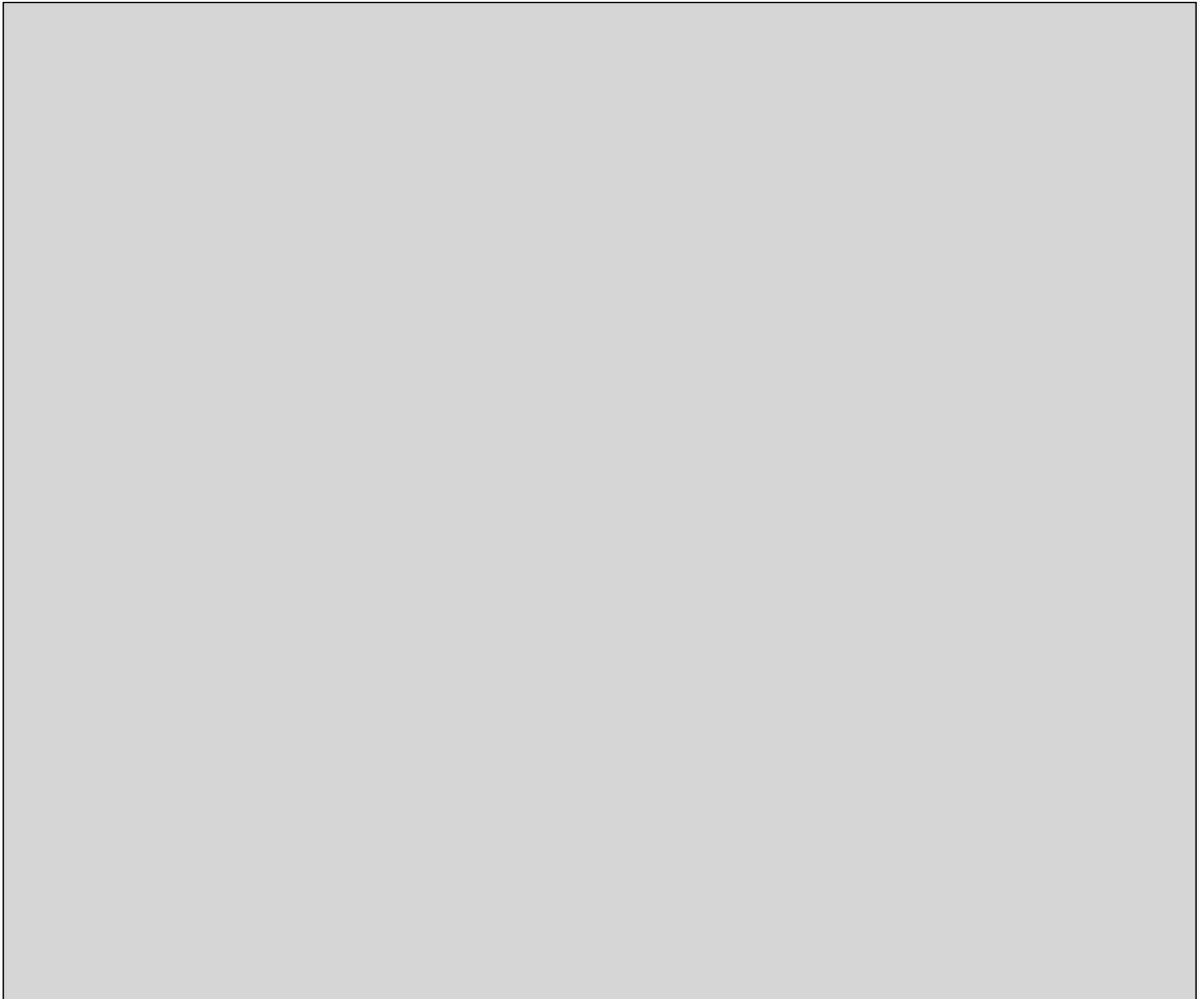


**NWMO BACKGROUND PAPERS**

**2. SOCIAL AND ETHICAL DIMENSIONS**

**2-2 SOCIAL ISSUES ASSOCIATED WITH THE ATOMIC ENERGY OF CANADA LIMITED  
NUCLEAR FUEL WASTE MANAGEMENT AND DISPOSAL CONCEPT**

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## **NWMO Background Papers**

NWMO has commissioned a series of background papers which present concepts and contextual information about the state of our knowledge on important topics related to the management of radioactive waste. The intent of these background papers is to provide input to defining possible approaches for the long-term management of used nuclear fuel and to contribute to an informed dialogue with the public and other stakeholders. The papers currently available are posted on NWMO's web site. Additional papers may be commissioned.

The topics of the background papers can be classified under the following broad headings:

1. **Guiding Concepts** – describe key concepts which can help guide an informed dialogue with the public and other stakeholders on the topic of radioactive waste management. They include perspectives on risk, security, the precautionary approach, adaptive management, traditional knowledge and sustainable development.
2. **Social and Ethical Dimensions** - provide perspectives on the social and ethical dimensions of radioactive waste management. They include background papers prepared for roundtable discussions.
3. **Health and Safety** – provide information on the status of relevant research, technologies, standards and procedures to reduce radiation and security risk associated with radioactive waste management.
4. **Science and Environment** – provide information on the current status of relevant research on ecosystem processes and environmental management issues. They include descriptions of the current efforts, as well as the status of research into our understanding of the biosphere and geosphere.
5. **Economic Factors** - provide insight into the economic factors and financial requirements for the long-term management of used nuclear fuel.
6. **Technical Methods** - provide general descriptions of the three methods for the long-term management of used nuclear fuel as defined in the NFWA, as well as other possible methods and related system requirements.
7. **Institutions and Governance** - outline the current relevant legal, administrative and institutional requirements that may be applicable to the long-term management of spent nuclear fuel in Canada, including legislation, regulations, guidelines, protocols, directives, policies and procedures of various jurisdictions.

### **Disclaimer**

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## EXECUTIVE SUMMARY

The Nuclear Waste Management Organization (NWMO) wishes to ensure that the substantial insight and learning from previous studies and work on the nuclear waste issue are identified and considered in its study. For this reason the NWMO has commissioned a number of background papers to summarize this learning and ensure that it is available for the consideration of interested Canadians.

This background paper on social issues associated with the Atomic Energy of Canada Ltd Nuclear Fuel Waste Management and Disposal Concept (NFWMDC) provides a comprehensive listing of the social issues related to the concept of deep geological disposal. Although some issues identified by the research are specific to the AECL proposal for deep geological disposal, many issues are relevant to other options for managing nuclear waste.

This paper summarizes previous research into the social issues raised by participants to the NFWMDC hearings from March 1996 to March 1997. Participants included public and Aboriginal individuals and groups who voluntarily attended the hearings and/or made written submissions to the Hearings Panel. Typically, these individuals and groups were motivated to participate in the hearings because of their concerns about the proposed concept or about nuclear energy and nuclear waste. Many of these groups and/or their consultants and advisors raised issues also identified by the 'technical' and regulatory reviewers in presentations and submissions. Other participants to the hearings included technical experts, federal government departments, international representatives and industry and industry association representatives.

A primary purpose of the social issues research was:

- to identify and describe the social issues associated with the proposed Atomic Energy of Canada Limited (AECL) concept for the disposal of used nuclear fuel waste raised by participants in the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment (NFWMDC EA) hearings, by the Scientific Review Group and by NFWMDC EA Panel in its report; and,
- to thematically cluster, or categorize the statements of social issues.

The focus of the research was on the issues raised by public and Aboriginal individuals and groups in the hearings process. All issues raised by public and Aboriginal participants were deemed to be social issues if they addressed failures, defects and/or deficiencies in the NFWMDC that related to, or were perceived to relate to, the well-being of human society and the environment. These social issues include perceptions about scientific, engineering, technical and environmental matters. As such a wide range of social issues were captured. Issues raised by non-public participants (e.g., technical and professional associations) were considered to be social issues only where the participant directly related the issue to people, their interaction and their well-being.

The statements of social issues are classified into 21 categories by the ideas or themes that they represented. These statements are intended to represent the views expressed by the various participants to the hearings between March 1996 and March 1997. They do not represent the views of the Nuclear Waste Management Organization or the author. Nor are they intended to represent the current views of the public, Aboriginal peoples or any organization or community.

The social issues are summarized below for each of the 21 categories. Due to the importance placed on Aboriginal perspectives by the EA Panel and the extent of involvement of Aboriginal participants in the hearings, Aboriginal perspectives were classified separately from the perspectives of other hearings participants.

### **The Generic Concept**

- ❑ The generic concept was incomplete and could not be proved safe at the generic conceptual level.
- ❑ AECL did not adequately demonstrate the feasibility of the concept and did not provide a clear statement on the limits to the flexibility of the concept to adapt to changes.
- ❑ The implementing organization was not identified.
- ❑ The use of international experience and peer reviews was not maximized.

### **Need for and Timing of Disposal**

- ❑ The need for disposal was not addressed and the timing for disposal was not justified.

### **Alternative Management Options**

- ❑ The concept did not address alternatives to the disposal concept and alternative methods of disposal.
- ❑ The disposal concept lacked sufficient monitoring and retrievability.

### **Involvement and Role of the Public**

- ❑ The public involvement process and the public's role in decision-making were inadequate.

### **The Environmental Impact Statement (EIS)**

- ❑ The EIS was incomplete and did not adequately define important terms.
- ❑ The EIS did not support the conclusion that the concept was safe.

### **The Impact Assessment**

- ❑ There were omissions, inadequacies and deficiencies in the impact assessment.
- ❑ The assessment of the impacts on the social environment was incomplete and the social issues were inadequately addressed.
- ❑ The analysis of the biosphere component was seriously flawed.

### **Site Selection**

- ❑ The proposed site selection process was incomplete and incapable of leading to an acceptable site.
- ❑ The proposed voluntary siting process was flawed and inappropriate.

### **Human Health and Safety**

- ❑ The safety of the concept was not adequately demonstrated.
- ❑ The discussion of public and occupational health effects was inadequate and too restrictive.

### **Acceptable Levels of Risk**

- ❑ The process for and determination of acceptable levels of risk was inappropriate and deficient.

### **Risk and Uncertainty**

- ❑ Measures for adapting to uncertain and unlikely outcomes were not adequately described.
- ❑ AECL did not seek wide public input and input from other disciplines when developing scenarios or in developing and screening risk factors.
- ❑ The concept design did not provide sufficient protection for present and future humans and the natural environment.
- ❑ The risk analysis was inadequate and incomplete.

### **The Limits of Science and Technology**

- ❑ Scientific knowledge, analytical capabilities (e.g., computer modelling), engineering and current technology were insufficient to design, build and operate a safe disposal facility or to make predictions over the long time frame.

### **Transportation of Nuclear Fuel Waste**

- ❑ The transportation of nuclear fuel waste would increase the risks of exposure to radiation.
- ❑ The transportation safety analysis underestimated the risks and consequences of transporting nuclear fuel waste.
- ❑ The concept proposed inadequate or inappropriate security, safeguards and emergency response measures.

### **Policy and Decision-Making**

- ❑ Policy and decision-making processes used to select and approve the concept were not adequate.

### **Trust and Credibility**

- ❑ The proponent, the industry, the regulator and government did not have the trust or the credibility of the public to undertake, regulate or oversee this project.

### **Ethical Aspects**

- ❑ The ethical analysis component of the assessment was inadequate.
- ❑ The process for selecting, assessing and implementing the concept was not fair.
- ❑ The approach to compensation and incentives was unethical.
- ❑ The concept's predetermination of a location in the Canadian Shield is inequitable.
- ❑ The concept would not provide adequate and equal protection for all future generations and would place an undue burden on future generations.

### **Cost and Financial Deficiencies**

- ❑ The information on cost and finances was inadequate and not credible.
- ❑ Financial impacts were not fully addressed and there was no guarantee that a segregated or dedicated fund would be established to fund disposal.

### **Regulations and Standards**

- ❑ The concept relied upon regulations and standards that did not adequately protect human and environmental health.
- ❑ The process for developing the regulations and standards did not adequately involve the public or address social concerns.

### **Scoping of the Problem**

- ❑ The concept omitted consideration of energy policy, including alternative energy sources and the future use of nuclear energy.
- ❑ There was inadequate discussion of reprocessing and disposal of reprocessed spent fuel and MOX fuel.
- ❑ The potential for and consequences of importing nuclear waste from other countries was not addressed.

### **Aboriginal Involvement in Planning and Decision-making**

- ❑ There was insufficient culturally appropriate, funded consultation and communication with Aboriginal peoples throughout the process.
- ❑ The decision-making processes used by AECL and the government in defining the concept and in completing the Environmental Impact Statement (EIS) and those proposed for subsequent phases were inadequate.
- ❑ The concept omitted consideration of, or demonstrated a lack of respect for, Treaty and Aboriginal Rights and the constitutional rights of Aboriginal people.
- ❑ The concept is unethical because it will place undue risks and burdens on future generations, it is inequitable to locate the facility in areas where the people had not benefited from nuclear energy, and it would entice poorer Aboriginal communities to accept the facility through compensation or incentives.
- ❑ The procedure for assessing and deciding about the concept was not fair.
- ❑ The proponent, the regulator and government did not have the trust or the credibility to undertake, regulate or oversee this project.

### **Aboriginal Perspectives on Long-term Waste Management**

- ❑ The concept was not proven to be safe and it conflicted with the Aboriginal beliefs about their responsibility to Mother Earth.
- ❑ The site selection process of the concept was deficient and inappropriate.
- ❑ Alternative management options were not adequately addressed.
- ❑ The transportation assessment was inadequate.

### **Aboriginal Perspectives on the Environmental Impact Assessment**

- ❑ The assessment did not demonstrate the safety of the concept to present and future generations and to the environment.
- ❑ The treatment of Aboriginal spiritual, cultural and social values was inadequate.
- ❑ The assessment did not adequately address the impact of the concept on traditional activities or on the natural environment.

## 1. Introduction and Purpose

In 1978, the Government of Canada and the Province of Ontario established the Nuclear Fuel Waste Management Program “to assure the safe and permanent disposal” of nuclear fuel waste in Canada. Atomic Energy of Canada Limited (AECL) was given the responsibility for researching and recommending a permanent method of “disposal in a deep underground repository in intrusive igneous rock” which led to its development of a disposal concept.

The Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel (the Panel) was appointed by the federal government in 1989. It was instructed to conduct a public review of Atomic Energy of Canada Limited’s (AECL’s) proposed concept under the Federal Environmental Assessment and Review Process (EARP).

AECL submitted the Environmental Impact Statement (EIS) for review in 1994. The Panel conducted public hearings into the EIS in 16 communities in Ontario, Saskatchewan, Manitoba, New Brunswick and Quebec between March 1996 and March 1997. “Phase I focused on broad societal issues related to managing nuclear waste; Phase II focused on the safety of the AECL concept from a technical point of view; and Phase III focused on the public’s opinions of the safety and acceptability of the concept.”<sup>1</sup> The Panel accepted verbal presentations and written submissions from participants.

The Panel issued its final report, *Nuclear Fuel Waste Management and Disposal Concept: Report of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel*, in February 1998. The report sets out the Panel’s criteria for safety and acceptability, and provides conclusions on the safety and acceptability of the AECL concept from technical and social perspectives. The report also makes a number of recommendations regarding “future steps to be taken in the management of nuclear fuel wastes in Canada”<sup>2</sup>. As one future step, the Panel recommends:

*“If the AECL concept is chosen as the most acceptable concept at the end of Phase II, governments should direct the Nuclear Fuel Waste Management Agency, together with Natural Resources Canada and the AECB [Atomic Energy Control Board] or its successor (now the Canadian Nuclear Safety Commission (CNSC)), to undertake the following: review all the technical and social shortcomings identified by the Scientific Review Group and other review participants; establish their priority; and generate a plan to address them.”*<sup>3</sup>

In December 1998, the “Government of Canada Response to Recommendations of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel” (Government Response) was issued. The Government Response to the Panel’s recommendation on shortcomings states, in part, that:

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<sup>1</sup> Canadian Environmental Assessment Agency. Report of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel, February 1998, Minister of Public Works and Government Services Canada, page 1.

<sup>2</sup> Ibid. page 64.

<sup>3</sup> Canadian Environmental Assessment Agency. Report of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel, February 1998, Minister of Public Works and Government Services Canada, page 74.

*“The Government of Canada agrees with the intent of this recommendation. The waste management organization should review all of the social and technical issues related to the AECL concept as identified by the Scientific Review Group (SRG) and other review participants and AECL’s response to these issues.”<sup>4</sup>*

The range of social issues associated with the AECL Nuclear Fuel Waste Management and Disposal Concept is quite broad. Additionally, there may be some scope of opinion regarding what constitutes a “social” issue.

The purpose of this research into social issues associated with the AECL concept is:

- to identify and describe the social issues associated with the proposed Atomic Energy of Canada Limited concept for the disposal of used nuclear fuel waste raised by individuals and groups who presented their concerns at the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment (NFWMDC EA) hearings, by the Scientific Review Group and by the Panel in its report; and
- to thematically cluster, or categorize the statements of social issues.

This research represents a systematic effort to define “social issues”; to identify and document the social issues contained in the hearings record; and, to classify the issues.

For the purpose of this background paper, social issues are defined to mean failures, defects and / or deficiencies in the AECL Nuclear Fuel Waste Management and Disposal Concept raised by the participants in the NFWMDC EA hearings that related to, or are perceived to pertain to, human society and the environment, the interaction of the individual and the group or the well-being of human beings as members of society.

Participants included public and Aboriginal individuals and groups who voluntarily attended the hearings and/or made written submissions to the Hearings Panel. Typically, these individuals and groups were motivated to participate in the hearings because of their concerns about the proposed concept or about nuclear energy and nuclear waste. Many of these groups and/or their consultants and advisors raised issues also identified by the ‘technical’ and regulatory reviewers in presentations and submissions. Other participants to the hearings included technical experts, federal government departments, international representatives and industry and industry association representatives.

This research identified as social issues all issues raised by public and Aboriginal individuals and groups which addressed failures, defects and/or deficiencies in to AECL NFWMC. The application of this definition provides a comprehensive listing of social issues, including the scientific, engineering and technical deficiencies perceived by public and Aboriginal individuals and groups as having the potential to affect the interaction and the well-being of people, communities and/or the environment. Issues raised by non-public participants (e.g., technical and professional associations) were considered to be social issues only where the participant directly related the issue to people, their interaction and their well-being.

The social issues were identified from the transcripts and written submissions for the three Phases of the NFWMD hearings and from the Panel’s final report. Over 1200 statements of

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<sup>4</sup> Natural Resources Canada, Government of Canada Response to Recommendations of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel, December 1998, Government of Canada, page 14.

social issues made by participants in the hearings were recorded (Appendix A). These were combined into representative statements of the issues.

This background paper presents the classification of the social issues, and the approach used to develop the classification in Section 2.0. Section 3.0 provides a summary, by category, of the social issues. The full list of statements of social issues is presented, by category, in Table 1, Appendix A. The method of identifying, documenting and classifying the social issues and the discussion of the definition of social issues is presented in Appendix B.

## 2. The Classification of Social Issues

Over 1200 statements of social issues were identified from the hearings record (Appendix A: Table 1) based on the definition of social issues as failures, defects and / or deficiencies in the AECL Nuclear Fuel Waste Management and Disposal Concept raised by individuals and groups during the NFWMDC EA hearings. An approach was developed to thematically cluster, or classify the issues to organize them and to facilitate the identification and understanding of the issues. (For a more complete discussion of the definition of social issues and the approach to classifying the issues see Appendix B: Methodology.)

The approach to classifying the social issues included a review of the classification of social issues for other projects and a review of the social issues identified in this project. The classification of the social issues was based on the following factors:

- the structure of the hearings (e.g., This environmental assessment hearing was structured to address specific considerations in an environmental assessment such as need, alternatives, and the EIS Statement. These topics were reflected in participants' comments.);
- the questions investigated during the hearings (e.g., Risk and Uncertainty, Acceptable Levels of Risk and Ethical Aspects);
- the types of social issues raised by the public and Aboriginal participants;
- the participants' statements of issues and the terminology used; and,
- the extent and importance of Aboriginal participation in the hearings.

Aboriginal perspectives on, and related to, the concept are grouped separately from the perspectives of others. This separation of issues related to Aboriginal people is consistent with the Panel's treatment of Aboriginal issues throughout the hearings and in its' Report and with the extent of involvement of Aboriginal participants and communities in the hearings.

The classification of social issues is shown in Figure 1 below. It accommodates the broad range of issues raised by individuals and groups from many different backgrounds and interests and includes their concerns with the scientific, engineering, technical and environmental aspects of the concept.

### Figure 1: Classification of Social Issues

#### The Generic Concept

- Public Acceptability
- The Generic Concept Approach
- Peer Review and International Experience
- Monitoring
- Flexibility
- Feasibility of Implementation
- The Implementing Organization

#### Need for and Timing of Disposal

**Alternative Management Options**

- Alternatives to the Disposal Concept
  - Monitored, Retrievable Storage
  - On-Site Storage
  - Treating the Waste
- Alternative Methods of Disposal

**The Involvement and Role of the Public**

- Decision-making about the Concept
- During the CEAA Hearings
- Funding
- Communication

**The Environmental Impact Statement (EIS) Documents**

- Definitions
- The EIS Documents

**The Impact Assessment**

- Social Environment
- Natural Environment

**Site Selection**

- Site Selection Process
- Site Selection Criteria
- Lessons from Siting Processes
- Voluntary Siting
  - Role of Communities on Transportation Routes

**Human Health and Safety**

- Public Health and Safety
- Occupational Health and Safety

**Acceptable Levels of Risk**

**Risk and Uncertainty**

- Deficiencies in the Risk Analysis
- Scenario Analysis
- Containment and Containers
  - The Concept Design
  - Multiple Barriers
  - Disposal Containers
  - Transportation Casks

**The Limits of Science and Technology**

- Ability of Science and Technology to Address Uncertainty
- Long-term Predictions
- Computer Modelling

**Transportation of Nuclear Fuel Wastes**

- Potential for and Consequences of Accidents
- Security, Safeguards and Emergency Response

The Responsible Agency  
Other

**Policy and Decision-making**

**Trust and Credibility**

The Nuclear Industry  
Government and the Regulator

**Ethical Aspects**

Ethical Analysis in the EIS  
Procedural Fairness  
Compensation and Incentives  
Locational Equity  
Future Generations  
    Protection of Future Generations  
    Burden on Future Generations

**Cost and Financial Deficiencies**

Deficiencies Related to Cost  
Deficiencies Related to Financial Aspects

**Regulations and Standards**

Protection of Human and Environmental Health  
Process for Developing the Regulations and Standards  
Credibility of the Regulations and Standards

**Scoping of the Problem**

Energy Policy and Future Use of Nuclear Energy  
Reprocessing and MOX fuel  
Importing Nuclear Waste  
Alternative Energy Sources  
Other Scoping Issues

**Aboriginal Involvement in Planning and Decision-making**

Aboriginal Involvement and Communication  
Respect for Treaty and Aboriginal Rights  
Aboriginal Role in Planning and Decision-Making  
Aboriginal Role in Site Selection  
Equity

**Aboriginal Perspectives on Long-term Waste Management**

The Generic Disposal Concept  
Alternative Management Options  
Transportation

**Aboriginal Perspective on the Environmental Impact Assessment**

Spiritual, Cultural and Social Values  
Human Health and Safety  
Environmental Health

The Environmental Impact Statement

### **3. Summary of Findings**

The social issues are summarized below in groupings that represent the main theme or idea of several statements of issues. The groupings are consistent with the classification illustrated in Figure 1. The statements below summarize the statements made by various groups and individuals to the EA Panel. They are not intended to represent the views of all public and Aboriginal hearings participants. Nor are they intended to represent the current views of the public, Aboriginal peoples or any organization or community.

#### **3.1 The Generic Concept**

A number of statements of social issues related to the generic nature of the concept, the conceptual approach to research and approval, and flexibility and feasibility of implementation of the concept. The issues are summarized below.

- ❑ The concept could not be proved safe at the generic conceptual level; it could not be evaluated adequately without site specific information. AECL did not prove that the concept could protect human and environmental health to the extent that is reasonably achievable in a generic research program.
- ❑ The generic concept was incomplete. For example, the concept did not include consideration of disposal of other types of nuclear wastes, and it did not address the need to find a safe, affordable, environmentally acceptable way of reducing the radioactivity and the quantity of the waste.
- ❑ The implementing organization was not identified, creating concern about the trustworthiness and competence of the organization.
- ❑ AECL did not maximize its use of international experience and peer reviews to improve the concept and the assessment.
- ❑ AECL did not adequately demonstrate the feasibility of the concept and did not provide a clear statement on the limits to the flexibility of the concept to adapt to changes.

These issues contributed to a lack of confidence in the safety of a future facility and to the perception that the safety of the concept had not been proven. This raised the concern that the well-being of people, communities and the environment would not be adequately protected.

#### **3.2 Need for and Timing of Disposal**

The social issues are:

- ❑ The need for disposal was not addressed.
- ❑ The timing for disposal was not justified.

For some participants, the lack of justification for need and the lack of immediacy for a disposal facility undermine the justification for increasing the risks associated with the management of the used fuel. Establishing a disposal facility could affect the well-being of people and / or communities and their environment more than is necessary. Unless the need for a facility is clear and the timing justified, public acceptance could be compromised.

### **3.3 Alternative Management Options**

The social issues related to alternative management options are summarized into the following three issue statements:

- ❑ The concept did not address alternatives to the disposal concept and alternative methods of disposal.
- ❑ Alternative methods of disposal (e.g., non-plutonic rock, limestone caverns) were not seriously assessed.
- ❑ The disposal concept lacked sufficient monitoring and retrievability. Monitored, retrievable storage and on-site storage were not fully researched and evaluated as part of the concept assessment.

Without a more complete consideration of alternatives and more extensive monitoring some participants expressed a lack of confidence that the disposal concept was a safer option. Without a comparison of disposal to other options, there was no certainty that disposal would have the least impact on the well-being of people, communities and the environment.

### **3.4 Involvement and Role of the Public**

The following issue statement summarizes the statements of social issues related to the involvement and role of the public:

- ❑ The public involvement process and the public's role in decision-making were inadequate from the initial decisions on the disposal concept to the proposals for involvement in subsequent phases of the project. Some statements of social issues focused on the lack of public involvement in decision-making about the concept, insufficient provision for public involvement in the CEAA hearings, and the need for adequate funding and greater communication.

Due to the perceived deficiency in public involvement in the assessment and in decision-making, the process was not seen by some participants to be legitimate. The stakeholders, whose well-being may be affected, believed that they had a right to be involved in the decision-making about the concept and that their involvement may have reduced the potential for effects on people and / or communities.

### **3.5 The Environmental Impact Statement (EIS) Documents**

Issues related to the EIS documents are captured in the following statement:

- ❑ The EIS documents were incomplete, contained contradictions and did not provide adequate information to be able to conclude that the concept was safe and would not adversely affect the well-being of people and communities. For example, many statements focused on a failure to adequately define a number of important terms such as “community”, “voluntarism” and “safe”.

### **3.6 The Impact Assessment**

The social issues concerning the impact assessment are summarized into the following three issue statements:

- ❑ There were omissions, inadequacies and deficiencies in the impact assessment (e.g., the postclosure assessment does not take into account the preclosure activities and their effect on the rock mass, and the pre and post closure studies were based on different approaches).
- ❑ The assessment of the impacts on the social environment was incomplete and the social issues were inadequately addressed. For example, statements of social issues addressed: an incomplete assessment of the cumulative impacts on an already existing vulnerable population; omission of an assessment of the effects of siting on communities; and, a failure to present a coherent social framework, limiting the integration of social issues.
- ❑ The analysis of the biosphere component is seriously flawed. For example, statements of social issues included: the modelling of ecosystems and the evaluation of impacts were inadequate, and the concept ignored basic ecological principles.

With these perceived failures and deficiencies of the impact assessment, some participants were unable to determine whether the proposed disposal facility would adequately protect the social and natural environment and the well-being of future generations.

### **3.7 Site Selection**

The social issues associated with the site selection component of the concept are summarized into two issue statements:

- ❑ The proposed site selection process was incomplete and incapable of leading to an acceptable site. Statements of issues addressed a lack of confidence in the process, insufficient consideration of site selection criteria, and inadequate use or application of lessons from past siting processes.
- ❑ The proposed voluntary siting process was flawed. It did not include all potentially affected communities; it would focus on disadvantaged communities; and, it did not clarify who was to give consent.

These social issues express concern that the protection of human and environmental health could be compromised and that the well-being of all potentially affected communities may not be adequately protected.

### **3.8 Human Health and Safety**

Statements of social issues that addressed public and occupational health and safety were noted throughout the hearings process. The issues are summarized below:

- ❑ The safety of the concept was not adequately demonstrated. The ability of the concept to meet appropriate regulatory requirements to protect human health was not fully demonstrated. For example, the analysis does not address whether the facility would meet radiological protection standards when the peak risk occurred.
- ❑ The discussion of health effects was inadequate and too restrictive. It focused on mortality, and omitted calculations of collective doses, global dose rates and delayed health effects.
- ❑ The analysis omitted the concept of public health and did not provide calculations and validations of health outcomes and costs.
- ❑ Occupational health and safety were not adequately addressed. The analysis failed to properly examine potential radiological and non-radiological effects of the construction and operation of the proposed concept on the health and safety of workers in all areas of the nuclear industry.

These social issues question the ability of the concept to provide adequate protection of human health and well-being.

### **3.9 Acceptable Levels of Risk**

The social issues related to acceptable levels of risk are summarized as:

- ❑ The levels of risk associated with the concept were not believed by some participants to provide the desired level of protection of human health, and were not acceptable. The process for, and determination of acceptable levels of risk was inappropriate and deficient because there had not been adequate interaction between the public, the regulator and the proponent in determining the acceptable levels of risk. Many statements indicated that the public not scientists should determine the acceptable levels of risk, and that the treatment of public perception of risk was deficient.

### **3.10 Risk and Uncertainty**

Social issues related to risk and uncertainty raised by some participants are summarized below:

- ❑ The measures for adapting to uncertain and unlikely outcomes were not adequately described. For example, there was no provision to ensure that funding for management of the waste would be available over the long term, which could compromise safety.
- ❑ The proponent did not seek wide public input and input from other disciplines when developing scenarios or in developing and screening risk factors. The assessment did not address a wide enough range of different scenarios to estimate the range of potential hazards to humans and the environment.

- ❑ The concept design did not provide sufficient protection of human and environmental health due to a lack of robustness in the design, testing and assessment of the vault containment system (i.e., multiple barriers), the disposal containers and the transportation casks. There was also insufficient evidence that the containment would last for the required length of time.
- ❑ The risk analysis was inadequate and incomplete for a number of reasons, including the inappropriate use of peak dose and peak risk, the lack of consideration of worst reasonable cases, the inappropriate use of natural analogues, the inability to validate the assumptions, and inadequate attention to the effects of human error. The risk analysis did not provide confidence that the health and well-being of people would not be compromised.

### **3.11 The Limits of Science and Technology**

The statements of social issues related to the limits of science and technology are captured by the following:

- ❑ Scientific knowledge, analytical capabilities (e.g., computer modelling), engineering and current technology were insufficient to design, build and operate a disposal facility safely over the long time frame and to make accurate long-term predictions. There was no assurance that the health and well-being of future generations could be protected. Statements of social issues addressed the inability of science to adequately deal with the uncertainties, to provide the assurance the public wants, and to verify and validate the models and the long-term predictions.

### **3.12 Transportation of Nuclear Fuel Waste**

The statements of social issues concerning the transportation of nuclear fuel waste are summarized into the following three issues:

- ❑ The transportation of nuclear fuel waste would increase the risks of exposure to radiation and contamination during accident and non-accident conditions. On-site management would eliminate the transportation risk.
- ❑ The transportation safety analysis underestimated the risks and consequences of transporting nuclear fuel waste. The analysis did not include either enough scenarios with plausible transportation accidents or worst case accident scenarios.
- ❑ The concept proposes inadequate or inappropriate security, safeguards and emergency response measures.

These issues suggest that some participants believed that the well-being of people and communities might be adversely affected by the transportation of nuclear fuel waste.

### **3.13 Policy and Decision-Making**

The social issues concerning policy and decision-making are summarized by the following statement:

- ❑ The policy and decision-making processes used to select and approve the concept were not adequate because they did not include all stakeholders at key decision points. The policy was not complete, and a Panel endorsement of the concept could be interpreted as support for the continued use of nuclear power and the safety of the concept.

This social issue addresses the interaction of the stakeholders, the proponent and government, and the relationship between people and society. It addresses decision-making at local, regional and national levels.

### **3.14 Trust and Credibility**

The social issue related to trust and credibility is:

- ❑ The proponent, the industry, the regulator and government did not have the trust or the credibility of the public to undertake, regulate or oversee this project. This lack of trust and lack of credibility reduced confidence in the concept and confidence in the ability of those involved to build and to operate a disposal facility which would protect the well-being of people and communities.

### **3.15 Ethical Aspects**

Social issues related to the ethical aspects of the concept are summarized in the following statements:

- ❑ The ethical analysis component of the assessment was inadequate. Some specific statements of issues addressed the omission of a comprehensive ethical and social framework, and the lack of clarity on how the ethical principles would be applied in subsequent phases of the project.
- ❑ The process for selecting, researching, assessing and implementing the concept was not fair. Many stakeholders were not involved in key decisions. And, it was ethically unacceptable to seek the consent of vulnerable, disadvantaged communities.
- ❑ The concept's approach to compensation and incentives was unethical and inappropriate. Compensation and incentives could be used inappropriately to gain community support and outweigh public concerns rather than just addressing impacts. The proposal to compensate existing residents in an area for possible damage caused in the distant future was inappropriate.
- ❑ The concept's predetermination of a location is inequitable. The concept predetermines a location near to a disadvantaged community on the Canadian Shield. It is inequitable to burden disadvantaged people who not have benefited from the production of the waste on behalf of more affluent populations who have received the benefits.
- ❑ The concept would not provide adequate protection for all future generations. The concept did not consider protection of those distant future generations (beyond 10,000 years) and restricts the choices available to future generations to manage the nuclear fuel waste.

- ❑ The concept would place an undue burden on future generations, including additional risks, financial burdens and a responsibility to manage the waste.

These deficiencies of ethical aspects of the concept refer to societal judgements about the concept, as well as the interaction of the individual and the society.

### **3.16 Cost and Financial Deficiencies**

The social issues related to costs and financing are summarized into the following two issue statements:

- ❑ The cost estimates were not credible, the concept was too expensive, and the information on costs and financing was insufficient. The costs could place an undue burden on society and reduce the availability of funding for other beneficial initiatives.
- ❑ Financial impacts were not fully addressed (e.g., financial impacts to the province resulting from emergencies) and a financial plan was not included. In addition, there was no guarantee that a segregated fund (a fund dedicated to managing the waste) would be established. This reduced confidence that adequate funding would be available to manage the fuel waste safely.

### **3.17 Regulations and Standards**

The statements of social issues concerning regulations and standards are summarized into the following two issues:

- ❑ The concept relied upon regulations and standards that did not adequately protect human and environmental health and well-being. It was believed that the regulations and standards were too lenient; that there was no health-based standard on radiological doses; that the regulations did not apply for the duration of the hazard of the nuclear fuel waste; and, that they were not revised in accordance with changes in international standards in a timely fashion.
- ❑ The process for developing the regulations and standards did not adequately involve the public and did not adequately address social concerns related to human and environmental health and well-being.

### **3.18 Scoping of the Problem**

The social issues associated with the scope of the problem addressed by the concept are summarized below:

- ❑ The concept omitted consideration of energy policy, including alternative energy sources and the future use of nuclear energy.
- ❑ There was inadequate discussion of reprocessing and disposal of reprocessed spent fuel and MOX fuel.

- ❑ The concept did not address the potential for and consequences of importing nuclear waste from other countries.

These social issues address broad societal policy choices that affect the well-being of Canadians.

### **Aboriginal Involvement and Perspectives**

The following issues related to Aboriginal involvement and perspectives address the interaction of Aboriginal people and society with the broader society and they relate to the well-being of Aboriginal people. They are representative of the issues concerning Aboriginal perspectives raised by hearing participants in 1996 and 1997. They do not necessarily represent the views of all Aboriginal people then or now.

#### **3.19 Aboriginal Involvement in Planning and Decision-making**

Many issues were raised with respect to Aboriginal planning and decision-making. The main issues raised by Aboriginal representatives are presented below.

- ❑ There was insufficient culturally appropriate, funded consultation and communication with Aboriginal peoples from the initial stages and throughout the process. Aboriginal people were not given enough time or were not provided with the opportunity to review the concept.
- ❑ The planning, assessment and decision-making processes omitted consideration of, or demonstrated a lack of respect for, Treaty and Aboriginal Rights and the constitutional rights of Aboriginal people.
- ❑ The decision-making processes used by AECL and the government in defining the concept and in completing the EIS and those proposed for subsequent phases were inadequate. They did not fit with Aboriginal traditions and culture or the Aboriginal view of community.
- ❑ The proponent, the regulator and government did not have the trust or the credibility of many of the participants to undertake, regulate or oversee this project.

The social issues related to equity were similar for Aboriginal and for non-Aboriginal people. The issues are:

- ❑ It is inequitable to locate the facility in areas where the people had not benefited from nuclear energy.
- ❑ The concept was unethical because it would place undue risks and burdens on future generations.
- ❑ Enticing poorer Aboriginal communities to accept the facility through compensation or incentives was unethical.
- ❑ The procedure for assessing and deciding about the concept was not fair.

### **3.20 Aboriginal Perspectives on Long-term Waste Management**

Most Aboriginal participants expressed opposition to the concept of deep geological disposal and some First Nations passed resolutions opposing the concept. The statements of social issues by Aboriginal participants with respect to the long-term waste management were summarized by the following four issues.

- ❑ The concept was not proven to be safe and it conflicted with the Aboriginal beliefs about their responsibility to Mother Earth.
- ❑ The site selection process of the concept was deficient: the principle of voluntarism was inappropriate for Aboriginal communities; the loss of traditional and Treaty lands was not addressed; and, exclusionary siting criteria that address Aboriginal issues were not included.
- ❑ Alternative management options were not adequately addressed, including continuous long-term monitoring, above ground storage, technologies to reduce the hazard, and alternative energy sources.
- ❑ The transportation assessment was inadequate. The assessment underestimated the risks to Aboriginal people and the environment of the transportation of nuclear fuel waste. The assessment did not recognize that the waste would likely be moved through Aboriginal communities and across Aboriginal lands.

### **3.21 Aboriginal Perspectives on the Environmental Impact Assessment**

The statements of social issues by Aboriginal participants with respect to the environmental impact assessment were summarized by the following four issue statements:

- ❑ The assessment did not demonstrate the safety of the concept to present and future generations and to the environment.
- ❑ The treatment of Aboriginal spiritual, cultural and social values was inadequate. The assessment failed to adequately present First Nations' understanding of their environment, links to the land, and different perspectives about the possible impacts of the concept.
- ❑ The assessment did not adequately address the impact of the concept on traditional activities, including lost opportunities to pursue these activities and the resulting impact on community health.
- ❑ The assessment did not adequately address the potential impacts on the natural environment.

## 4. SUMMARY

This report documents and classifies the social issues associated with the AECL Nuclear Fuel Waste Management and Disposal Concept. The classification and listing illustrate the broad range of social issues raised by participants at the Nuclear Fuel Waste Management and Disposal Environmental Assessment (NFWMD) hearings.

A primary purpose of this research into social issues was:

- to identify and describe the social issues associated with the proposed AECL concept for the disposal of used nuclear fuel waste raised by participants to the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment (NFWMDC EA) hearings, by the Scientific Review Group and by the Panel in its report; and
- to thematically cluster, or categorize the statements of social issues.

For the purpose of this report, social issues are defined to mean failures, defects and / or deficiencies in the AECL Nuclear Fuel Waste Management and Disposal Concept raised by the participants in the NFWMDC EA hearings that related to, or are perceived to pertain to, human society and the environment, the interaction of the individual and the group or the well-being of human beings as members of society.

Participants included public and Aboriginal individuals and groups who voluntarily attended the hearings and/or made written submissions to the Hearings Panel. Typically, these individuals and groups were motivated to participate in the hearings because of their concerns about the proposed concept or about nuclear energy and nuclear waste. Many of these groups and/or their consultants and advisors raised issues also identified by the 'technical' and regulatory reviewers in presentations and submissions. Other participants to the hearings included technical experts, federal government departments, international representatives and industry and industry association representatives.

All issues raised by public and Aboriginal participants were deemed to be social issues if they addressed failures, defects and/or deficiencies in the NFWMDC that related to, or were perceived to relate to, the well-being of human society and the environment. Issues raised by non-public participants (e.g., technical and professional associations) were considered to be social issues only where the participant directly related the issue to people, their interaction and their well-being.

The application of this definition and approach provides a comprehensive listing of social issues, including the scientific, engineering and technical deficiencies perceived by public individuals and groups as having the potential to affect the interaction and the well-being of people, communities and/or the environment.

The social issues were identified from the transcripts and written submissions for the three Phases of the NFWMD hearings (March 1996 to March 1997) and from the Panel's final report. Over 1200 statements of social issues made by participants in the hearings were recorded (Appendix A). These were combined into representative statements of the issues.

Aboriginal perspectives on, and related to, the concept are grouped separately from the perspectives of others. This separation of issues related to Aboriginal people is consistent with the Panel Report. It recognizes the importance placed on Aboriginal perspectives by the EA Panel and the extent of involvement of Aboriginal participants in the hearings. It also enables the Aboriginal issues to be easily identified.

The statements of social issues were classified by the main ideas or themes that they represented into the 21 categories listed below. The statements are intended to represent the views expressed by the various participants to the hearings.

- ❑ The Generic Concept
- ❑ Need for and Timing of Disposal
- ❑ Alternative Management Options
- ❑ Involvement and Role of the Public
- ❑ The Environmental Impact Statement (EIS) Documents
- ❑ The Impact Assessment
- ❑ Site Selection
- ❑ Human Health and Safety
- ❑ Acceptable Levels of Risk
- ❑ Risk and Uncertainty
- ❑ The Limits of Science and Technology
- ❑ Transportation of Nuclear Fuel Waste
- ❑ Policy and Decision-Making
- ❑ Trust and Credibility
- ❑ Ethical Aspects
- ❑ Cost and Financial Deficiencies
- ❑ Regulations and Standards
- ❑ Scoping of the Problem

#### Aboriginal Involvement and Perspectives

- ❑ Aboriginal Involvement in Planning and Decision-making
- ❑ Aboriginal Perspectives on Long-term Waste Management
- ❑ Aboriginal Perspectives on the Environmental Impact Assessment

The social issues are summarized for each of the 21 categories in Section 3 of this report.

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## **6. APPENDIX A: STATEMENTS OF SOCIAL ISSUES**

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**A.1 TABLE 1: NUCLEAR FUEL WASTE MANAGEMENT AND DISPOSAL CONCEPT ENVIRONMENTAL ASSESSMENT HEARINGS: STATEMENTS OF SOCIAL ISSUES RAISED BY HEARINGS PARTICIPANTS AND IN THE PANEL REPORT**

**1.1 The Generic Concept**

AECL has not proven that the concept can protect environmental and human health or [result] in acceptable social and economic impacts to the extent that is reasonably achievable in a generic research program.

“AECL ... should admit that burial is not disposal. It is merely an unproven means of long-term storage.”

One danger inherent in a dump is that what is out of sight is also out of mind. Hiding nuclear waste underground would tend to give the green light to the proliferation of nuclear power plants with all their attendant dangers.

The public should be informed whether the rock type chosen for this concept is the best one.

“The AECL concept, it's actually a very complicated and multi-phased concept; in some cases not terribly well defined.”

“If a facility is established for spent fuel, it should incorporate right from Stage 1 of planning, incorporation of the other wastes that would fall in a similar category, whether or not it is from a power reactor, a research reactor or other high-level wastes such as the liquid wastes that exist at Chalk River Nuclear Labs, the liquid high-level nuclear wastes.”

“Now, if things really get out of hand in a nuclear power station, we can just shut it down. But if things get out of control with buried nuclear waste, you can't just shut it down. That's not an option.”

In the EIS, no consideration has been given to the contaminated waste from decommissioning and to the cost of decommissioning the nuclear power plants. No concept has been tendered for the safe disposal of the contaminated decommissioning waste.

“No mention is made in the concept before us of disposal of decommissioned reactor material which harbours the same deadly qualifications.”

The concept is unacceptable because it is unacceptable and ethically wrong to put toxic materials into the earth where they can not be adequately monitored.

Need to know more of the details of the concept, too much is undecided, e.g., the materials to be used for the containers.

The concept is unproven and seriously flawed, technically and scientifically.

The timeframes are too long.

### **Public Acceptability**

“The AECL concept ... has not been demonstrated to have broad public support. The concept in its current form does not have the required level of acceptability to be adopted as Canada’s approach to managing nuclear fuel wastes.”

“For a concept to be acceptable, the motive behind it must be above-board, the implications must be clear, the proponent must be trustworthy, and the discussion must be carried out in a spirit of good faith. None of this is so in the present instance.”

The concept is unacceptable from a scientific and social point of view.

There is insufficient data to indicate how widespread the public’s understanding of the facts and the issues is and the level of public support for the concept.

AECL has not demonstrated that the concept has broad public support. “Significant numbers of the public are currently sufficiently opposed to the AECL concept that it would be ill advised to proceed with it now.”

“Our arguments against disposing of nuclear waste in Manitoba and, indeed, against this concept in general are often derisively referred to as being indicative of the "not in my backyard" or NIMBY syndrome, ... there's nothing wrong, per se, with protecting one's immediate environment from a perceived threat. People identify the local environment, as a part of what they call "home" and the integrity and sustainability of that environment is important in shaping a community's identity. Indigenous cultures in particular can tell us a great deal about the benefits of a rootedness in and care for one's home place. To dismiss a people's wish to protect their home is patronizing and inappropriate.”

### **The Generic Concept Approach**

The concept does not address the need to find a safe, affordable, environmentally acceptable way of reducing the radioactivity and the quantity of the waste.

“It seems to me that there's a certain vested interest involved here, and I'm wondering why there hasn't been a more objective independent organization doing this assessment or if there have been other assessments?”

The proposal does not recognize the changes in attitudes in science and technology over the past 40 –50 years. (i.e., critical and sceptical about it's own foundations).

“If reactors continue to produce nuclear waste, then the burial of nuclear waste is not a solution because even with burial, most radioactive used fuel bundles will always remain in storage above ground, under water because of excessively high heat and radioactivity.”

Without site-specific information, it is impossible to adequately evaluate the concept.

The concept should not be divorced from the siting phase where technical suitability can be determined.

“The idea of concept approval has proven to be impossible in practice. The concept would need to be presented for full EIS on a site-specific, material-specific, waste-form-specific basis.”

“An abstract analysis divorced from a concrete siting does not make for a proper environmental impact analysis.”

Reviewing a concept instead of a site-specific project could be used as justification to proceed with the specific project.

Site specific details are required for a complete assessment.

The concept cannot be assessed without site-specific data. “... the failure of the attempt to assess a concept for a project which is so dependent on the geology, hydrology and ecology of the environment in which it is placed without a specific site in mind. “

Switch “to a site selection process and site-specific EIS without generic approval of the concept. ... It is “very important to make clear that the proposed waste disposal concept has not been approved, and has not been demonstrated to be safe and effective. “

Siting and transportation cannot be separated from discussion of the concept.

In seeking purely concept approval, AECL has effectively disengaged themselves from having to produce any proof or guarantee that their burial is, indeed, the best and safest way to dispose of the nuclear waste.

“More research is needed. It is a question of where that effort is directed, when and by what agency. More public discussion is needed, too, and it is a question of format and timing.”

“Their concept is purely hypothetical. The only thing AECL's research proves is its lack of acceptability and safety. Their documentation, item after item, is clearly lacking foundation and credibility. Its results are purely extrapolating.”

“The social requirements involved in disposal of nuclear waste from a larger society perspective should be developed.”

Burying the waste reduces the interest in finding better solutions and over time may lead to complacency and reduced vigilance.

Due to the variability in rock performance and the advective flows, generic studies are not possible or useful.

“... the technology cannot be more fully developed without proceeding to the next stage with the selection of a site.”

“I don't think hiding the stuff with our current technology and the current availability of our technology and our abilities to monitor that is the answer.”

“How can we possibly expect that 200 or 300 or even a million years into the future, if, God willing, humanity still exists, that we will maintain some record of something that we have deliberately and consciously sealed a kilometre below the surface, so that we don't think it is going to a problem?”

More than one disposal site and facility should be considered so that no one area is affected.

“The rationale to switch from a site-specific approach, as recommended by Dr. Hare, to the current generic Disposal Concept assessment is unclear. A generic assessment limits meaningful discussion about the evidence and its relationship to an actual disposal site.”

It is unclear what approach AECL is seeking approval for. Whether the approach would be to ensure that “the principle of environmental protection and safety would not be compromised, as page 149 of the EIS states. Or that the implementing organization would keep adverse effects as slow as reasonably achievable, social and economic factors being taken into account, as written on page 146 of the EIS. Those two statements represent two different approaches.”

“Once a generic concept is approved, the public and others will not be able to address many of the broader issues at a site selection stage. Those most directly affected then will not have the opportunity to identify other alternatives and/or question the concept or question the safety of the concept.”

After approval the concept will go ahead regardless of new information; political and economic influence will drive the process.

### **Peer Review and International Experience**

AECL did not maximize its use of international experience with actual siting of disposal facilities for high and low level wastes. Such peer review and consideration of international experience “could inform the social perspective on safety and bolster confidence in the entire process.”

“In terms of the social consensus, we have to only look to siting processes and their failure. ... there is no social consensus.”

AECL used little peer review by social scientists and ethicists in completing the EIS.

The EIS does not address how the issues of deep geological disposal that have been identified in other countries will be addressed. AECL should have examined unsuccessful experiences in other countries and demonstrated how it will address those issues in the Canadian context. The problems encountered in the other countries should have been described in the EIS.

“AECL must fully take into account the unsuccessful experiences of other countries in finding a scientific solution to the problem of how to safely dispose of high-level nuclear waste underground and demonstrate how it will conduct it differently in Canada.”

The validity of the concept is questionable. In other countries a great deal of money has been spent looking at disposal sites but no sites have been approved, suggesting that the concept of underground disposal is not viable.

Need for independent peer review of the proposal, including reviews the social science and the conceptual models.

## **Monitoring**

International surveillance should be incorporated.

“The most obvious condition that needs to be monitored is the movement of radioisotopes from the containers into the surrounding buffer. ... AECL's response does not give us an assurance that this could be done.”

“It is not adequate to limit monitoring to the geosphere beyond the vault; that is to the zone in which we have to rely on natural barriers over which we have no control and whose nature we do not appear to understand well.”

“Action levels for monitoring should, in fact, be such that the unexpected rather than the expected system behaviours can be dealt with. It seems logical that the lifetime of the monitoring system should bear some relationship to the lifetimes of the hazardous materials which are being monitored.”

“This suggests to us that the technology is not yet available to provide the degree of security through long-term monitoring which would be required for public confidence in a permanent disposal system. Certainly AECL's response shows an inability to satisfactorily meet the need for postclosure monitoring.”

The responsibility for long-term inspection, monitoring, maintenance and the repairs to the burial site are not adequately addressed.

Post closure plans should detail the monitoring program to be undertaken by an independent agency.

“It is not indicated as to what constitutes sufficient evidence to lead to the closure of a disposal facility without the need for extended monitoring. What are the criteria? In addition, where extended monitoring is required, how long and of what nature is the extended monitoring to take?”

“If we bury radioactive waste deep in underground rock and seal up the openings, then by the time anyone on the surface notices that the repository is leaking, it will be literally impossible to take corrective action.”

## **Flexibility**

The AECL concept does not rely on long-term institutional controls but many participants viewed institutional controls as an indication of responsible management and a greater guarantee of safety than disposal.

“Control and verification capability should be included and maintained as a safety factor that is strategically as important as technical passive safety capability.”

AECL did not include a system of early detection of failures inside or close to the vault. These should be researched further and built into the defense-in-depth approach.

AECL did not provide a clear statement on the limits to the flexibility of the concept to adapt to changes. This significantly affects the ability to “foresee the potential consequences of implementing the concept and its safety performance at a real site.”

Concern about a “lack of flexibility and choice for future generations to make decisions in light of their own social and ethical framework”

### **Feasibility of Implementation**

AECL did not show how the properties of the underground research laboratory’s rock mass compared to conditions in the Canadian Shield.

AECL “failed to describe clearly enough the critical factors and the range of these factors that would allow a site to be considered suitable.” [inclusion and exclusion criteria] The AECL strategy of applying only a limited number of criteria in the early siting stage “avoids difficult questions, putting them aside for the next phase.”

AECL’s R-Siting document is mainly generalized and qualitative. It does not indicate how criteria for siting will be developed and ranked to narrow the list of sites to identify which sites merit further evaluation. (SRG, 1995) Detailing the criteria would allow an estimation of “whether the socio-economic and technical consideration can be adequately reconciled to guarantee safety, acceptability and feasibility of the concept.”

“The viability of any disposal plan designed and managed separately from our American neighbours will also be questioned.”

### **The Implementing Organization**

The implementing organization is not identified. This created concern for some in not knowing who the Implementing Agency is, how trustworthy it is and how it will behave.

The Panel has not adequately addressed who the implementing organization should be.

AECL and Ontario Hydro should not give participants assurances on how the proponent in the future would proceed.

“We do not believe the current proponents of the process have the social capacity, social management skills to handle what is going to be an incredibly complicated social process. We are not sure that there is actually any organization in the country at the moment that could actually handle the kind of commitments that had been made in the proponent’s documents.”



## **1.2 Need for and Timing of Disposal**

There is no need for this disposal concept. The actual need or justification for disposal has not been adequately addressed. Need has not been proven. Therefore, the proponent should not proceed to site selection.

There is no hurry to dispose of the waste. Current storage is safe and will continue to be for many years. The systems will last for decades and can be monitored and repaired as needed.

AECL has not attempted to model the impact of timing of disposal to optimize the decision on when to proceed.

“What to do with existing nuclear fuel waste is not an urgent matter...” “We really look at the existence of the nuclear facility sites and the storage that’s taking place there now as something that will continue for likely a century. And that’s the kind of framework that I think the rest of this needs to be dealt with in.”

“The communities around the nuclear stations in Durham Region have never expressed any sense of urgency for removal of the nuclear fuel waste to another location. ...”

## **1.3 Alternative Management Options**

### **Alternatives to the Disposal Concept**

“AECL provided little comparative information about alternatives.”

There is no adequate comparative risk, cost and benefit analysis of all of the available waste management options.

“The ultimate decision about the fate of these wastes is so important and far-reaching that it must not be made until more options have been fully considered.”

“One of the EIS guidelines says, and I quote, “The proponent was to describe possible alternatives to the concept at a level of detail which allows meaningful comparison.” The proponent didn’t do that, and now they say there’s not enough information to judge whether another option like the surface storage is acceptable. ... The preferred option has become the default option, and we haven’t really looked at the alternatives.”

The Government of Canada should be looking at a number of nuclear waste management options including short-term options until a better solution is found.

Alternatives to disposal as well as alternative methods of disposal should have been addressed. No data is presented on viable alternatives. “The EIS lacks a discussion of “disposal” versus long-term management.”

“AECL should research and seriously consider alternatives to this proposal, including current storage, transmutation and other ways to reduce the toxicity of the waste. They need to be addressed from a peer-accepted scientific basis and the full participation of the various communities and the trade union movement.”

“... The safety merits of the AECL concept should be carefully compared with those of realistic alternatives.”

The EIS should discuss alternatives in the event that the site-specific research showed that the concept was not viable at that site.

“Some alternatives were also rejected on the basis that Canada would require international approval. However, if the alternative is safer than the proposed method then is it not worth Canada’s effort to concentrate on creating international approval towards them instead of dismissing them ...”

### ***Monitored, Retrievable Storage***

Monitored retrievable storage should have been more seriously evaluated.

“ ... The degree of uncertainty about the potential performance of the disposal system is so great that the public would require the assurance that we could continually monitor any potential leakage from the containers so that, if problems were to develop, appropriate remedial action could be undertaken.”

“If indeed what we are going to need to consider is a proposal for a long-term monitored retrievable storage system, we then need to have a much more thorough review of the various options for such a system. The risks and benefits of these alternatives need to be evaluated.”

“AECL should have considered extended storage and monitored retrievable storage. ... The institutional control argument for “permanent” disposal is weak.”

“Discomfort with the lack of monitoring...” in the concept. The concept lacks long term monitoring. Perpetual monitoring of the waste site is essential. AECL’s proposal allows the proponent to walk away from the site without long-term institutional monitoring.

To some participants “leaving the waste on the surface near heavily populated areas or seats of government would constantly remind people of its presence, thereby ensuring that institutional controls did not lapse.” Storage in a visible place (e.g., Toronto or Montreal). The sites should be visible and near large centres of population so that their presence cannot be ignored. Store the waste close to the seat of government where it will be a visible reminder and may better ensure close attention is paid to the hazard.

Storage “can be monitored, it is retrievable, it doesn’t have to be moved, it is more economic, it is a reminder of the garbage that is produced, and the people who benefit directly from nuclear power have to deal with it.”

Waste should be stored (deposited) near production facilities, as those who have benefited from the generation should accept responsibility for its disposal.

Maintain accessibility to the used fuel in order to extract the plutonium for destruction or use in nuclear reactors and/or to eliminate the hazards of the waste at some future date, if possible. "If the best case scenario is that we develop technology to reverse or neutralize the waste, then we must look towards concepts that will allow easy retrieval."

Due to uncertainties, the concept should include monitoring and surveillance in the long-term instead of final closure.

The waste must be retrievable in case something went wrong or to access the waste for other useful purposes.

Dry storage should have been evaluated. It is a proven, mature, cost-effective technology that can last for 100 to 1000 years.

The waste will need to be monitored for thousands of years; therefore, this is storage, not disposal.

### ***On-Site Storage***

"Until a safe and acceptable solution is found ... the waste be kept where it is; on-site in monitored, retrievable storage facilities."

"As much as 40 to 100 years [of on-site storage] is perfectly feasible with the current technology, and yet there was the proposal to only leave it 10 years and then move it to the disposal facility."

"We seriously believe that nuclear waste should remain where it is, in monitored above-ground retrievable storage facilities. This message is not NIMBY; rather, it is a message to politicians to define the problem."

"If we have any concerns, at all, about on-site long-term storage, it revolves around the integrity of the fuel bundles themselves because this whole plan seems to rely on transfer of the waste fuel from the existing canisters into some other canister for disposal."

"This alternative [on-site storage] also has the benefits of eliminating transportation, additional costs and risk of construction and waste can be continually monitored."

Implementation of the concept might start with dry above ground storage on-site, followed by a retrievable dry "in-rock" stage at lower depth on-site, allowing access, with permanent deep disposal in the distant future.

"Nuclear waste, stored on-site in its current form, provides us with an effective albeit expensive method for monitoring, protecting and controlling its behaviour. Buried in the ground, it is out of sight and out of mind."

"... each individual site has created the waste and, therefore, has an ethical as well as a social obligation to keep that waste on site. No, no time frame. It's to be kept on site and in my view it should be kept on site until a way to dispose of it and if necessary dispose of it on site."

“The only serious alternative to the proposed concept is an indefinite continuation of the status quo; on-site storage of the wastes, requiring ongoing maintenance and reconstruction of the storage facilities. ... It would be a denial of the ethical argument that this generation should be responsible for the disposal of its wastes.”

The waste should remain on site to deal with any problems so that future generations are not burdened.

The “EIS fails to examine the potential of long-term storage to minimize radiation doses received by workers and the general public during waste handling and transport.”

“There is no reason to move it off site as long as there is still going to be waste on site. You are only doubling your risks by moving any off site.”

“Used fuel is now well protected by its visibility and the radiation that is contained in the water. Underground disposal removes both levels of protection.”

“Above-ground storage presumes that there will be continued surveillance and investment for a longer period of time than past human history. That’s a very iffy kind of situation.”

“We also strongly urge the panel to consider strategies and technologies which permit local storage.”

### ***Treating the Waste***

“Transmutation I think deserves a little more detail than the page-and-a-half that it has in the EIS.”

More research into alternative use of nuclear fuel waste should continue.

Reprocessing or transmutation should be examined.

Put all the (“fiscal”) resources into a safe way of neutralizing the waste.

### **Alternative Methods of Disposal**

AECL should address: the trend away from disposal as a waste management approach; the importance of re-using and recycling resources; and, the need to reduce consumption and waste generation.

“Keeping in mind the lifespan of the disposed compounds, it may not be prudent at this time to insist that the disposal plan be permanent in nature; however, as time passes and if it is proven that geological disposal is a satisfactory method, then the plan can proceed to include permanency into its concept.”

“Some research money should go into the development of a method of neutralizing the radioactive component of waste with the long-term objective being that the waste is only returned to the ground when its radiation level has reached a level equal to or less than the amount that it was when it was removed from the ground. This is the only responsible method of disposing of radioactive waste.”

“I know in some decommissioning plans in some countries for nuclear stations, they're actually considering putting wastes underground at the reactors sites. I think that should be reviewed as an option.”

“The EIS does not adequately differentiate between “permanent” and “long-term” disposal. The two are different. We should achieve long-term disposal to the best of our abilities and prepare contingencies that will permit later generations to remedy the unexpected.”

Post closure retrievability, if required, is not adequately addressed. Is it possible or desirable after closure?

The disposal facility should be monitored indefinitely.

### ***Alternative Host Media***

“AECL has dismissed a number of host rocks out of hand...”

AECL should have compared plutonic and non-plutonic rock and provided better justification for its choice of plutonic rock.

Limestone caverns along the shore of Lake Ontario and sandstone should have been evaluated as an alternative medium.

“AECL's section on rock is not adequately researched. Documentation I have read states rock mass responses are different and not totally predictable. The same is true of faults and fractures which ultimately affect our groundwater and its flow.”

## **1.4 Involvement and Role of the Public**

### **Decision-making about the Concept**

“The significant initial decision regarding site location is to be made without the input or consent of either the general Canadian public or even the potential host communities.”

“The EIS does not provide adequate detail on public involvement.”

“The role of the public in decision-making processes is not clearly defined.”

Inadequate consultation through the decision-making process, including the initial stages.

“We are concerned that communities, in particular, Native people, workers, women, people of colour, the disabled and the unemployed within those communities have had little say in the EIS or its review until more recently.” “These are the very groups who are most likely to be affected by accidents and leakage. These are the groups who live closest to the highways and railways and burial sites.”

“The EIS should identify those segments of the public with a greater potential of being impacted, identify the viewpoints of aboriginals, northern residents, and other members of the public potentially impacted by the concept, and outline how these varying viewpoints were and will be incorporated into the concept.” Those potentially affected should be involved in all aspects of decision-making, including concept assessment.

“Some of the opinion surveys should have been dedicated to gathering the opinions of northern communities. ... It would seem that the proponent, by excluding a direct examination of the view of northern communities and others most likely to be impacted, has failed to seek out negative comments.”

“The opinions of community members near other radioactive waste storage facilities or nuclear power plants.... were not adequately addressed.”

“The proponent’s approach to public involvement are based on their preferred interest in this concept; there is limited information on the subject – no alternative concepts available for review.”

Need a public discussion of a set of management options to determine the publicly acceptable solution to the management of nuclear fuel waste.

“Individual communities and the general public should play an active role in nuclear fuel waste management.”

The Public Involvement and Social Aspects document fails:

- To assess the content and merit of public concerns. The public concerns are not matched to the concerns expressed by the scientific community.
- To address emerging philosophical perspectives and does not address the conflict between representative and participatory decision-making.

AECL does not discuss how public input will be weighed compared to scientific evidence.

AECL does not present a procedure for conflict resolution.

Most public and community participants will not have the time and/or the resources needed to effectively participate over the time periods required.

Communities should not be dependent on other organizations to raise their concerns.

There are no criteria for public participation.

The Assembly of All Living Beings has not been adequately consulted.

“It would seem imperative that a major investment must be made to achieve a meaningful dialogue with the public and ensure adequate preparation for the political decisions that will be taken. These will be at various levels ranging from national (or even international) to local. The distinction between these levels is not always clearly defined or preserved in the EIS and its reference documents, leaving open questions as to which level certain methods or approaches apply.”

“While the Joint Committee reaffirms its support for these principles [voluntarism, shared decision-making, openness, fairness and environmental protection] it must also reiterate that the EIS appears deficient in demonstrating how these principles would be assessed during implementation. Of particular concern is that the process of weighing and resolving issues and making decisions leading to the final disposition of nuclear waste be open and clear to the public. Only then will the expertise and capability concerning societal issues be equal to that established for technical and scientific issues.”

“... the public consultation program simply took note of the problem of nuclear waste disposal but failed to address its underlying causes.” The descriptions are very general and not useful to decision-makers.

All the diverse groups of people that may be affected must be involved in the concept approval process. They have to be heard and be an active part in the process if a proper social impact analysis is to be done. Yet, this generation of Canadians has not been consulted on this important project.

### **Public Involvement During the CEEA Hearings**

“There have been no hearings held in northern Canada. The most northerly has been held in Saskatoon, Saskatchewan. It is very much in the southern part of the province and certainly in southern Canada.”

“... the proponent and other scientists who are supportive of the concept handle these very serious questions in a very dismissive way. They do not deal very seriously with the critiques.”

“This community is three and a half to four hours drive from here [Toronto], and this is about the nearest place that we could be involved in this community consultation process in Phase 3 of this review process of this concept.”

The location of the hearings sessions was criticized. (“The Panel should have visited Massey, Ontario where AECL planned to test drill in the early 1980s.” and “The Panel should not hold meetings in Toronto because the waste will not be disposed of in Toronto.”)

A deficiency statement would allow residents at a future site to be aware of original deficiencies and to be able to judge whether they have been adequately addressed.

This is not a fair and informed public review of the AECL concept.

The process for the hearings is flawed. AECL continues to provide additional information but it is difficult for participants to review and discuss in so short a time and without adequate resources.

Concern that presentation time is too short to present clear arguments and that written submission will be reviewed by the Panel or their advisors with no interaction and discussion with the submitter. Concern that the SRG response to a written submission is not part of the public record.

## **Funding**

“It is nice that some participant funding was available, but it was very minimal, given the scope of issues that need to be dealt with.”

“Voluntary sharing of information is not going to be enough, the public needs to have the resources to track what's going on over time. We're going to then, therefore, need to have sustained funding as we go along through the project cycle for local community groups and perhaps for others with significant interest in the project, and not just during specified hearings.”

Lack of time and funding for participants for the review.

Inadequate resources were available for a critique of all aspects of the concept.

“Community sector groups received just over 1 per cent of the funding and less than one-tenth of the time allotted to the proponent to respond to the proposed concept.”

## **Communication**

Need for better communication of information to the public.

More public education is required before a decision can be made.

Communication of risk is inadequate. “There is inadequate and imbalanced information to provide an adequate understanding of the known risks of both high-level and low-level radiation on human and environmental health.”

“...the presentation to the public should have emphasized what happens over long periods to this remaining inventory [radionuclides remaining in the waste for over 100,000 years] and its almost unchanged hazard potential.”

“AECL and Ontario Hydro have done a very poor job of educating the public as to how this is going to proceed.”

“Proponents should be prepared to discuss risks in the language of risk analysts, for instance ten-to-the-minus-something or other, but in seeking a dialogue with the public they should talk user-friendly language.”

“Each and every failure to render the information accessible is also a failure to lessen public distrust and skepticism.”

The concept should include more information about communication with future generations.

## **1.4 The Environmental Impact Statement (EIS) Documents**

### **Definitions**

AECL failed to adequately define the concept.

Definition of what waste is to be disposed of is unclear. Does it include nuclear weapons waste?

“Some clarifications needed with respect to what constitutes the waste: reactor fuel waste, all high-level waste, all waste, domestic waste, international waste.”

The EIS does not include a detailed inventory of spent fuel and source terms. It fails to adequately describe the characteristics of nuclear fuel waste and its chemical and radiological properties

“Defining "community" and defining "public acceptance", and obtaining commitments to these as being binding for the process.”

“The proponent states that it will ensure the “betterment” of the “community”, without defining its concept of “betterment” or “community”.”

A description of the “betterment” program is required.

The definition of “host community” in the EIS is inadequate.

AECL does not address how they will define community (a fundamental difficulty) and who will represent the community. Who is required to give consent? Who speaks for the defined community? Can the host community be a province?

AECL should have provided a detailed definition of voluntarism and how it ought to be implemented.

“In the high-level waste Environmental Impact Statement, "safe" is defined as "Meeting criteria, guidelines and standards for protecting the health of humans and non-human biota". However, Webster's Dictionary defines safe as "secure from threat of danger, harm, or loss”.

The definition and assumptions about the critical group needs to be clearly stated.

## The EIS Documents

"Many participants were confused because the EIS did not distinguish sufficiently between the generic concept and the detailed case studies used to demonstrate its safety."

The EIS should provide a rationale for its timeframes (e.g., siting stage and operations stage).

The EIS does not address prudence and disaster avoidance adequately. The key threats to prudence are: irreversibility and lack of effective monitoring.

The EIS has failed to address the scope of the potential for harm of the nuclear waste.

Information not being provided or not being addressed or provided satisfactorily are:

- the emphasis on the use of optimization;
- the need to establish which barriers catch which radionuclides;
- criteria for ceiling abandonment;
- an inadequate assessment of human intrusion;
- the nature of the concept is still undefined;
- multi sources of exposure;
- mineral potential as defined today might be different tomorrow.

"... the hazardous nature of the waste, its radiotoxicity and chemical toxicity and the geological effects of the radiation and chemically toxic substances are not adequately presented."

"The waste exclusion zone has not been adequately researched."

"Glaciation also seems to have been dealt with inadequately, as well as external pressures on containers without collapse."

Request full disclosure from AECL with respect to the deficiency statements.

Inadequate data is presented on which to make a decision, including retrieval, long-term monitoring, repository design, character and location of the preferred rock barrier.

"The EIS has not adequately demonstrated the safety and feasibility of deep geological disposal for nuclear waste."

"No mention is made in the concept before us of disposal of decommissioned reactor material which harbours the same deadly qualifications."

"On page 2 of AECL's environmental impact statement we find something puzzling. "...reprocessing...is not currently done in Canada, and there are no current plans to do so. The term 'nuclear fuel waste' as used in this document refers to either the used fuel, if it is not to be reprocessed, or the solidified high-level waste from reprocessing."

The EIS was and is unbalanced; “it did not convey the same clarity and precision with respect to social aspects as it did with respect to engineering aspects.”

The EIS is inadequate; is incomplete, flawed, and biased. There are failures of content, format, structure and approach of the EIS.

The deficiencies in the EIS need to be addressed before the concept goes to the next phase.

The Postclosure safety assessment lacks convincing documentation.

The EIS document is out of conformity with the Panel’s guidelines.

“The three major areas where we believe the document falls short is in the areas of public ethics, public participation, and the natural environment.”

There is a tendency to trivialize or minimize potential impacts. ...Statements must be quantified or qualified.

“The preclosure assessment is based on Ontario Hydro's studies of a hypothetical generic facility using an unspecified portion of the Canadian Shield, the postclosure case study is site-specific and does not demonstrate irrefutable feasibility of other sites. Many different pieces of work have been forced together without making sure that they all fit perfectly.”

“The EIS summary is filled with misleading images that make the project difficult to be properly evaluated by a member of the public.”

“The EIS not only ignores the public’s concern about safety and the environment but focuses on determining how to market the project.”

AECL’s treatment of public involvement is poor and does not utilize the vast amount of material on the subject.

The EIS does not describe other views and positive and negative aspects of the concept or how the public interest has been diminished.

“From the initial review of the EIS, it appears that AECL has not produced a blueprint to achieve a licensable disposal facility for nuclear fuel waste.”

Maps of the areas that would be excluded should have been included in the EIS.

The "Public Involvement and Social Aspects" document fits very close to the definition of a sales document not a technical document.

The Postclosure safety assessment criticisms:

- fundamental issues in the methodology
- lack of convincing documentation
- over-estimate the continuity of sparsely fractured rock and underestimate hydraulic “communication”

- inattention to microbial activity in rock and
- inattention to glaciation.

“The concept needs to be examined from optimistic and pessimistic scenarios for future generations in terms of technical capabilities, resource availability, social stability etc.”

## **1.6 Impact Assessment**

There were no guarantees on how impacts would be assessed and managed in the future because the implementing agency had not been identified.

“The cost that we can never measure, that we can never put the dollar values on, which is the human health impacts, the impacts upon wildlife, the impacts upon our environment, and we must not forget those costs.”

The assessment should address the impacts of all materials used for the facility, including materials extraction, production and transportation.

More extensive use should have been made of the experience under the Ontario Environmental Assessment Act.

Inadequate attention to monitoring early warning indicators of biochemical stress.

The postclosure assessment does not take into account the preclosure activities and their effect on the rock mass.

AECL should develop a methodology for passing through major water flow zones at a potential candidate site.

The EIS should discuss the results of site disturbance and its effects on site integrity.

The EIS does not adequately address future human intervention in the vault.

An integrated, life-cycle environmental assessment process should be undertaken for the nuclear fuel cycle.

## **Social Environment**

The EIS did not fully address the cumulative impacts on an already existing vulnerable population.

“Your review of a high-level nuclear waste disposal concept warrants consideration of, one, its psychological impact should an accident occur and, two, a consideration of some of the underlying psychological assumptions that might be driving its development at this time in our history.”

“The proposal does not adequately consider the possible social and environmental hazards which it presents to the communities directly affected as well as the global community.”

“AECL should address the effects of the siting on communities; including division, stress on family and personal life and other social costs.”

Many participants stated that the lack of systematic input into the EIS by social scientists and ethicists led to an imbalance between the technical and social considerations.

“... there is not the same indication [as for the technical aspects] that the need for highly qualified experts in the social aspects of waste disposal projects has been recognized within AECL’s concept.”

“ ... the EIS gives little indication as to how, or whether, the accumulated knowledge and experience [on societal issues] is to be converted into an informed capability for the future. Unless there is assurance that such a capability will be developed and used, major problems can be foreseen in convincing the public that the proposed solution is the correct one and that the measures taken in response to concerns are appropriate.”

AECL “ has not addressed the risk and potential consequences of significant social turmoil and opposition, at least at the individual and community level.”

AECL should have exercised more comprehensive use of the social sciences to identify and assess societal safety concerns, conflict situations and significant social turmoil.

AECL has not presented a coherent social framework, limiting the integration of social issues.

There appears to be little connection between the good social science of Ontario Hydro and its reports and the AECL EIS. The social science as proposed by AECL is inferior to Ontario Hydro’s social science.

The social science in the EIS should be assessed independently.

The EIS has failed to reference to women’s health or to address potential impacts on women’s health, employment, access to services, and participation in decision-making. The EIS does not address the impacts on women.

Women experience health affects from exposure to radiation and social and economic impacts of policies and practice. And, the EIS does not address the potential for impacts from the proposed concept to be felt differently among women, depending on whether they are aboriginal women, women workers, older women, younger women, low income women, or women living with a disability. Therefore, the impact assessment is incomplete.

There is a lack of socio-economic analysis and inadequate discussion of social and economic impacts. The socio-economic impacts appeared to be downplayed. The documents suggest a boom-bust situation for communities near the facility. The north does not need more boom-bust situations.

The EIS does not state what compensation is projected in the event of a minor accident.

Impact management is not a solution to all problems (over reliance on impact management).

The EIS does not adequately address how potential impacts “on provincial decision-making and institutional structures would be examined in the siting process”.

The EIS “should not remain silent on the societal aspects of the post-closure period at the original facility or the broader implications of continued use of nuclear energy in Canada, when additional facilities will almost certainly be needed.”

### **Natural Environment**

“The EIS does not appear to take into consideration any synergism or linkages between impacts and the environment. One of the areas I feel that hasn’t really been fully addressed in the EIS document is the thermal footprint of the nuclear waste storage facility, and it will have an impact on the environmental security of the disposal facility and its lifespan. Possible impacts could be changes to the groundwater flow regime, changes to groundwater chemistry, increase in biological activity, destruction of permafrost if you site it in northern parts of the Shield, alteration in the structure and chemistry of the bentonite barrier.”

“The analysis of the biosphere component is seriously flawed and cannot be relied on.”

“The concept is scientifically unsound in that it ignores basic ecological principles by promising to permanently isolate radioactive waste from the biosphere.”

“The disturbance to the flora and fauna of a disposal region would be disastrous. ... this proposal threatens to do serious damage to its [wilderness] tranquility and beautiful complexity.”

“The method of modelling the ecosystems and evaluating the impact on non-human biota has to be improved to respond to the dynamics, complexities and diversity which are orders of magnitude beyond the approach that has been presented in either the EIS or the in-room emplacement cases.”

“This dumping seems to be part of the on-going disregard for the environment of northern Ontario”

“The EIS document does not adequately address the potential impacts on the environment.” “The processes of bioaccumulation and biomagnification are also not addressed or even identified.”

“The EIS does not clearly define the context with which to interpret the changes in the ecosystem.”

“The EIS fails to adequately apply some common concepts of ecology...such as population composition, population distribution and species abundance.”

“The proponent uses concepts and terminology of ecology without explaining nor applying those concepts to the EIS document.”

The consideration of environmental impacts was based on a rather narrow and incomplete characterization of the physical environment, and especially lacking in the application of ecological concepts”

The specifics of biological and/or ecological data are not provided.

“Generic baseline data about the natural environment potentially impacted should be identified as should the mechanisms that will ensure its relative protection.”

The identity and location of flora and fauna on the Canadian Shield are not provided in the EIS.

Inadequate attention is paid to the concept and importance of endangered species and the preservation of their habitats. “To state that an endangered species could be easily moved is to misunderstand the very nature of the need for their protection.”

The Preclosure documents have a narrow view of protected lands. They do not address the importance of protecting ecologically representative segments of the landscape. The issue cannot be restricted to simply the identification of endangered or threatened flora and fauna.

The potential impacts to biota are inadequately addressed in the EIS. Protection of wildlife, habitat, and areas of high biodiversity are not addressed. A review group of specialists should evaluate the analysis and conclusions of potential impacts on biota.

The use of environmental increments and four hypothetical generic organisms are unproven as a means to address the complex issues in this assessment.

The concept should meet safety and protection standards for biota, which should be established with public input.

“Delaying” potential effects is clearly unacceptable.”

“The discussion of wetlands...is unacceptable.”

“The means and criteria used to determine the VEC (valued ecosystem component) and the range of changes expected need to be explicit.”

“In the EIS there is no reference to the range of values for the biota in the plutonic rock ecosystem.”

“The EIS applies one criteria to humans and another to the other members of the biota without explicit correlation.”

“AECL fails to adequately represent real ecosystems in their study strategy.”

“In the EIS there is some confusion regarding the criteria used to determine the potential effect that radiation has on the environment”

“The biological importance of a contaminant is not dealt with and the method of determining the local variation has not been explained or justified as a reasonable estimate of effect.”

The EIS measures only the effect on human life, but it needs to also measure the effect on non-human life.

AECL does not justify the position that the level of radiation protection for humans ensures adequate protection of non-human species and individuals. This does not address concerns for rare and endangered species.

Need greater research into the effects on non-human species of exposure to radiation and chemical toxicity of spent fuel.

The biosphere definition is too restrictive in the Postclosure safety assessment.

Little detail about environmental effects or the demand for resources.

The EIS does not describe the effect on the natural environment of a systems failure.

Combinations of various natural processes and their combined effects should have been examined.

Impact on water systems needs to be more carefully evaluated.

The documents do not address the need to establish policy on roadless areas.

“The current proposed disposal concept has little regard for the impacts on the natural environment ... There is no value placed on the environment”.

## **1.7 Site Selection**

### **Site Selection Process**

AECL did not translate its principles for siting into safeguards and procedures”.

AECL has not provided “sufficient information, available through the social sciences, as to how it would proceed to site a disposal facility. That comprehensive information would be needed ... to conclude that a site that would be socially as well as technically feasible could be found.”

“By defining safety as meeting current standards for radiation exposure, the EIS implies that any site may be considered for disposal of nuclear fuel waste. Any recommendations based on this concept will have absolutely no value in a future site-specific assessment.”

Need a fuller explanation of the change in approach from a site search restricted to Ontario to a site involving the whole of the Canadian Shield.

“We certainly question the presumption that the storage must be found in Canada's hinterland away from Canada's most populated areas.”

“The proposal has been made without the consideration of site selection for the proposed permanent disposal facilities.”

AECL's approach to site characterization and evaluation and social issues related to siting is inadequate.

The EIS does not provide a good reason for siting; one of the requirements for a good siting process.

“From a social perspective, AECL failed to demonstrate that it had developed an adequate decision-making strategy for successfully selecting a safe site in a cost-effective way.” “The EIS does not provide any assurance that the current technical characterization and assessment tools can adequately address situations where social processes and financial considerations might dominate the site screening stage.”

“The objectives of a future siting process should be to find a socially acceptable site which incorporates a body of low – to medium-permeability host rock”... but “does not have to concentrate on finding a “perfect” pluton.”

“The EIS should provide terms of reference for siting, including areas in which the disposal site could be sought; the implementing agency (ies); the role of the public and the mechanisms and requirements for each stage of the siting process (e.g., social and scientific investigations). It should include the approvals requirements.”

“AECL's siting process will not ensure an adequate comparison of potentially suitable sites. AECL should specify the number of sites and areas that need to be characterized.”

If approved, “further environmental assessment could be minimal if the disposal concept were implemented at an existing licensed facility. Given these regulatory exemptions, potentially even high-level waste could be put in a mined cavern at AECL-Chalk River with a minimum level of environmental assessment.”

### **Site Selection Criteria**

“The exclusionary criteria developed by AECL are based on identifying as many sites as possible. Exclusionary criteria should also address a community's interest in being a host community prior to site selection.”

AECL identifies only those exclusion criteria based on safety or feasibility - “exclusion criteria based on, ethical, social, cultural, aboriginal, and archaeological issues are not sufficiently considered.” It is inappropriate that potential host communities have input to the exclusion criteria, only after the siting regions have been identified.

Siting criteria should have been provided. Siting criteria should be established prior to any screening process (e.g., applying volunteerism before criteria are defined).

AECL should have prepared siting exclusion criteria.

Exclusionary siting criteria should be applied at the outset of the siting process to help reduce stress in communities.

“If the siting criteria are to be drawn up in an open and transparent fashion, then AECL’s suggestion that exclusion criteria be applied before initiation of public involvement and that information would be available to the public only in designated areas is inadequate.”

“AECL suggests that there are many possible sites but after applying their screening criteria there are only 20 plutons available.”

Concerned about “the availability and extent of plutons which have been and can expect to remain bore hole free with areas of sufficient permeability.”

### **Lessons from Siting Processes**

“The EIS should reveal the lessons learned and uses made of past siting process.”

“In Section 7.2, Site Selection Process, in AECL document 10711, particularly disturbing ... was the absence of a study of past and current experiences around the issue of site selection, especially from a viewpoint different from that of the proponent.”

“The major weakness in the EIS is a failure to learn from experience -- the experience, I would say the mismanagement, of the Siting Task Force....”

Lessons from other siting processes may not be useful because the different materials to be sited require different levels of certainty and flexibility.

### **Voluntary Siting**

“AECL’s discussion on experience with voluntary siting processes does not include information on why the successful processes work, their key components, opposition to the process, problems faced and how the problems were addressed.”

“AECL does not comment on the “conflicts that could occur between communities and their neighbours and the implication of conflicts on the siting process.”

“So the effects on culture ... the effects that always happen on human activity on the whole environment in those areas has to be considered. So your definition of community will have to be one that encompasses all of the impacts that such a project will make. I would even go so far as including the communities that live along whatever routes the transport of that waste will have to take.”

“Finding a willing host community raises the question how that willingness is going to be obtained -- is going to be bought? It is unrealistic to expect rational decisions from a community in economic difficulties. There is no evidence of serious social studies into this situation.”

“It is not at all clear to us that for the proponent, AECL, voluntarism is fully equivalent to free and informed consent.”

“There's no such thing as a reliable, binding agreement. There may be good science, but the binding agreement is not going to give anybody reassurance if it comes from politicians.”

“The proposal does not address how “a community is not going to be stuck with a faulty facility.”

“The principle is wrong. The only communities likely to be interested are disadvantaged communities.”

“A siting process has to be done between equal partners or roughly equal partners, which means the communities involved have to be in power.”

“What kind of compensation are you talking about [for community which accepts deep disposal] and what if no host community agrees? What are the alternate plans?”

“The siting process ... is predicated upon the assumption that there will be a willing host for the facility... it is very unlikely that a willing host will be readily available even with the significant compensatory measures referred to in the EIS.”

“The principle of volunteerism may be flawed, particularly if the choice is between employment with additional health risks and unemployment.”

“Voluntary siting process may not work. There are questions of who is to be included in the determination of whether consent is voluntarily given. (e.g., people on transportation routes and in near by communities and “communities of interest”).”

“... it is not strictly true that voluntarism exists when the facility will impact on the surrounding environment and human populations long after the original host community members have passed away.”

“In one community, the immediate neighbours of a facility may not support or “volunteer” to accept the facility but the larger community does. This is not voluntary consent.”

“The integrity of that consultation effort is paramount, it is critical to the success of the site selection process, if indeed you want voluntary acceptance.”

“AECL’s siting process excludes many affected people and communities from the decision-making process. Informed consent must be obtained from all of the potentially affected communities, including adjacent communities and transportation communities and other communities. Communities bearing the impacts may not consent.”

“Adjacent communities and communities along transportation routes should be provided with a veto.”

“If individuals believe that something poses dangerous risks, AECL’s claims of a voluntary process may be called into question.”

“Who represents the community, is another important issue”.

“There is a need to define what does public acceptance mean and how is it going to be determined? What mechanism will be used to assess it? And will that be seen as binding?”

“The concept and site-specific plans for a repository must have the support of the provincial government in the host province where the nuclear waste repository is located.”

“The concept of voluntarism should be redefined so that a right of veto is extended to the provincial government in the province in which the proposed site is located.”

“The principle of informed consent may not be appropriate. How do you get the informed consent of future generations to what are essentially risks that they didn’t voluntarily take on?”

The AECL proposal does not include protection of property rights during siting of the facility.

“It is not appropriate that if the potential candidate area were on crown land, then the proponent would need only to seek the approval of the federal government rather than a local community to locate a candidate site.”

“The EIS seems to imply that, in the case of Crown Lands, local consent is either not necessary or is somehow subservient to the landholding Crown.”

“By negotiating a compensation package before determining technical acceptability a dangerous precedent may be set for environmental assessment. This suggests that a short-term benefit to one community is an acceptable trade-off for serious long-term environmental and health costs.”

“The right to withdraw from the process should not be removed from the community at a certain stage in the process. The community needs to be able to withdraw after assessing new information.”

“Binding commitments” by the implementing organization are unlikely to be enforced and a community may have the facility but not the commitments.”

“AECL does not address the long-term effects of voluntary siting on a community – the effects of dividing the community.”

***Role of Communities Along Transportation Routes***

“Communities along transportation routes may reject the concept and the risks but the concept may be implemented, violating the community will.”

“Communities along a transportation route should have decision-making powers.”

“Shouldn't informed consent be required, be a necessity for the communities through which these materials will be moved, as well as stored?”

## **1.8 Human Health and Safety**

### **Public Health and Safety**

“...robustness in meeting appropriate regulatory requirements to protect human health and the environment has not been convincingly demonstrated.”

“In its assessment of postclosure health effects, AECL used only fatal cancers or serious genetic effects as significant consequences.” AECL did not apply the World Health Organizations broad definition of health.

“It is a serious limitation of the EIS that AECL continues to define human health in the very narrow sense of “a fatal cancer or serious genetic effect” rather than in the broader sense of the World Health Organization definition of health as “a state of complete physical, mental and social well-being and not merely the “absence of disease or infirmity”. At the very least, the risk of non-fatal cancer should be included and there should be a discussion of other effects reported in the literature for exposure to low level radiation. To this should be added the effects of stress and anxiety on a host community and surrounding populations.”

“Claims that mined caverns will “protect human health” are not true. The only way to protect health is the virtual elimination of these persistent, toxic substances.”

Environmental Impact Statement omits some key aspects of human health including the concept of public health.

The EIS implies that disposal of nuclear waste, in and of itself, can permanently protect human health and the natural environment, which is not true.”

The EIS does not discuss radiation emissions and exposures associated with routine operation and maintenance of the fuel waste packaging facility.”

Calculations and validations of health outcomes and costs would have been a significant contribution to the treatment of worker health and safety in the EIS.”

“The disposal concept would make only a minimal contribution to public health and safety until the production of nuclear fuel waste ceases.”

“We should look at whether a substance is bio-accumulative, does it accumulate in food chains? Is it persistent? Is it just a transient substance in the environment, or will it be there for a long period of time? And, of course, is it toxic? How toxic is it? What are the health effects?” The EIS is not clear on these questions.

“This concept will put New Brunswick at a greater risk of environment and health effects from radioactivity because the concept involves the continued operation of nuclear facilities in the province, the accumulation of the highest level radioactive waste on site, and the additional risk of accident during the transport of high level radioactive waste through the province to its place of burial.”

“The trucks or trains used for transporting the canisters, the drivers, the people living along the routes will be subjected to continual radiation.”

Inadequate information on the health and safety of individuals living and working in the area, as well as the impact to future generations.

Inadequate treatment of protection of human and environmental health from chemical and radiological toxicity.

The effects of the ionizing radiation on the human gene pool have not been addressed.

“Under incident-free transport, Ontario Hydro has not properly evaluated the dose to the public at rest stops, has underestimated the population density along roads and has neglected out of Ontario province reactors and the potential high-level repository.”

“... pregnant women and their unborn children should also be singled out since some of the chemical contaminants could be toxic to fetuses (e.g., mercury).”

“Has the EIS met the criteria that were set out for it with regard to health and safety? We say no.”

“The EIS does not deal with these guidelines (for health & safety) in the prescribed manner. We have little discussion of safety measures and virtually no specifics that reflect the requirements of the guidelines.”

Need to determine indicators for early biochemical damage to signal health and genetic effects on human and non-human populations.

The EIS does not recognize that women and children both before and after birth are particularly vulnerable to the hazards of radiation, particularly in the event of an accident.

AECL ignored the Panel's direction to include population risk as a criterion. AECL did not calculate the total population health impact or risk of the concept in the reference location. AECL discusses risk only in terms of mortality, thereby under-estimating the risk of breast cancer and thyroid cancer and other potential health effects on women. The total number of cancers is much more tightly coupled to the total emissions into the biosphere than is the dose or the risk to the critical group.

AECL focused only on the health impacts to the critical group or to the most exposed individual.

The EIS does not adequately discuss the potential impacts of radiation, radionuclides and other contaminants on human and various components of the natural environment in the short and long term.

AECL's concept of risk does not include delayed effects. Damage from radiation is cumulative, and so it becomes difficult to scientifically prove that cancer and genetic defects are caused by persistent low levels of radiation.

“Neither the high-level waste nor the low-level waste studies compares waste management alternatives from the perspective of minimizing total population dose.”

There should be an analysis of whether the facility would meet radiological protection standards when the peak risk occurs.

Discussion of health effects in the EIS is inadequate and too restrictive by focussing on mortality. The selective use of information is misleading.

The issue of criticality is not adequately addressed in the EIS.

The existing health and biochemical stresses on possibly affected populations (human and non-human) should be factored into the site selection process.

The concept will include chronic releases of radionuclides within regulatory limits with attendant health risks. And, the concept will not reduce the toxicity of the waste.

Inadequate treatment of behavioural radionuclides in the environment.

The EIS does not adequately discuss persistent toxins that are predicted to be released to the environment.

“The food webs and bioaccumulation of radionuclides in these relationships need to be explored.”

AECL did not heed the guideline request that it discuss a worst case accident scenario involving a major breach of containment.

AECL does not provide all of the information to calculate the number of cancer deaths and other health effects.

The EIS does not contain calculations of collective doses. Global dose rates and global doses need to be calculated. “The average dose rate as a function of time to the critical group ...is unreliable.”

“For the purposes of this assessment, it may be necessary to show the effects on several different groups demonstrating different types of concerned communities.” [rather than focus on the critical group] “Explicit calculations need to be done for aboriginal and northern communities.”

“Would it not have been more appropriate to use new risk factors with new dose conversion factors?”

“If for some reason all of the barriers failed, then the proponent must show that it has an accurate method for assessing health risks at levels of exposure that are no longer insignificant.”

“Once it's closed, once there's no more institutional surveillance, how will you assure that no one will be able to go down and take back what's there to make a bomb with it?”

Inadequate treatment of potential for human error and unforeseen natural events in the Postclosure safety assessment

### **Occupational Health and Safety**

“The EIS does not adequately address the issue of worker health and safety.”

“We also feel that the proponent lost an opportunity to compare what we know about radiation exposures at a place like Chalk River which is operated by the proponent. We have excellent data on radiation exposure levels and we have excellent data potentially on what the health consequences for the workers at Chalk River are.”

The EIS (p.243) provides a table for estimating doses to the public for six scenarios, but does not provide an equivalent table for workers.”

“The EIS does not provide a credible analysis of the potential for extended storage of fuel wastes at existing sites to reduce radiation exposure to workers and the general public.”

“In assessing the options and acceptability for storage and disposal, the Panel should be considering the need to minimize the handling of waste material to reduce opportunities for exposure to workers.”

The EIS fails to properly examine potential radiological and non-radiological effects of the construction and operation of the proposed concept or the transportation of radioactive waste to the facility on the health of workers in all areas of the nuclear industry, and particularly the health of women workers.

The data and supporting documents used to verify estimates of worker exposures should be strengthened, particularly for accident scenarios.

The EIS does not provide information on worker training.

### ***Occupational Health and Safety of Transportation***

“Of obvious concern to the possibility that containers could break during an accident. Accident scenarios are described in such vague terms that it is impossible to determine if this was considered. It is also not clear whether estimates of accident-related worker exposures would include clean-up activities.”

Want guarantees of safety for workers and the public. Safety must be as rigorous for transportation as for the facilities.

The application of the ALARA principle will put transportation workers at greater risk.

“So if nuclear waste were to be sent by train to some location in northern Ontario, would we then be reclassified as nuclear workers and subjected to 10 times the exposure currently allowed to the public?”

Concern about the AECB's track record with respect to worker health and safety.

The transportation safety analysis has three main problems: the conclusion "is based on running computer programs, not running transportation systems; the safety case is based on truck transportation, but they're asking us to approve transportation in general, they didn't calculate rest stops, and so left out a large group of workers who would be exposed."

Ontario Hydro did not study rail workers.

"What has really been done to assess the risk or to put in place proper procedures to protect the worker who transports this waste?"

"The EIS should be rejected on the grounds of its lack of provision for health and safety of workers alone."

"There was no specific training program, for example. There was no specific definition of a procedure that would be used and, for example, if you were to load the material onto a train, how it would be loaded onto the train, what measures would be taken, what would happen as the train was moving along the route, et cetera, but more in terms of generalities."

There is no mention of possible occupational radiation risks while transporting and handling fuel waste and measures to be taken to prevent accidents.

## **1.9 Acceptable Levels of Risk**

From a social point of view, the Panel believes "that the demonstration of safety should be much more robust to justify selecting this disposal concept as Canada's approach for managing nuclear fuel wastes."

The concept cannot be regarded as acceptable if it fails to demonstrate safety from both the technical and social perspectives. From a social perspective safety of the concept has not been adequately demonstrated.

"Given the criticisms expressed by technical reviewers, some participants found it difficult to have confidence in the safety of the concept."

The Panel believes "that the methodologies the proponent developed to demonstrate safety have not yet gained sufficient recognition as valid and robust tools to enable the public to gain confidence in the safety of the disposal concept."

From a social perspective, safety of the AECL concept has not been adequately demonstrated for a conceptual stage of development.

"AECL did not use case studies appropriately to provide sufficient confidence in decisions to be made on the safety of the concept."

"The consensus among citizens and communities who have informed themselves on the issues is that there is no safe solution to the waste disposal problem."

AECL does not guarantee that there will be zero risk to present or future generations.

The concept does not guarantee zero risk of dreaded diseases to future generations.

“Quebecers...do not consider the concept of geologic disposal either safe or acceptable”

“Despite millions of dollars and many years of effort, we are nowhere closer to proving the actual safety of the concept, and just as far from proving that it is acceptable to the public.” “We feel that after two decades, half a billion dollars, the safety (of the concept) has not yet been proved.”

The definition of safety should have a psychological or social component to it.

The concept is unacceptable and has not been demonstrated to be safe enough.

“What is reasonable can't be set by scientists, but it must be set by the public.”

The proponent has not presented a convincing case that burying nuclear waste is safe or acceptable.

“What the government should do is not set an "acceptable risk" but require a process for risk management”.

Incremental or additive risk should be a public policy issue. This is not adequately addressed in the EIS.

AECL's determination of acceptable levels of risk is inappropriate and deficient. The public, and particularly those most exposed to the risks, should have a leading role in risk assessment associated with the proposed concept.

Need greater public input into the determination of acceptable levels of risk.

“None of the surveys cited deal directly with either the issue of nuclear fuel waste disposal or how different communities or sectors of the public perceive risk. The proponent has trivialized the public perception of risk.”

Concerned that a distinction is made between objective estimates of risk and how risk is perceived.

The process to determine an acceptable level of risk is inadequate. Fundamental values and different perceptions of what is safe need to be a key part of any discussion on what level of safety/risk is acceptable.

The EIS does not convey different viewpoints and different worldviews about perception of risk.

“The proponent relies on secondary sources of data for a significant portion of its discussions of the identification and analysis of perceptions of risk.”

There appears to have been very little work modeling public perceptions of risk with a social science approach, particularly with the inclusion of empirical data, and also few studies considering ethical dilemmas and compromises that small northern communities may be faced with.

AECL cannot offer guarantees of health and safety for people near to the disposal site. Something is likely to go wrong.

The documents demonstrate AECL's failure to understand the scope and significance of arguments that risks associated with technology are embedded in the lives of the people who adopt them.

The EIS does not address all scenarios. Under certain conditions the travel time of radionuclides from the vault to the surface could be only 70 years.

Burial is not a safe option.

## **1.10 Risk and Uncertainty**

### **Deficiencies in the Risk Analysis**

"Where there may be an increase in risk to humans and the environment over time, the peak dose and the peak risk should be used as references to develop assessment scenarios and eventually to verify compliance."

AECL "did not demonstrate that the proposed technologies have performed adequately in the past to protect human health and the environment when used in projects of similar size. It gave few concrete references and little systematic analysis or discussion of relevant previous technical and managerial achievements to give us confidence that the proposed technologies will perform adequately in the future."

The safety analysis is unsatisfactory. It should include a responsibility matrix, a presentation of various scenarios, and a comparison with other energy systems.

The public safety assessment methodology used for accident analysis for licensing nuclear generating stations may not be appropriate for application to the disposal facility. And, the model should have been tested using the accident history at the stations.

Key research gaps need to be filled: failed containment systems; failed engineering systems; and, institutional failures.

"The existing AECL characterization of fuel waste... is generic and lacks specific radionuclide inventories. ... more detail about the exact inventories is essential."

The analysis does not address that in fractured rock the water can move rapidly.

The system of fractures in the shield area demonstrates the possibility of renewed seismic activity and that fluids in the rocks will move along existing fractures through the disposal site.

AECL does not adequately address the effects of earthquakes.

Concern that there has been no consideration of climate change, including its effects on the temperatures in the vault.

“Criticality... We fear the EIS dismisses this concern too easily. Should criticality be reached, the first victims will be the inhabitants of communities nearest the burial sites. At present, these are primarily First Nations.”

Need to examine the potential for criticality in the vault, particularly if MOX fuel waste is to be included.

AECL has not properly analyzed or tested the concept.

“The use of natural analogies to demonstrate that containment and isolation has occurred in nature over long periods of time is not useful in building confidence because such concentration levels do not exist naturally, and particle radiation is a result of human manipulation”

Unclear what AECL believes to be the acceptable number of fatalities per year for construction, transportation and operations.

“The Panel asked whether unacceptable effects might not occur with the concept; whereas, the SRG has turned it into: Unacceptable effects are not likely to occur.” Environmental Assessment Review Panel Guidelines Order “is focused on the question of using known technology to address or mitigate effects. And what the SRG report seems to be contemplating, particularly going forward, is the idea that there could be technology or we expect there will be technology. But clearly, that is a distinct matter from known technology.” “Surely the test requires convincing evidence that it can be carried out to standard.” The applicability criterion, used by the SRG is too broad.

The SRG’s acceptability criterion is “framed with the question of human health impacts and, in particular, the likelihood of cancer rates or of cancer occurring in humans. ... That is clearly way narrower than the EARPGO demands scrutiny in terms of environmental assessment. First, a human impact is not simply somebody dying of cancer. ... The criterion makes no reference to adverse environmental impacts that are not human health. The approvability criterion used by the SRG is too narrow.

“It is impossible to make any determination of whether the nuclear fuel waste disposal concept is “safe”, in the sense used in the EIS. We cannot predict where people may choose to live thousands of years in the future. Nor can we predict what future generations might construe as “reasonable” standards for radiation exposure.”

“The EIS uses an unfortunate definition of “safe” which implies that current standards are adequate to protect health, which is not the case.”

Most of the data that have been used to provide estimates of the risks associated with radiation exposure have been derived from studying exposures that have taken place under much different circumstances than under those that could be reasonably expected to be associated with the nuclear fuel cycle.

“... the body of evidence does not assure safety.”

“There are a significant number of assumptions, the validity of which could not be confirmed by independent scientists. External examiners were not even able to verify claims on the concept performance at an order of magnitude scale.”

“There's a very high degree of variability and uncertainty in assessing the performance of the disposal system and the resultant low degree of confidence given in the project dose rates and radiological risk figures means that the safety of the concept has not been demonstrated.”

“There are no worst case or worst reasonable cases modelled. For the in-room emplacement case, in scenarios from moderate case modellings, many simulations have resulted in dose rates, which greatly exceed the regulations. These are lost from view by the averaging of the results.”

Worst case scenarios should have been provided. The worst case preclosure scenarios were not addressed.

“We are concerned about what point incremental exposure to low-level ionizing radiation is hazardous over numerous generations because this does not become apparent until several generations. Why should we presume that aggregate numerous small exposures are safe?”

The linear dose-response relationship for risk estimates is inappropriate.

The EIS “does not clearly outline what the response would be should the stability of the repository be compromised. It may not be possible to define the response to some emergencies, but a description of some disruptive scenarios, such as enhanced fracturing of wall rocks due to thermal or seismic effects, and what would be done to alleviate the resulting problems would be useful to consider.”

“There is inadequate information on the impacts of radiation on human and environmental health.”

The treatment of the immediate release fraction of volatile nuclides is unclear. There is little discussion of the fates of long-lived actinides in the fuel.

“Optimization” is not tested against philosophies or the approaches of best available technology economically achievable, versus ALARA, versus precautionary principle.

Biosphere dose factors are not presented by AECL. It is not possible to calculate the maximum discharges and discharge rates to the biosphere.

The EIS does not discuss the potential effects of low angle fractures from glaciation.

AECL does not adequately describe measures for adapting to uncertain and unlikely outcomes.

The hazardous nature of the waste is not adequately presented in the EIS.

The EIS does not address the measures to be taken to prevent accidents during construction of the vault and during the storage phase.

Human error is not adequately factored into the assessment.

“The externalities (regarding importation of nuclear waste) we would be looking at are transportation risks, leakage and migration of radionuclides off site for a waste disposal site and the health risks of these radionuclides to Canadians.”

It is unclear for how many years the postclosure risk continues.

Safety issues can only be addressed through a demonstration using a monitored retrievable system which is not part of the concept.

Accidents may prevent the occupancy and use of the land.

Over the long term funding may not be available and safety may be compromised.

“The risks of transportation probably represent the greatest concern in the whole of the environmental impact statement. The information on transportation is inadequate.”

“The EIS does not adequately discuss current risks in Nuclear Fuel Waste Management in Canada” or past performance of the industry.”

Non-expert stakeholders should have been involved in developing and screening risk factors to be analyzed.

“High risk of uncertainty with regard to accidental exposure, transportation problems, disposal vault integrity, seismic activity in the Canadian Shield.”

The misuse of science in proving the concept is safe. The proponent did not treat the possibility of an earthquake happening at the site of a repository very seriously. The probability of an earthquake occurring is based on the extremely poor data. Plutonic rocks are among the least studied kind of rock. We know very little about fracturing of plutonic rock.

Plutonic rock is not stable and AECL has minimized concerns about plutonic rock.

## **Scenario analyses**

AECL did not seek wide public input when developing scenarios.

AECL did not address a wide enough range of different case scenarios (e.g., the consequences of cumulative minor accidents, the handling of emergencies and with unforeseen events).

“From a social point of view, insufficient scenarios have been provided to estimate the range of potential hazards to humans and the environment or to conclude that the concept is based on a thorough and participatory analysis that could adequately protect human health and the environment.”

AECL did not “identify the extent of the consequences of scenarios at various points in time.”

AECL ignored or downplayed issues where firm predictions were impossible.

“The sensitivity of the safety results to the nature of AECL’s assumptions [e.g., temporal changes in man’s cultural or social behaviour, physiology, or changes in the biosphere caused by human actions] should have been more extensively tested and discussed.”

AECL should have used other disciplines that “would have led to the assessment of other or modified scenarios”.

Some scenarios were dismissed too easily.

“... no estimate of uncertainty is given for the human intrusion scenarios. This is a major shortcoming since these scenarios dominate the total radiological risk associated with the concept. ... The proponent has also failed to analyze the long-term impact on vault integrity and radionuclide movement as a result of such intrusion.”

## **Containment and Containers**

### ***The Concept Design***

In the Panel’s view there “should be an element of passive safety in any concept in the event that future generations are unwilling or unable to care for a storage or disposal facility.

AECL did not clearly define or limit the engineered barriers.

AECL “should have presented, compared and assessed designs and site characteristics that enhance long-term safety.”

“The conclusion of AECL (1996: Vol.1, p. 30) that the engineered system would be designed for the geological conditions encountered at a host site is to be rejected. AECL’s conclusion leads to the situation, that during the site selection process no special attention will be necessary concerning the geological situation because the geological situation is not really important . The best radiation protection will not be reached.”

“There may ... be significant potential for large-scale fractures in or near the plane of the vault because:

- a room and pillar panel is a plane of weakness
- maximum shear stress and/or compressive stress are in or near this plane;
- Initial maximum horizontal and shear stresses may in fact be greater than they appear...;
- both of these stresses will increase as the rock temperature rises due to heat released by the nuclear fuel waste.”

“The geometric arrangement of all chambers in a plane” weakens the rock making the vault the most likely location for a crack or shifting... The horizontal in-room emplacement concept should be abandoned. A random, three dimensional cluster repository would reduce the risks.

“The case for a room-and-pillar repository cannot be adequately proved. At candidate sites it may not be possible to prove “with a high degree of confidence and within the expected financial constraints, that there is an acceptable safety factor against large-scale fracturing through a room-and-pillar vault in the long term”.

“The concept introduces a large weak plane by locating numerous parallel tunnels in a single plane.”

“Re-mining to retrieve the waste, as stated in the EIS, is not feasible. Yet, retrievability is required.”

There are contradictions with respect to future retrievability. “AECL assumes the geosphere itself would protect the waste for all time. The EIS “states that, if future generations want to remove the waste, it is feasible to do so. However, it states in the technical section of the EIS that removing the waste once it is emplaced is extremely difficult if not impossible and totally unadvisable.” The EIS fails to show that retrieval would be safe and feasible.

AECL should provide more information on the degree of accessibility of the vault and the cost of repair, if necessary.

“How can the rationale for vault size, the adequacy of canister material, the adequacy of transportation canisters, etc. be assessed without knowing what and how much is going to be stored in the vaults.”

“What quantity of waste is being considered and would it be related to Canadian sources?”

Size of the vault is not adequately justified.

Where is all of the copper for the containers going to come from?

“There have been no studies to show adaptability of design within the concept to waste forms of different heat, chemical, and radiological characteristics, particularly for possible inclusion of different waste forms within a single vault. For both cases that have been presented so far, the characteristics of a specific waste-form are of primary importance in the vault design.”

The concept is a generalization and there are many local deviations. Rock stresses at the URL may not adequately represent those that may be found at an actual site.

AECL does not discuss potential problems with testing hydraulic parameters in boreholes drilled in heterogeneous crystalline rocks.

“The depth of this proposed facility is also doing more harm than good. Locating this dangerous waste within the ground water system of the Canadian Shield is nearly guaranteeing its spread to more populous regions of the country should an error occur. Even Canadian shield rock with no visible fractures is porous and will allow the permeation of contaminated waters; also, a digging operation of the necessary magnitude is likely to disturb the rock formation and further decrease the effectiveness of a plutonic rock barrier.”

AECL should have evaluated building the vault below the ground water table where there would not be any discharge to the surface.

“We also questioned whether the very act of making the burial vault and doing the bore holes would leave the integrity of the Canadian Shield, the granite of the Canadian Shield intact, or whether the very act of blasting and drilling wouldn't, in point of fact, open small cracks.”

The EIS “lacks a detailed analysis of the current status of high-level waste inventories in Canada, and none of scenarios for the proposed size of disposal facilities reflects a realistic projection of future high-level waste inventories.” The vault capacity figures are different for AECL and Ontario Hydro. AECL's capacity figures appear to be larger than required. Concern that the concept addresses more bundles of used fuel than exist today.

### ***Multiple Barriers***

“It appears, though, that AECL has not fully considered the impact of groundwater inundation on these barriers [backfill, buffer etc.]”

“My concern is the integrity of the container and the buffering around it to withstand that [glaciation], and if there is breakage and leakage, then the potential for incredible flushing of contaminants when there is so much water moving when the ice sheet recedes.”

“Assumptions about the effectiveness of barriers, both engineered and natural, have been used in part to determine the choice of radionuclides which are of concern.”

“AECL overlooked that the multi-barrier concept must apply to each and every radionuclide... It is not enough to design multiple barriers for a generic fuel waste because this may in reality amount to only single barrier for certain radionuclides.”

“There's a lack of consensus on the relative importance of engineering and geological components of the multi-barrier and there's a wide range of interpretations on some of the basic selection and/or disqualification criteria.”

Concern whether there are actually multiple barriers. Does a pathway exist through one barrier?

The integrity of containment, groundwater chemistry and microbial life and related impacts has not been adequately addressed in the EIS. AECL does not provide confidence in the integrity of the vaults and the composition and placement of backfill.

The buffer and backfill materials are inadequate and should be water repellent, non-corrosive plastic.

For the in-room emplacement, if the buffer “blocks shrink in the short term, that is during the prolonged filling process, will not these channels provided a rapid ingress for groundwater at some future time along multiple pathways that simply bypass the calculated rates of movement through clay by diffusion?”

“... changes in the brine chemistry in the buffer caused by thermal diffusivity may affect the sealing properties of the precompacted clay blocks; if the Ca/Na ratio of the resulting brine increases, then the buffer may shrink and crack allowing preferential flow pathways to the surface of the containers. This possibility must be considered in any preclosure safety analysis of the stability of the vault emplacement at a site.

Major deficiencies with the multiple barrier system; “safety and cost; lack of quantitative data; strategy for monitoring; decision trigger for retrieval; discussion of contaminants and associated effects; analysis of pillar/room option and borehole option; discussion of system performance over time; container failure; and groundwater activity. Of these deficiencies the discussion on groundwater movement, waste retrieval and container failure lacked the most analysis and quantitative data...”

### ***Disposal Containers***

Insufficient evidence that the containers will last 10,000 to 12,000 years and that they could be designed to last a million years.

The disposal container should have been designed with a minimum life span comparable to the time frame for the hazard of the used fuel.

“The limited testing and assessment of the prototype containers is inadequate to justify the essential structural integrity of the containers for the specified 500 years minimum lifetime, especially since there are no engineering standards that are applicable to such a long design life.”

“The AECB document points out that AECL overestimates the stress that titanium plate could withstand by 50 per cent.”

“Why, after 20 years of work and public expense, has not a single copper container been built and tested under actual conditions? ... It is incomprehensible that AECL may be given approval to proceed with a 20 billion dollar project when not a single copper container has been constructed and tested. ”

The disposal containers have not been built or tested, only modeled. Therefore we cannot be sure that they can be built and that they will perform as intended.

“Also questioned is AECL's conservative projected failure rates for the proposed welded copper storage containers.”

“Nowhere in all the 700 pages is it explained what the basis is for the assumption that only 12 containers (the “dirty” dozen) will fail.”

“No ASME or ASTM standards for the ultrasonic inspection of copper exist. As far as I am aware.”

“And what if they (containers of nuclear waste) do leak? What plans do we have to intervene in such a situation? How will people be protected? How will the environment be protected? How will the damage be reversed? “

Concerns about the uncertainties of: the rates of corrosion of the containers over 500 years; and the long-term effects of the storage of fuel bundles in sealed environments; the rate of groundwater movement in the prospective sites; and, the potential for spreading the soluble components of the fuel bundles after 500 years.

“We cannot predict the reliability of titanium containers as we can for the copper containers. It does not allow the use of a reliable predictive model of its corrosion processes and does not have a corrosion performance track record as copper does.”

Ceramic containers should have been evaluated. They may provide greater safety over the long term in comparison to the metal containers proposed.

“The public is entitled to ask what kind of pressures will be placed on the containers when all the ... components of pressure occur. These are the really conservative situations not the worse scenarios around which AECL should have made all its computer and engineering calculations.”

“If the steel liner is deemed necessary, this begs a further question. What happens to electrolytic corrosion by metallic containers over one million years? “ And, there are other factors that could influence failure – container failure due to pin holes, steel rails in the concrete, the alkaline nature of the concrete in the vault etc. These questions need to be addressed.

“These casks are going to last 500 years, ... I don't think that that is going to be long enough for nuclear waste that does not break down for millions and millions of years”

“ ... When discussing flaws that pierce the copper containers, [AECL] does not discuss the possibility of the enlargement of these flaws due to transportation and handling or to an even distribution of thermal stresses within the container.”

The model used to predict the stability of copper is suspect and, due to assumptions, cannot reliably predict stability out to one million years. The case for use of copper has not been proven. Concern that the safety of the copper cask proposed after completion of the EIS is not substantiated.

The safety of the copper canister design is going to be highly subject to the geochemistry of the disposal site and that the process of developing an acceptable design has to be carried out step by step in conjunction with the process of identifying a site. “The immediate site that is under consideration must be taken into account when the final design of the canister is decided.”

AECL documents show that “the range of welded copper containers with a single pin hole leak is 1 in 1000 to 1 in 10,000. The authors of this postclosure safety analysis chose the failure rate as 1 in 5,000 containers. Of course, the more conservative assumption would be 1 in 1,000 containers ... but there is no discussion to justify the less conservative number chosen. ... There is no discussion of the possibility of having more than one pin hole leak per canister ...”

There is no discussion of or apparent consideration given to electrochemical corrosion in the larger sense of interactions between the copper canister, the zircaloy fuel sheaths, and the nuclear fuel. ... Large scale coupled hydrogeochemical models are needed to determine if electrochemical reactions between the different metals (copper and zircaloy) and nuclear fuel within the canister affect one another.”

“There is little discussion of electrochemical reactions with the alternate canister design involving internal stainless steel support.”

The microbial corrosion over the long time frame has not been adequately addressed.

Detailed container design should not be undertaken until data on the host rock at a potential site is available.

Container composition has not been adequately demonstrated to provide the necessary safety, including copper.

“Despite the significantly improved artificial barrier (copper containment), the worsening of the geological barrier at the same time leads to dose rates which are some orders of magnitude higher in AECL’s new “copper concept”.”

AECL used a probability of  $10^{-4}$  for failure of the copper containers but in Sweden they used a factor of  $10^{-3}$ . AECL does not explain the difference.

### ***Transportation Casks***

Participants raised concerns about the adequacy of the “testing and integrity of the shipping casks”.

The temperature extremes in Northern Saskatchewan are more variable than the +/- 40C. temperature that the transportation cask was designed for.

Weight restrictions play an important role in cask design to conform to Ontario highways regulations. The cask weighs less than casks in other countries. It is unclear if the margin of safety was reduced to make the cask lighter.

Transportation casks have not been adequately tested, including actual full-scale tests.

The scaled transportation cask impact tests are inadequate tests of the casks reliability.

“The accident tests of the transportation cask should have been done on full scale containers. The tests do not address real-life conditions.”

“AECL chose to determine the validity of testing scale models with a public opinion poll. It is hard to view this as anything other than a self-serving manipulation of the public participation process. AECL’s use of public opinion polls to justify the use of scale model tests of the transportation casks is inappropriate.”

In terms of the northern Ontario realities (e.g., forest fires and remote locations) an eight-hour limit is insufficient [for cask testing].

## **1.11 Limits of Science**

### **General**

Scientific knowledge is insufficient to undertake this disposal. Too many uncertainties to consider it safe.

"I lack confidence in the judgement of the scientific and engineering community that has proposed burial as a solution, because it uses the very same scientific reasoning that gave us thalidomide and contaminated blood."

"Disposal, in the sense of permanent isolation from the biosphere, is for all practical purposes an undefined term, and therefore incapable of scientific verification.... We do not believe that science has the power to dictate to Nature, or to foresee events, thousands of years hence. Science cannot even predict the weather for the next month."

"Approval at this stage on the basis of present evidence is to ignore the limits and uncertainties of the science, the absence of information in vital areas and the failure to demonstrate the necessary flexibility and robustness in the concept."

"It is not possible to predict groundwater flows or extent of contamination in underground water."

"We ask, has scientific research ascertained a foolproof method for storing reactive substances for at least 10,000 years? To believe that a geological or political landscape will remain unchanged for more than 400 generations is deception of the highest level."

"Human kind has not demonstrated the capability, up to this point in time, to seal up a hole in the ground so that it will remain sealed forever, and that is really the fundamental question." (e.g. the pyramids)

"We do not have it within our power to prove that it [the concept] is safe."

"AECL can't know about Canada's groundwater systems because there has never been an national inventory of them."

The current proposals of science and technology are not adequate to manage nuclear fuel waste safely.

There are many limits to the ability of science and scientific knowledge.

"The value of natural analogues is limited. Because of their characteristics as uncontrolled experiments, important parameters are unknown; therefore results gained from analogues are not a substitute for the necessary validation of models." Evidence from the natural analogues is unconvincing.

"Lack of confidence in technical solutions to cover such a long period."

Science cannot project 10,000 or 500,000 years in the future.

AECL should demonstrate "the viability of their new tools, techniques and materials".

The historical record based on artifacts that have survived is unreliable because it cannot reveal the artifacts that did not survive.

Many essential disciplines that could provide confidence are "emerging fields". At the present time, they cannot provide the confidence required.

Science is not able to guarantee the safety of the concept. It is not able to provide a much higher level of guarantee than for less hazardous projects.

AECL does not state the uncertainty of existing geophysical techniques to delineate GDFZ's across a candidate site.

### **Ability of Science and Technology to Address Uncertainty**

Participants raised the number nature and importance of scientific uncertainties as issues.

Questioned the scientific and technical uncertainties and the accuracy of the data used to make predictions.

AECL failed to present the debate "as also a feature of current medical and social scientific analysis".

There are too many uncertainties to approve the concept.

"There are too many uncertainties, unpredictable, countless unknown possibilities, of earth movements changing patterns of underground water movement, security and health hazards to future generations associated with the concept."

Much of the evidence brought forward by AECL does not reduce uncertainty over the "long time frame that has to be considered."

"When I look at the material that's been generated, assessing the impact of glaciation on the ability of this waste to be contained, I am not in the slightest convinced that the matter has been given anywhere near enough care and assessment."

"We do not know, really, anything about either the stability of the Shield, the stability of the methods of retaining nuclear waste, nor anything about the demographic or other major geological conditions that will affect this area for the next thousand, two thousand or three thousand years."

"The earth does not always behave the way our scientists or computers would like it to."

"We don't have the data yet, and we don't have the science". There are no statistics on nuclear fuel waste disposal on which to determine the risk.

There are "literally hundreds of unanswered questions of a fundamental scientific nature which surround the question of high-level waste disposal."

It is not possible to anticipate all possible scenarios over the long time frame. (e.g., "I'm not sure what the impact would be on that facility even if it did burn it, but I do believe there's a point here that we keep telling ourselves that we've figured out all the angles" (regarding a forest fire near a nuclear waste facility))

Society does not know how to calculate the risks of storing nuclear fuel waste underground.

Studying hypothetical risk factors for conditions over a thousand years is beyond our abilities.

The risks evaluated in the environmental impact statement are only predictions, predictions which are only as good as present knowledge allows.

Intrinsic uncertainty about long-term impacts is apparent in almost all of the technical areas.

“The process of predictive assessment of this concept ... departs from true science and also from the common sense public judgment.”

“... much of the information that is used to declare the concept as valid is in fact generally based on selected data obtained by certain premises, and when all these premises are combined in what is claimed a conservative position, the number of predictions that must arise multiples in proportion to the number of assumptions.”

“In the EIS comparing background radiation levels with the radiation received by a single radionuclide such as Iodine 129 is irresponsible and poor science.”

### **Long-Term Predictions**

“Major scientific uncertainties about the long-term safety performance of the disposal system have not been adequately resolved...”

“Some participants could not imagine a facility that could last as long as this one is proposed and that its performance over that time could be predicted.”

“We cannot predict the long-term acceptability of any concept to future generations.”

To some participants “relying on undemonstrated technology to achieve passive safety for thousands of years was less acceptable than the assumption of societal breakdown and the loss of institution control.”

The unpredictability of geological events (e.g., earthquakes) or of an Ice Age over the timeframes involved in the concept are not adequately addressed.

“There is the arbitrary 10,000 year timeframe that the politicians have set as the time period that the disposal must be shown to be safe. When the scientists first worked on this project, we used a million years, which is another arbitrary figure. Perhaps a more reasonable figure would be to say that the repository must be shown to be safe whenever the waste comes out in the future.”

“The situation of the waste is not a problem to be solved; it is a dilemma, a conundrum. There is at present no known safe solution, and there cannot be since we lack the empirical outcomes that only 10,000 or 25,000 years will surely make.”

“A great majority of the evidence presented by AECL to prove its long-term predictions to validate its concept is purely speculative and highly mathematical with a minimum of practical verification.”

“The real proof of the long-term safety of a final repository can only be acquired on the basis of site-specific data.”

The time frames are too long for science or anyone to make sensible conclusions on safety.

“How can we make decisions for generations 100,000 or 10,000 or even 100 years into the future in any kind of realistic way when the future is unknown and ultimately unpredictable?”

A long term trial / demonstration is required to confirm the predictions, prior to considering disposal

### **Computer Modelling**

Concern that there are errors in the software, both in specification and in the implementation. Recommend that there be an independent audit of the software and examination and re-evaluation of the success of the software in implementing the models.

“Of equal or greater concern is the lack of credible consensus in terms of the ability to satisfactorily characterize a potential site or to apply the results of such a characterization to a safety assessment exercise. There are simply too many continuing uncertainties to allow confident application of many of the mathematical models used in safety assessment modelling.”

“The Scientific Review Group stated that the SYVAC computer program: ...has undermined the effectiveness of the assessments. It is the foundation for its results; therefore, the results are also seriously flawed.”

“AECL also contends that its computer can predict our environmental future. Earthquakes are far from predictable.”

“Even the Geoscience Council of Canada noted that as geologists, they feel that it is very arrogant for AECL to say it can forecast for 10,000 years. The Council also suggested that AECL convey to the public both uncertainties and response to uncertainties.”

“I don't believe that geology is fundamentally a predictive science and I believe that the mathematical models that are being used, although very clever, are unverified in the sense they're invalidated in the sense that they have not been tested against reality.”

Cannot validate the geological model.

The models are not validated.

“The data base for actual testing must be expanded to reduce reliance on models and to generate better input for the necessary modelling.”

“The first difficulty arising from the use of computer models for nuclear waste disposal is the impossibility of modelling programs that correspond to factual realities because they typically deal in tens or hundreds of thousands of years.”

“You don't know what is going to happen until you make models and you test them and you test them to destruction”

“There is no direct connection between naturally occurring bodies of uranium ore and man-made buried waste, nuclear waste, nor does the past securely predict the future.” [re: natural analogues]

“The models used are insufficiently developed to demonstrate that the ... concept ... can be used as a basis for a site-specific facility. Considerable improvement and updating of the model would be required before there would be enough confidence to proceed.”

The assumptions underlying the mathematical modeling are not clear.

The assumptions of the models are not conservative.

There are too many hypothetical projections and too many assumptions made in the computer simulations.

The mathematical models need to be verified; verification of a concept with such long time spans is new. The models cannot be used to prove the safety of the concept, but only used as a hypothesis.

“The use of computer codes and models as analytical tools to evaluate the geological stability will not be as accurate as claimed due to recent data that has given credibility to the increased rotational speed of the planet Earth”

“The premature failure of containers and the potential for radionuclides entering the ecosystem more quickly is not adequately addressed in the models used for predicting potential harm.”

The science does not support the models: there are too many uncertainties, too much missing data associated with AECL's computer modeling, and the required experimentation has not been done.

AECL's “assumption that all fuel bundles are exactly the same in terms of radioactive constituents has a significant impact on AECL's modelling...”

The model cannot represent all of the characteristics and contingencies of a real situation over such long time periods. Good data is not available at this time.

The conceptual models are flawed, misinterpret data, unsuitable to the task or unreliable.

“ ... the predictive power of radionuclide transport modeling is insufficient; models need to be verified -- that is, shown to be mathematically correct -- and they need to be validated to correspond to what happens in nature. ... the models used were not validated, and the consequence of a non-

validated model is that the calculated dose rates are, at most, coincidentally related to the expected actual situation in the future. This is also true for the probabilistic methodology used by AECL”

“Actual proof of the conservative nature of many assumptions [of the models] is not given.”

“ ... because of the long-term time frames that have to be considered, it is almost impossible to make sure that all relevant or possible events, and of course any combination of events, have been recognized and described properly.”

“It has not been proved that data sets provided by AECL are sufficient, representative and meaningful.”

The EIS does not provide a rationale for the selection of sensitivity analysis parameters.

The linear models used by AECL are inappropriate, especially for the postclosure phase. AECL should discuss their rationale for relying on linear models.

“Nature behaves as a system and therefore a total systems approach should be considered when modeling.”

“Simulations should be treated as predictions that can change as you gain more knowledge and experience from disposal.... And therefore, simulations or total systems performance assessments should be taken with a grain of salt”

The BIOTRAC Model is inappropriate. It does not address the integration of the ecosystem.

The AECL modeling of the natural environment does not include the interaction of the different components of the ecosystem. “ ... we should consider another whole group of target organisms, and that is the microbes that carry out the functional basics of the ecosystem structure, the maintenance of the ecosystem.”

AECL has yet to complete the development of the calibrated regional groundwater model for the area of the URL

The models used by AECL keep changing and do not provide the confidence that they will produce good results at various sites.

AECL does not explain the uncertainties in modeling radionuclide sorption in fractured rock and the difficulties of relating tracer test results over a wide area.

The heterogeneity of the rock mass is least understood and not well represented in the models.

“There is no discussion of the limits of site characterization techniques to the development of a site-specific model and little discussion of the development of these models.”

“I think that the results of the computer modelling are not reliable enough to prove long-term safety of a repository. There are at least five reasons for this answer:

1. The lack of input-data and parameter uncertainty ...
2. Scenario development ...
3. Model uncertainties ....
4. Verification and validation ...
5. Computational uncertainty ...”

“All these problems are working together and interacting and it is unlikely that they can be removed in the near future. To reduce this problem, AECL makes so-called CONSERVATIVE assumptions. ... However, conservative assumptions merely REPLACE A LACK OF KNOWLEDGE or LACK OF INPUT DATA. It has to be shown for every conservative assumption that it has in reality a conservative effect on the overall result of these calculations.”

“The generic biosphere and food chain models contain many parameters for which data is not well known, and have therefore been based on limited experimental data or through analogy with other parameters. The effect of this uncertainty on radiation dose has not been sufficiently addressed.”

## **1.12 Transportation of Nuclear Fuel Waste**

### **Potential for and Consequences of Accidents**

Participants raised concerns about whether the EIS adequately addressed “the state and safety of Canadian highways, particularly northern ones.”

“Our group strongly opposes the removal of nuclear fuel waste from the site on which it is produced. It is clear that there are great risks involved in any form of transportation of these hazardous substances.”

“The concept does not seem to include research data for safe transport of the stored wastes. AECL should detail the transportation plan and transportation safety analysis.”

The transportation safety analysis assumptions do not address conditions in northern Ontario.

“A major failing is that the EIS doesn't limit the distance to a potential repository.”

“Transportation on waterways, including the St. Lawrence River and Great Lakes, is too risky.”

“Transporting of waste on public highways raises the potential of the risks of environmental damage due to accidental release of contaminated effluent.”

“There will be transportation accidents. ... some may be severe enough to release radioactive materials. ... Ontario Hydro has greatly underestimated the consequences.”

“The fuel that's used in the assessment for incident-free transport is the average fuel, which is coming out of the reactors. It is not the maximum fuel, it is not the fuel that the safety analysis report for these casks allows. ... And therefore, if there are any changes in Ontario Hydro's plans, if instead they want to use plutonium fuel, which has a higher burn-up, then the safety analysis report will understate what the consequences are.”

“Ontario Hydro assumes that there is the same distribution of accidents in rural, suburban and urban settings. In other words, the percentage of accidents at 75 kilometres an hour with a half-hour fire would be the same in a rural, suburban and urban setting. At least in the States, that definitely is not the case.”

“Under potential transportation accidents, Ontario Hydro has underestimated the overall accident rate. The assumptions employed by Ontario Hydro with regard to the accident severity scheme are based on data from the States, not Canada. The temperatures in a road or rail accident could be considerably greater than assumed by Ontario Hydro, who again has used an inadequate database from the States. Finally, the fuel response to accident conditions is also based on U.S. studies, which are not conservative. Finally, Ontario Hydro has neglected to factor in human error and sabotage into the analysis of probability and consequences.”

“The potential accident scenarios are not realistic. Ontario Hydro assumes that local emergency personnel are well equipped and trained, that residents near an accident scene could be evacuated within 24 hours, and remain outside until the area is decontaminated to safer levels. Ontario Hydro also assumes that local contaminated foods and water are interdicted. Thus, residents will be exposed to lower levels of direct gamma radiation and lower radioactive concentrations in food and air. We regard these assumptions as wildly optimistic.”

“The EIS does not include enough plausible transportation accident scenarios. Each scenario should address the health consequences and the kind of emergency response plan that might be required.”

“The worst scenario for transportation accidents (e.g., conventional accidents, thefts, and terrorism) together with the associated risks is not provided.”

“More detail is required on accident potential during loading and unloading of the transportation casks, including the assessment of risks for these activities.”

The presentation of conventional traffic accident statistics is inadequate.

“The EIS needs a clear statement of risks for a transportation spill of radioactive substances.”

“It didn't really address the issue that bothers us as ordinary people, namely that truck drivers do stupid things. Wheels fall off trucks, trucks do jack knife, people don't realize there's black ice, all sorts of things happen and nobody can control other drivers.”

The extent of the impact of transporting the waste has not been addressed.

## **Security, Safeguards and Emergency Response**

Participants raised concerns about the adequacy of the emergency preparedness.

What are the security requirements for the transportation of the waste? "If someone wanted to get their hands on nuclear waste...where would they rather try and get it from? Trying to get it out of Pickering security system or trying to get it off of some lonely trucker stopped for fuel in the middle of the night at the Husky station in Nipigon."

Security issues for transportation of the fuel and the effects of security on communities are inadequately addressed.

Safeguards and assurances for safe transportation are inadequate. It is unclear whether the fuel can be safely loaded, stored, and transported by truck.

"There is inadequate attention to the risks from protests during transportation."

Local communities may not be able to respond to an accident. "Communities across northern Ontario would be completely unprepared to deal with any accident regarding the transport of high level nuclear waste."

Accountability for worst-case transportation accident is not clear.

Risk management or risk reduction means that the distance over which waste should be transported between the point of origin and point of disposal should be as short as possible.

Possible protests and other kinds of transportation problems are not acknowledged in the EIS.

## **The Responsible Agency**

"Who should be responsible for transportation? It is unclear which agency or department will have the final say in how nuclear waste will be moved."

"The EIS does not address the role of the provinces in decision-making about transportation. The implementing organization will need to get the approval of each provincial government whose lands would be used for the purpose of transporting the fuel waste to a disposal site."

The role of a province in transportation and in addressing emergencies is unclear.

## **Other**

"Waste should be buried near the point of production. Too many risks are involved in transportation. Surface transport represents the greatest

opportunity for waste to escape into the ecosystem.”

“The EIS does not address a separate Quebec and how the waste would be shipped from New Brunswick.”

“If rail is the preferred option, the EIS does not show the route from New Brunswick. Will the nuclear waste be shipped through the United States?”

Inadequate discussion of inter-modal transfer as part of the transportation assessment.

The extent of insurance coverage for transportation is unclear. Will the Nuclear Liability Act apply? How will people and communities be compensated?

### **1.13 Policy and Decision-Making**

The approach to approving the concept was a concern to some participants who were concerned that a Panel endorsement of the concept would support continued use of nuclear power and would make it difficult for any community to resist accepting a facility or negotiating modifications to the concept.

AECL does not show how the “broader Canadian public and the provinces would be involved in decision-making related to future steps.”

“Any EIA process, the next stage in the process, if it should go ahead, it must be conditional on prior access to an involvement of the public in the policy decisions concerning the future of the nuclear industry. ... It's going to be filled with decisions about the export of nuclear reactors, about the importation of MOX fuel and other issues. These cannot continue to be bracket out of the decision-making process.”

“In no way has this process mirrored any of the substantive safeguards in the Ontario Environmental Assessment Act. “ ‘What happened to the applicability of the Ontario Environmental Assessment Act? Where is there evidence before you as to the ramifications of a no-go, which is a big issue under Ontario's Act?’”

Approval of the facility will result in the production of more and more hazardous wastes and violates the principles of modern waste management.

The residents of the host province must have significant opportunity to have input into the decision to host the repository.

“At what point does the body responsible for the vault decide it is unsafe, and who is the body responsible for the vault, both before and after decommission?”

“Those social sciences, economics being one of them, should be tightly tied into any decision-making processes.”

“ ... both the Quebec population and the Quebec government have found the concept of geologic disposal unacceptable.”

“If the panel recommends proceeding to siting, that recommendation will be interpreted by many as approval of the concept in principle.”

The role of a province during siting is unclear (e.g., in negotiations with communities, responsibilities during transportation route selection) as well as provincial wide public involvement.

## **1.14 Trust and Credibility**

### **The Nuclear Industry**

Many participants complained about AECL’s lack of openness and transparency; AECL’s insensitivity to a wide range of stakeholders; and, AECL’s failure to ensure effective public participation.

The required degree of confidence in AECL and Ontario Hydro may not exist at present.

“There's also ... basically a credibility gap with the nuclear industry generally.”

“The nuclear industry in Canada and beyond Canada has a history of hiding its problems, of misleading official bodies, of being optimistic and uncritical in its assumptions, and of intimidating opponents.”

Distrust of AECL due to past assurances and past actions, etc. AECL and Ontario Hydro have not always behaved with openness, fairness and in shared decision-making with respect to nuclear matters.

“The industry's record with regard to the health and safety of the public and the facts of the proposal are just too bad.”

“The track record of both agencies [AECL and Ontario Hydro] runs against them.”

“A significant factor in allaying fear is that of trust.”

AECL has been accused of withholding information about the concept from communities

“Engineering with the nuclear profession does not have a good record. ... Critical cooling tubes located around the core of the reactors are leaking. These tubes, designed to last for 40 years, are failing in 20 years and sometimes earlier. ... It is difficult to have any confidence in the engineering proposed for permanent storage when the nuclear industry currently has an engineering problem that it can't solve. The idea of the same industry developing a solution that has to last for 500,000 years is well beyond my level of confidence in the industry. This one-time design idea requires an unprecedented success rate in engineering. This is clearly a level of confidence that cannot realistically be expected, given the record of the Canadian nuclear industry.”

“Pickering nuclear power station...The important thing is despite the fact that some of the best minds in the industry tried to make this project absolutely safe and bug-free, they couldn't do it.” “We thought we had a perfectly safe system in the Pickering reactors when we installed the tubes that they used in solid concrete, knowing they would not wear out in a few years. In fact, they did. Yet the best engineering knowledge at the time we had assured us it wouldn't.”

“Another thing we can't trust is the closed circuit of people that run the industry and that have been shepherding this proposal through its various stages.”

The nuclear industry has failed to develop sound technology on how to deal with the waste.

“I cannot trust the industry that without any conceivable idea of how to deal with its mess went ahead anyway, willing to foist it off on thousands of generations to come at genetic, environment and dollar costs that are unknowable.”

“This research has been funded by those who do not have the concerns of the environment and our communities in the forefront and, hence, there are some questions as to the biases of the researchers themselves.”

AECL lacks credibility and trust with the Canadian public.

It appears that AECL has given selected information and data to the Panel and public.

Basic conflict of interest as AECL is the proponent of this concept and promotes the expansion of nuclear power in Canada and internationally.

General concern about AECL's past activities in Manitoba. “I strongly believe that the general manner in which Atomic Energy of Canada has operated in Pinawa reflects so poorly on the organization that it's absolutely impossible for us, as citizens, to have much faith in the high-level nuclear waste research.”

Distrust of AECL based on experience at Atikokan; AECL was not forthcoming with information and appeared to be arrogant.

“That company (Eldorado) operated under government supervision and government encouragement very irresponsibly, with no concern for either their workers or the people in Port Hope, or even the people downwind.”

No trust in AECL: “AECL offered to build the Gentilly-1 reactor...it was a technical and financial disaster...AECL persuaded both Quebec and New Brunswick to build... Gentilly-2 and Lepreau (and reneged on financing); AECL convinced the Quebec government to build LaPrade; it never ran a single day.”

“The industry was prepared to reduce the evacuation perimeter around Gentilly-2 so as to exclude 13 municipalities who were previously included, without informing the residents or mayors of any of the 13 municipalities.”

“Most Quebecers would attach little credibility to these forecasts, both as to the costs and the reliability of the repository, given the previous track record of the two proponents (AECL & Ontario Hydro)”

“Openness, however, has not been the experience of Quebecers in dealing with AECL or the government on nuclear matters”

“During AECL’s effort in 1988 to install a nuclear reactor at the Centre Hospitalier de l’Universite de Sherbrooke...it became clear to everyone that AECL had not been honest and forthright in its assertions, nor had it been open in its dealings”

Concern about the honesty of the process and in the nuclear debate.

Concern about the credibility of AECL. “Lack of a clear AECL commitment to proper management of all types of radioactive wastes raises questions about AECL's credibility in the matter of the current assessment of the high level waste disposal concept.”

AECL should not be in control of researching a solution to nuclear fuel waste as they are also selling reactors that produce the waste.

AECL does not have the trust of the public for its science to be believed. Suggests unethical behaviour by AECL throughout the history of the program.

“How we can possibly trust this industry, or the government that subsidizes it to the tune of billions of dollars and manufactures their own boys to tell everybody that everything is okay?”

“... AECL fails to follow the guidelines for the EIS set out by the Panel.”

“... We are answered questions by half-truths, and the rest of it is enshrouded in secrecy, things nuclear.”

“AECL has provided little information to communities in the past and then at times has left without answering questions. AECL has been too secretive in the past.”

“Ontario Hydro has been unable to provide information in a fair and consistent manner.”

“The AECL commitment to openness and fairness does not stand up under any analysis of past behaviour on the part of either Atomic Energy of Canada Limited or the Government of Canada.”

“AECL is arrogant, shortsighted, secret society opposite to the kind of open, concerned organization that is needed to do this job.”

## **Government and the Regulator**

Criticisms of the regulator include delays in adapting to changes in international standards, reporting to the same minister as AECL, and its failure to “ensure wide public participation in setting standards.”

“The absence of clear policy statements by governments with respect to the future of nuclear energy in Canada makes it more difficult for the public to develop trust in a proponent and regulator.”

The decision on the Concept has already been made.

“I, like most other citizen intervenors here, cannot trust enough to accept.”

Distrust of AECB based on the perception that AECB was not critical of AECL or Ontario Hydro. AECB not in a position to monitor implementing agency.

“The environmental inspectors in all levels of government are seriously understaffed, and ineffective at ensuring adequate compliance with our environmental legislation, approvals and permits. ... We spend most of our time responding to environmental problems as they surface, rather than planning for and avoiding them in the first place.” “I cannot expect the government or industry to protect the natural environment from man-made pollution, especially radioactive waste from nuclear power plants.”

The results of the Government of Canada decision regarding the Low Level Siting Task Force process resulted in greater distrust of government promises, “making implementation of the voluntarism principle that much more difficult.”

“How can trust be found or encouraged when we find that the uranium left behind in the '30s is still not cleaned up, that aboriginal peoples are being told only one side of the story in an attempt to get a willing host community.”

Insufficient independent review of the science and engineering to provide confidence in the results.

Lack of credibility of federal government due in part to helping AECL with reactor sales to China by relaxing environmental requirements.

## **1.15 Ethical Aspects**

### **Ethical Analysis in the EIS**

Some broader questions (e.g., distributional equity) require “more elaboration in an ethical and social assessment framework”.

In the absence of a comprehensive ethical and social framework “the concept cannot be said to have met this criterion for acceptability.

“It is NB power’s position that there are no persuasive ethical reasons to prefer deep disposal of nuclear waste to the management method used now – monitored above ground storage.” “The ethical arguments by the proponents are unbelievably shallow and simplistic.”

“The concept of deep geological disposal of high level radioactive waste is driven by an ethical argument that limits other options. We believe such an argument warrants more rigorous discussion.”

“We should not require that man’s endeavours be managed to account for societal breakdown, since this calls into question the viability of any industry which relies on institutional control to manage its risks.”

“The possible and preferable option is to state the ethical goals that have priority, whatever the methods used to achieve them. For example, you might insist that the storage method must cause a minimum of risk to people and other living things in the short-term while offering a maximum of future opportunities for improvement in security of storage. AECL’s impact statement covers the first point, but it completely misses the second.”

“This generation has enjoyed the benefits, although at some cost, of nuclear energy. We are therefore responsible until that waste is as inert as it was when we found it.”

“And so the solution is not to bury it; the solution is to solve the problem and actually confront ourselves with the reality that we have to take this material and reduce it, so that it is safe. ... We’ll have solved our problems and not passing problems on to our future generations because if we bury it, we still haven’t solved the problem.”

“The EIS does not provide a broader context of ethical, moral and social consideration in which the scientific, technical and economic considerations can be viewed.”

“The EIS document does not contain a section nor even sub-section which deals with ethical considerations specifically.... No clear discussion of ethics, or ethical or moral perspectives was evident...while “worst-case” scenarios for technical failures are identified and discussed (to some degree) in Section 6.0, no such scenarios are envisaged for ethical matters.”

“The ethical issues are not adequately addressed and not spelled out as being controversial at all in this EIS.”

“Equity is not addressed directly in the EIS. AECL has not acknowledged that environmental equity must be central to decision-making on waste management.”

“The Ethical Guidelines for Research [Royal Commission on Aboriginal People]... should have been foundational in the ethical aspects presented in the EIS.”

“AECL should present an understanding of societal values with respect to human and non-human individuals and communities, and the interdependent earth community.”

“The proponent appears to believe that it is not responsible for developing and adhering to an ethical framework.”

“AECL has not continued (since 1991) its ethical analysis to make explicit the underlying ethical assumptions.”

AECL proposes to operate according to five principles: safety, environmental protection, voluntarism, shared decision-making, openness and fairness. Concern that 'openness' applies only to the siting process. "The ethic of openness should be applied throughout the whole of the process. Restricting it to site selection destroys trust and credibility."

"The Joint Committee is concerned that the Environmental Impact Statement (EIS) (AECL, 1994), while noting these [ethical] principles (pp. 63-69) does not include a clear, unequivocal and upfront statement of their importance. Indeed it is disturbing to see so little on these issues in the EIS which is all too apparently the product of a culture which focuses primarily on scientific and engineering issues.... Bringing together the social and technical strands of the proposed program cannot be delayed if political decisions are to be taken in an atmosphere of public understanding and broad acceptance."

"It is important for the integrity of the technical solution that it remain intact and not be compromised politically or by insufficient consideration being given to the challenging social and ethical questions aroused by the existence of the waste."

"... it is not clear how the ethical principles will be applied as criteria in choosing one or more candidate sites for the Canadian repository."

"Would it not be a better ethical decision to decide as Holland has, that there must be a facility for long-term storage of retrievable waste, with every opportunity for human intervention, in order to carry out control activities and that the wastes not only must be retrievable but the process reversible?"

The argument, that permanent disposal of these wastes is the responsibility of the society that benefited from the energy associated with them, is seriously flawed.

## **Procedural Fairness**

"Should ordinary citizens be made to feel responsible for the disposal of waste, any waste, when we've had little control over the production of these wastes in the first place? When we do not have a chance to exert control over the production of the waste, you cannot count for them to dispose of those wastes and expect an ethical conclusion. It just will not happen, with or without good science."

"Who should prove that this concept is ethical?"

"The concept creates siting criteria that ensure that the siting process is not equitable."

"There is no ethics or morality to a process that does not require community acceptance of the site."

"The ethical issue as to whether or not the body that produces the waste should also be disposing of it and conducting research into the concept" ... needs to be addressed.

Future generations are not able to give consent. The main impacts are on people and other organisms many, many years in the future. They have been left out of too many discussions. AECL does not outline a process for obtaining the consent of future generations.

“Is it not unethical and morally wrong, to approve an unproven solution to nuclear waste disposal?”

“... related to the issue of consent, most if not all aboriginal communities, particularly ones across Canada characterized by social distress, vulnerability and fiduciary beneficiary status. In light of these factors, is it legally and ethically acceptable to even seek the consent of First Nations communities in the Canadian Shield?”

Ethical implications if Canada is dependent on foreign sales of Candu reactors and waste generation in other countries to fund nuclear waste management in Canada.

### **Compensation and Incentives**

“Enticing communities to accept the facility with compensation is immoral.”

“Compensation to gain community support is unethical if it is doing other than addressing impacts on the community or individuals. It may not lead to the best site.”

“Communities that are short of cash will be pressured into lowering standards in order to gain the immediate economic benefits that hosting burial sites will provide.”

“One ethical issue ... that the compensation available from the jobs and community developments accompanying the construction and operation of the facility may outweigh public concerns, and may create very serious ethical dilemmas” does not appear to have been documented. “The Environmental Impact Statement for Canada’s nuclear waste is based on the premise that compensation such as employment opportunities, community development, road improvements, new recreational facilities, population growth and monetary incentives could balance off risks that might be associated with nuclear waste.”

“AECL’s proposed “net benefit” to a community is not an adequate solution to inequity.”

The suggestion of compensation to current humans in an area for possible damage caused in the distant future is inappropriate. And, the assumption that damage to a community or ecosystem can be fully compensated is unsubstantiated.

### **Locational Equity**

“If approved the disposal site will be located in the north. The people in the south benefit from nuclear energy, so the waste associated with those plants should be stored where it is generated. People in the north have carried the risks and costs associated with resource developments,

developments whose benefits have primarily gone to the south. We have been affected by radioactive materials for decades and will continue to be impacted for generations by the mining of uranium in the Elliot Lake area. We have already had more than our fair share of negative impacts of the nuclear fuel cycle.”

“Northern Ontario does not receive benefit from nuclear energy and so it is unfair to dispose of the waste in Northern areas.”

“We in northern Ontario do not use nuclear power in a net way. That is, we produce more power or about the same amount of power in the north as we use, not on a day-to-day basis but on a yearly basis.”

“The concept of placing radioactive waste near a community that has never had the benefit of nuclear energy is inequitable.”

“It is unjust to burden Aboriginal people with wastes of an affluent population.”

“It is unacceptable and fundamentally unjust to expect disadvantaged people to bear the burdens of more affluent populations, who receive the benefits.”

“What of the ethical dilemma posed regarding the northern communities? They have little to no use of nuclear power, yet those who benefit from its use would be sending their wastes out of sight and mind, and placing northerners, particularly First Nation communities and their way of life and livelihood, at risk.”

AECL does not address the inequity of putting people who have not benefited from nuclear energy at risk for disposal of the waste.

“Whichever jurisdiction benefits from the electrical generation should be responsible for its disposal. This includes international responsibility and is reciprocal to Canada.”

Siting as proposed is unethical in that the facility location is restricted to plutons. Many, and particularly users of nuclear energy, do not have to be concerned about living near a facility, only those in remote, often poor communities need to be concerned.

Concerned about the morality of taking wastes that are created in the South and imposing them in a Northern community. “The location of the facility likely means that people who did not benefit from the nuclear energy are most at risk.”

In the north, communities often have to choose between harmful industry and poor economy.

“We in northern Ontario do not feel it is our responsibility to accept the waste of the nuclear plants in southern Ontario.”

“Whether residents of a remote northern location should have to accept what they see as serious health and environmental concerns, regardless of the actual scientific evidence, because of the electricity which is used by people in other parts of the country.”

Concern about the frequent use of utilitarian views and references to northern lands and waters as available and supportive of the concept.

“In the current siting plan, that risks and costs will be disproportionately allocated to small, but apparently strongly opposed minorities.”

“Those who benefit from nuclear energy, and the jobs associated with nuclear energy, should be the ones who benefit from the disposition of nuclear waste.” “Attempt to distribute the risks to where they are produced or used.”

Siting is a moral decision, not just a scientific or technical one.

## **Ethical Aspects: Future Generations**

### ***Protection of Future Generations***

“It [the concept] essentially provides for no choice by future generations in protecting their own health and environment.”

“Surely it is impossible to think that long term storage of nuclear waste will be safe for future generations. It is irrational and immoral to continue to produce highly radioactive waste material.”

AECL does not articulate clearly enough its obligations to future generations.

“Future generations will have to live with consequences of decisions they did not make, and giving them the illusion that the problem of nuclear waste has been solved by deep burial is not the responsible course of action.”

“The concept is irresponsible towards future generations. It violates our respect for future generations” (as does the whole of the nuclear program).

“The geologic burial concept is based on the unfounded assumption that institutional control will not be necessary. There is no basis for assuming that future generations will not compromise the integrity of a repository, either wittingly or unwittingly.”

“Is it ethical to remove the opportunity for our children and their great-grandchildren to reverse the process should danger be imminent or new technology for neutralization or use emerge?”

“As every subsequent part of this process involves different “future generations”, it is not clear which future generation takes priority: a speedier approval process for a non-intervention proposal may benefit those generations immediately following closure, but raise higher risks for those future generations that have to deal with its failure; by contrast a lengthy approval process that keeps intervention alive may be more burdensome to near generations, but ultimately less risky to far future generations.”

“It is unethical to protect only those living in the first 10,000 years, leaving those living in the more distant future exposed to far greater risks.”

The EIS does not adequately discuss responsibilities to future generations.

“There is a conflict between the methodology used for this generation and what we are doing for future generations and especially if we talk about irretrievable storage.”

The option that “will give future generations the greatest degree of rights in terms of remediating problems that we have created with waste” has not been adequately addressed.

“In the case of nuclear fuel waste, because the toxicity remains very high for thousands of years, there is a clear opportunity for discounting future risks relative to immediate benefits.”

“Above ground storage should be explored technically to determine if it is an alternative solution. If it is, then if future generations choose deep disposal, the decision should be based on their assessment of the technical, ethical and economic arguments, not ours.”

### ***Burdens On Future Generations***

To some participants “disposal could burden future generations because they would have limited options for managing the wastes, they would not want to leave the facility unmonitored, and they would find it expensive and difficult to retrieve the wastes if desired.”

“The ethics of placing upon people whom we have never met the huge responsibility and dangers is at best questionable, and perhaps even criminal.”

“Once the waste is deposited in the ground, we have been told that it would require approximately 10,000 years to be at safe levels. This means that we will leave for our descendants within contexts of social and political organizations that we can't even conceive of, a problem. And all we have to do is refer back 2,000 years ago.”

“We cannot avoid passing on to our grandchildren the responsibility of guarding and supervising these wastes, but at least this is better than risking an unmonitored disposal system which may not keep the wastes from the biosphere in some distant (or not so distant) future.”

The proposal will leave a huge debt to burden future generations.

The concept requires future generations to involuntarily accept the risks and the potential burden of management of the waste.

The concept does not remove the responsibility for management of the used fuel from future generations.

“To deprive subsequent generations of this potential energy source seems to me a far worse thing to do than imposing upon them the easy task of storing the material in a safe place.”

Future generations will be responsible for waste from which they received no benefit.

We are burdening future generations if we bury the waste because we cannot guarantee that is safe.

## **Other**

Participants expressed concerns about obligations to current and future generations and the Earth

“Is it ethical for AECL in presentation and literature to say that the concept is safe, when that is for this Panel to decide?”

“It is ethically wrong to put our waste into our earth.”

“AECL has not achieved an ethical consensus on the concept. The majority of thoughtful people do not support this concept of disposal.”

## **1.16 Cost and Financial Deficiencies**

### **Deficiencies Related to Cost**

The issue of costs and sources of funding should be addressed in an open public review.

The cost to Canadians of developing the disposal concept is too high.

The concept is the most expensive way to deal with the waste.

Cost estimates in the EIS are likely to be low. The true cost of the proposed disposal facility is too high for the Canadian consumer to accept, and too high for the federal and provincial budgets to absorb. Concern about whether the money will be available and where it will come from (e.g., higher rates, higher debt, or higher taxes).

Question the credibility of AECL’s estimates when in 1994 the cost was projected at between \$8.68 billion and \$13 billion.

Ontario Hydro has failed to estimate the costs ... optimistic clean-up and interdiction assumptions. The likely costs will far exceed the level of liability insurance that will cover these projected shipments.

There is no guarantee that clean-up costs to clean-up contamination will be available.

Dry storage on site could be undertaken for a fraction of the cost of disposal and could be maintained for up to 500 years.

“There are many variables associated with the current budget for nuclear fuel waste management including the opening date for the burial facility, the distance to the site, and the interest and escalation rates for the fund.”

“Future research and development costs, and costs associated with extended on-site storage need to be evaluated in the context of the burial options presented so far.”

“Another important variable excluded from the consideration is the cost associated with management of the reactor core components and the other nuclear fuel wastes owned by AECL and other operators of research reactors in Canada.”

There is inadequate information on costs and financing.

The costs should be apparent and not hidden by government subsidies and grants.

Impacts with respect to financial and other costs to the province resulting from emergencies are not addressed.

AECL should provide cost estimates for a 500 year monitored storage facility.

The true cost of nuclear energy is not addressed.

The true costs of the nuclear power cycle should be included. ...A partial list of costs to be considered: 1) mining; 2) proper storage of mine tailings; 3) fuel milling and processing; 4) heavy water.

### **Deficiencies Related to Financial Aspects**

“The nuclear industry cannot afford to pay for implementation let alone future stewardship of the concept.”

The financial situation of the nuclear industry should have been included in the EIS. Money has not been set aside for disposal.

AECL should stop alluding to a fund that does not exist [segregated fund].

“How is the nuclear industry going to fund the enormous cost of both constructing an underground site(s) and the thousands of years of monitoring?”

“What government is going to spend the amount of money necessary to coming close to guaranteeing, in perpetuity, the safety of the ecosystem that will potentially be affected by that dump?”

“There should be no more tax dollars spent on research for high-level nuclear waste. The financing of this responsibility are those that use it. “

“Consideration must be given to the amount of money that cannot be collected when reactors are shut down early.” “There are no guarantees that any of the other reactors will last 40 years. “

The financial situation of the nuclear industry in Canada has not been revealed in the EIS.

The examination of cost recovery for the concept is ambiguous. Cost recovery is not in fact being realistically assimilated in current rates applied to electricity consumers.

AECL should have prepared a detailed financial plan.

“The Panel should indicate to the parties involved their desire to proceed should be accompanied by a managed plan to fund the enterprise”.

More information is required on the nuclear waste fund. There is no dedicated or segregated fund to pay for disposal and associated costs.

There should be a commitment to financial guarantees for impacts, including impacts to which a province may respond.

“Over-allocation of resources to address hypothetical, trivial risks that are unjustifiably extrapolated for into the future, should be strongly resisted.”

“Delaying implementation ... will provide time to save these guaranteed funds.”

### ***Who Should Pay?***

The producers of the used fuel should be fully fiscally responsible for the disposal of nuclear waste. But not be responsible for the actual disposal concept, planning and implementation.

Nuclear fuel waste owners should be required to set aside funds now for all future waste management costs.

Polluter pay principle.

“Others feared that future ratepayers or even taxpayers in general might end up paying for the facility.”

The Government (of Canada) should fund the waste disposal authority.

“Who's going to pay for the proposed nuclear waste disposal sites? ...If those who benefit from our nuclear technology and use results for destructive purposes, from the United States to India, are not willing to pay for the total costs of nuclear waste disposal, then it will be our social programs that will subsidize the cost of long-term waste disposal.”

The current generation must set aside the funds necessary to pay the costs of high-level nuclear waste storage or disposal.

## 1.17 Regulations and Standards

### Protection of Human and Environmental Health

The legislation is too weak.

“Independent scientists have questioned the Atomic Energy Control Board's weak standards employed with respect to acceptable amounts of radiation.”

“We believe existing standards are inadequate, leaving too much possibility for the future and for the failure.”

The AECB's regulations for this disposal concept are out of date and too lenient. The risk estimate should be 20 cancer deaths per hundred Person Sievert instead of the 5 cancer deaths assumed by the ICRP.

The Regulations do not adequately protect or address public health.

AECB regulations are too lax, inconsistent and inadequate to protect public health now and in the future.

“I think when you review R-104, you will be struck by two qualities, as I was. I think one quality is the latitude that exists within R-104, which has not been conveyed to us in the course of the discussions in this hearing. In the course of the references to 104 and the summaries and so on, I don't think that we have got a sense of that latitude, and I think it has both a positive and a negative edge to it. In the positive sense, I think that there is some latitude there in terms of its discussion of the preferred approach. The approach is a preferred one and one which would ideally be met. That's much softer kind of language and I think that's the positive latitude. I think the negative, I think, is seen in Section 432. There's a discussion about variance from the general requirement, and that leads us into a discussion of optimization and how perhaps to provide approval when the regulatory requirements, in fact, cannot be met. And I think that I would just urge the Panel to look at those, look at that regulation through a lens of that kind of concern.”

“I think the assumptions that R-104 rests on which we could not assume to test, pass the test of public acceptability are also a matter of concern. I think that the assumptions R-104 rests on would not, could not be described to form any part of our social sensibility, and I would just offer you some of those assumptions as an example.”

“We should worry that as time passes without incident, the standards of care will be reduced to reduce the expense involved.”

Concern that the standards will be relaxed over time, possibly to cut costs or due to familiarity with managing the waste. The documents do not show how the standards will be entrenched and remain in effect.

AECL followed the AECB Regulatory Document R-104 which “fails to reflect the new and still evolving standards that the ICRP recommended in 1991 and subsequently.”

There are no measures to ensure that the implementing organization will meet standards and these standards will be enforced by the AECB.

The AECB does not exercise enough control.

The EIS did not examine the adequacy of the current standards, although the guidelines require AECL to do so.

The risk standard used by AECL was a “derived standard” but a “fundamental standard” could have been used.

AECB criteria should apply to all possible concepts and the criteria need to consider other species.

AECL did not clearly address deterministic or rejection standards for the facility as the Panel had asked.

“The AECB requirement to project only to 10,000 years is restrictive given the much longer timeframe of hazard. The reasons for such a restriction are not valid. AECB in R-104 does not explain the choice of 10,000 years. Curtailing the calculations at 10,000 years, long before the most significant exposures occur, makes the standard very lenient and may not minimize the burden to future generations.”

“The EIS does not adequately address the likely tightening of regulations in the future. AECL has assumed that the existing regulations are the best that needs to be done.” (Local communities may negotiate more stringent criteria.)

There should be safety and protection standards for biota and the concept should be required to meet those standards. This is not addressed in the EIS.

The EIS over relies on the existence of laws to regulate the health effects on workers and the public.

There is a need to incorporate a health-based standard on radiological releases and doses.

AECB should not allow the use of background radiation for comparative purposes. It is not benign and the comparisons are about a natural risk and a man-made risk.

### **Process for Developing the Regulations and Standards**

“Participants ... criticized the adequacy of current AECB standards because a wider range of Canadian society should help to establish acceptable levels of risk and the standards did not adequately address social concerns related to human health and ecological integrity.”

"I think R-104 in itself and its development and acceptance in 1987 with only nine public comments, I don't think it meets the test of public participation. I think we have to question the kind of scientific work that was done, the peer review that was done for that work and so on. And I think if R-104 can't meet those tests itself, can it serve as an appropriate test for assessing the AECL concept or any other projects that it is used in the assessment."

"The AECB now, instead of treating the waste facility as a normal operating facility, wants to reduce the dose rate from the waste facility down to 0.05 milliSieverts a year. Is there any reason for that given by the AECB?"

"Perhaps the most reasonable standard today is what we anticipate the reasonable person of tomorrow may expect of us today."

"The level of the health-based component of the standard is a public policy issue, which should not be left to technical experts. The AECB should set the level of the health-based component of the standard only as a result of the widest possible peer review, public scrutiny and debate, which would take account not only of cancer deaths, birth defects and the like, but also early warning indicators, such as chromosome aberrations."

AECB should set the form of the standards to protect human and environmental health and safety but the level of the standards should be set through public debate on acceptability.

Public input to the development of this Regulation was inadequate. R-104 is not based on prevailing public values.

Those who may live near to a facility need to be involved in the development of the criteria, guidelines and standards.

### **Credibility of the Regulations and Standards**

"Even where present nuclear reactors fail to meet safety and environmental standards, nuclear regulatory agencies of Canada have not shut them down. Instead, they have permitted them to operate unsafely for years while hoping they would increase their compliance with existing standards."

Concern about inadequate information on the regulatory agency, AECB, and whether it is an appropriate body to regulate both the industry and the disposal.

No engineering standards are applicable beyond 500 years.

The validity of the International Commission on Radiological Protection (ICRP) was questioned. The ICRP uses arbitrary and unscientific methods and does not accept medical "surveillance" of its recommendations

### **1.18 Scoping of the Problem**

## **Energy Policy and Future Use of Nuclear Energy**

A public review of nuclear energy should have been undertaken.

“One of the first steps would have to be perhaps the broader energy policy review that was promised in conjunction with this one, and some form where a mandate can be determined in a public way about what that new agency or what the next stage should be.”

“There has been no Canadian comprehensive energy policy offering ordinary citizens a proper context to make decisions on anything including, waste disposal. We should have some way of saying whether we want it to come from nuclear or solar, and so this in an intelligent manner. We may very well end up deciding that percentage should stay nuclear, maybe not. ... The point is we have no intelligent consensus in this country yet. In the absence of such consensus we cannot make intelligent decisions or peaceable decisions on how to take care of waste. “

“The energy policies of Canada and the provinces and the role of nuclear energy within these policies.”

“Fuel reprocessing as an energy policy”

“The need for policies on either the continuing use or the phase out of nuclear energy”

The future of nuclear energy and the production of more nuclear fuel waste needs to be addressed.

“The concept itself is fundamentally flawed in more than a geological sense, it is flawed as a plan for solving a problem. ... The risk at the surface is fundamentally unaltered by disposing of that old waste.” The solution is to stop producing the waste and then solve the problem.

“The disposal of nuclear waste cannot be separated from the nuclear cycle or from energy policy.”

“The future of nuclear energy needs to be discussed. Stop producing nuclear waste. It is unethical to place a greater unwanted burden on a community through the continued production of the waste.”

“The Nuclear Waste Proposal has profound implications for the future use of nuclear power generation, and its role in Canadian energy policy must be examined before we proceed with decision-making on waste disposal.”

“The problem is that we are dealing with a substance that – everybody has said it - is deathly dangerous to us all, and yet there has not been an open debate about it among the people of this country”

The concept should include a well-defined plan for stopping the production of high-level nuclear waste in Canada.

A pre-condition for the final selection of a site-specific plan for long term storage or disposal should be a complete shutdown of Canada’s uranium mining and nuclear power industry.

“You are looking at how we dispose of radioactive wastes, but you cannot separate that issue from the way in which we use and continue to produce radioactive waste.”

“We should have been given information on or a comparison of potential and perceived dangers of the nuclear option and real and established dangers of other forms of energy generation.”

“They intend to keep producing nuclear waste indefinitely into the future if the burial concept is approved...no amount of burial will significantly reduce the risk at the surface.”

“The government of Canada finally carry out a full environmental impact study on the whole matter of the nuclear generation of electricity through nuclear means.”

“Calls by many, including the Panel, have failed to elicit a government-sponsored parallel study of energy policy, with room for broad public education and debate on all issues of nuclear policy.”

“A decision to proceed, no matter how qualified, risks creating a parallel system, the on-going nuclear stations and the AECL concept for burial.”

“VANA wants the problem of disposal of Canada's nuclear fuel waste to be examined in a realistic context, including:

- first, global problems of plutonium storage and commerce, both military and civilian, and prospects for a plutonium-free world;
- second, storage and disposal of reactor waste and weapons-related nuclear waste practiced or contemplated by other countries; and
- third, AECL's aspirations for the future.”

This process is to support the continued use and/or expansion of nuclear energy and continuing production of nuclear waste.

This issue needs to be addressed from a community perspective – once a disposal site is found, there will not be any pressure to stop producing the waste.

## **Reprocessing and MOX Fuel**

“The MOX fuel scheme should be considered in this review for its effect on the likelihood that other foreign nuclear wastes will be imported into Canada ...”

“The review of AECL's concept should therefore also consider whether or not the long-term objective of adequately securing the plutonium remaining in the spent fuel can be achieved with the present management and proposed deep geological burial approach.”

AECL should assess the effects of the additional heat output from MOX fuel on the disposal concept.

Criticality issues not present with the existing spent fuel must be addressed for MOX fuel.

The EIS should discuss the use of MOX fuel made from weapons-grade plutonium.

“The absence of any discussion in AECL's environmental impact statement of the likelihood that acceptance of the concept before us could be construed as an acceptance by the Canadian public of Canada CANDU MOX.”

“AECL does not mention the environmental impacts of reprocessing technology, or the suitability of siting a reprocessing plant as well as a high-level waste repository. Yet the disposal facility could accept reprocessing waste.”

The EIS should provide more information on MOX fuel and related research and development activities.

Implications of disposing of MOX spent fuel on the concept have not been addressed, including implications for transportation and waste handling, criticality, and retrievability.

Inadequate discussion of the advantages and disadvantages of reprocessing.

### **Importing Nuclear Waste**

“Export of CANDU reactors needs to be discussed. There is a link between foreign production of Candu used fuel and this concept in Canada's responsibility for disposal of the used fuel.”

“The importation of radioactive waste for commercial disposal and mixed oxide (MOX) fuel containing weapons plutonium

Issues related to the nuclear fuel cycle (e.g., nuclear energy and importation of nuclear fuel wastes) need to be addressed when looking at acceptability.

Nuclear wastes should not be imported. This is unclear in the documentation. Are we going to import waste associated with CANDU sales to foreign countries?

“Concern over the lack of clarity as to the importation of nuclear waste into Canada”

“We're concerned in our group about the disposal of international wastes, ... transporting nuclear waste across the Pacific where Canadian laws and Canadian security would have very little to do with what happens.”

The development of the used nuclear fuel waste site may result in the import of nuclear waste.

Under North American Free Trade Agreement, once a nuclear waste site is established in Canada, we may or might not be able to turn away nuclear waste from the United States.

“Therefore, it may be possible to devise restrictions or bans of US nuclear waste if there is a rationale that the restrictions are necessary for purposes of environmental protection ... If no, Canada’s capacity to limit imports of US those types of nuclear wastes specified in the Tariff Schedules appears to be limited.”

Importing of Nuclear Waste - Will the sites be designed to receive and store any and all nuclear waste products that may be shipped from or through America into Canada?

Is AECL “contemplating becoming the Nuclear Waste Disposal facility operator on a paying basis for all CANDUs operating world-wide?”

### **Alternative Energy Sources**

The nuclear industry should develop safe alternative forms of energy.

Alternative energy sources should be considered.

“We feel that the subsidization of nuclear reactors is environmentally offensive, and should be switched to research and development of alternate, benign energy sources.”

Concern that approval of the concept and disposal would stop research into development of alternative energy sources and/or better solutions for the waste.

“We are against the continued production of nuclear waste, we will not agree to any proposal for the disposal of nuclear waste until we see a commitment to the use of alternative energy sources which are socially and environmentally responsible.”

### **Other Scoping Issues**

General concerns about uranium mining in Saskatchewan and bringing the hazardous materials to the surface of the Earth.

Prohibit export of nuclear waste.

The maximum liability of \$75 million under the Nuclear Liability Act is far too limited. Government should guarantee fair compensation if an accident occurs.

“Military application of nuclear technology”

“The economic costs, risks and concerns about the perpetuation of war must be debated before this concept can be fully appreciated.

## **Aboriginal Involvement and Perspectives**

### **1.19 Aboriginal Involvement in Planning and Decision-Making**

#### ***Aboriginal Involvement and Communications***

The choice of the concept, since it is on the Canadian Shield and will likely be located on Aboriginal lands, should have involved Aboriginal people, but it did not.

AECL has failed to consult with First Nations generally and has made no substantive effort to consider the potential impacts of this concept on our communities.

“There was no consultation or aboriginal involvement at any of the initial public consultation processes. As Metis people and Metis organizations, we were not invited to any initial consultation process.”

“Proper, respectful and culturally and politically appropriate consultation of First Nations people by First Nations people should have been undertaken. These consultations should have been fully funded by the proponents.”

“AECL did not attempt to obtain ethical guidelines in respect to the research they're doing to get our consent and they did not respect aboriginal protocol.”

AECL did not dialogue with the four national aboriginal organizations; namely, the Metis National Council, the Assembly of First Nations, the Inuit of Canada, the Congress of Aboriginal People.

“You will note that not a single organization that AECL sought advice from on aboriginal issues actually represents aboriginal peoples.”

“AECL did not attempt to seek advice or testimonies from our traditional elders. Instead, AECL tried to win their favour by arranging tours to nuclear energy sites. In my opinion, this is not a fair approach and does not take into account the knowledge and input of our elders.”

“I am not convinced you have spent the appropriate time with the Cree and the Ojibway peoples where the waste-dumping will affect them in the northern areas of the Canadian Shield.”

AECL “also indicate that they had distribution of brochure in Cree and Ojibway .... Not all aboriginal people read the material in their own language. I have not seen any of these brochures in our Metis communities. Furthermore, I must remind AECL that there is over 100 aboriginal languages in Canada, not just Cree and Ojibway.”

AECL indicated that they held a series of workshops and have interacted with our aboriginal communities. I want to remind AECL that limited workshop does not constitute full consultation with our aboriginal communities and our respected aboriginal groups. ... We need one-on-one dialogue and consultation. We need community input and interaction through meaningful consultation.”

AECL has not taken the opportunity to establish a new relationship with First Nations generally.

“Our people do not have much confidence in the ability of those in the nuclear industry to understand or present our viewpoints concerning our culture and our environment. The process must provide an opportunity for us to be heard directly; otherwise, our views will not be respected.”

“Aboriginal issues and concerns can not be served by this process.”

Deficiencies with respect to the level of First Nation’s consultation involved with the preparation of the EIS.

“Before the concept of nuclear fuel waste geologic disposal in the Canadian Shield is accepted, the proponent [should] undertake an interaction and consultation process with a wide range of interests within aboriginal societies located in the northern Canadian Shield, including the Metis Nation, in order to genuinely understand aboriginal issues, meet the needs of aboriginal peoples and respect aboriginal rights and the environmental assessment process.”

“The Metis have never been consulted on the impact of a proposed nuclear fuel waste storage facility on our Metis homeland. There has to be some discussion on specific land use policies of land claims nor has there been adequate discussions on the potential impact of our political structures and self-government models.”

AECL did not consult “Aboriginal people in an appropriate manner, respective of their culture, languages and consultative process”.

Aboriginal people were not given the opportunity or time to study and understand the concept. ... AECL did not involve them in dialogue from the inception and throughout the process.

The process does not allow AECL to research, understand and then inform First Nations or the broader public about First Nation’s concerns.

There was inadequate Aboriginal community input. Informed Aboriginal community consultation is required. AECL has not shown it can approach consultation from an Aboriginal perspective.

“First Nations need to be involved to ensure that their people are informed, using appropriate language. AECL does not address the difficulty of translating nuclear concepts into Aboriginal language. Information must be presented in appropriate Aboriginal language but many of the concepts and terminology do not translate effectively.”

The panel needs to go to the northern areas of the Canadian Shield to talk to those people who are going to be affected as opposed to going to all major centres.

"It's also an important note to make that the hearings themselves did not go north of Saskatoon where the majority of the people will be directly affected by the disposal and the concept itself.

Criticism of the hearings structure and process; that it will not serve the needs of Aboriginal people or result in conclusions that address their concerns.

"A lot of First Nations communities are sadly under funded by the federal government, and as a result they're unable to attend these type of important hearings. And unfortunately Ontario Hydro and the AECL don't provide any support to communities such as ours to come here, and we have to bear this cost ourselves."

Metis have not had a full opportunity to participate in the hearings.

### ***Respect for Treaty and Aboriginal Rights***

"The Aboriginal Rights Coalition considers the unwillingness of the proponent to take into consideration aboriginal rights and the decision to ignore the findings of the Royal Commission on Aboriginal Peoples as totally unacceptable and a violation of Aboriginal peoples human rights."

"There is no recognition of Aboriginal self-government. There is no discussion of the need for aboriginal peoples to secure an adequate land base for self-sufficiency. There is no mention by AECL of respecting treaty rights."

"The respect and protection of Aboriginal and Treaty rights should be added to "criteria for the rejection of a site."

The implications of 3<sup>rd</sup> party Metis land claims have not been considered as part of this concept.

"If the Government volunteers crown lands for the disposal site and those lands are aboriginal lands, then a major violation of aboriginal and possibly treaty rights may occur if that site is selected."

"The concept does not now but must recognize that an agreement with the First Nations of Canada must also be signed."

"Our rights with respect to the fisheries in Lake Huron are not addressed in AECL's proposal."

"Consideration of this proposal without respecting our rights, authority, jurisdiction or interest over our territories is completely unacceptable."

"The concept doesn't meet the requirements of international laws and the covenants that Canada has agreed to."

"It is a gross violation of international human rights as it puts people in a position of having to choose -- choose a monetary future and accept the waste of an industry which has no regard for them."

The presence of such activities there would further withdraw land from the present negotiations before those talks are completed

The documents do not consider how various outstanding land claims could impact the proposed project.

There is inadequate attention to the potential impact on Metis people's right to hunt, fish and trap, and the potential impact on Metis traditional land-use rights.

"The implementation of the proposed concept as set out in the EIS is in violation of the First Nations Constitutional and Treaty Rights in Canada."

"Aboriginal peoples have constitutionally protected rights that must be recognized and integrated within every stage of the environmental assessment process."

"There needs to be a discussion about the principles of joint land management, joint land ownership with First Nations."

"... land under negotiation should not be pursued as a burial grounds for nuclear waste."

"But to the AMC [Assembly of Manitoba Chiefs], the framework and conduct of this review amounts in its essence to a potential bypassing of our aboriginal, treaty and other human rights."

"The process that we're talking about here is a clear violation of those rights that are described as the right to a culture, including the economic activities and enjoyment of traditional territories, the management and control of natural resources."

"It is unacceptable that public hearings were called within our territory without respect to our jurisdiction over this area."

"This review appears to have failed to ensure that these rights are adequately protected and assured in the review of this concept. And this review has failed to ensure that the basic requirements for aboriginal consent to this concept, consistent with our fundamental human right of self-determination; namely, adequate information, meaningful comprehension and procedural fairness have been met."

### ***Aboriginal Role in Planning and Decision-Making***

"This Panel, the AECL, Ontario Hydro, has no business making decisions about what will happen to the Canadian Shield, because it's within First Nations territories. And you cannot decide what is right for First Nations people and their lands."

The proposed decision-making process does not fit with Aboriginal traditions and culture or the Aboriginal view of community.

"The social and spiritual values so deeply rooted in our culture must be factored into decision-making. There must be room in the process to take our special and unique requirements with the land into account."

"Why are there no Nishnawbe elders on the panel when they, the elders, have a good understanding of the land?"

“... issues of key importance to aboriginal peoples are simply being deferred. And at the point that they're raised again, we will likely be told, 'These issues are already decided. The concept has already been given a green light, and now you're being asked for your reasons why this community or that land would make a better repository than another.’”

“AECL does not treat Aboriginal organizations as governments in their own lands.”

“AECL and Ontario Hydro have limited their analysis of potential impacts to our communities to a laundry list of aboriginal issues drawn almost exclusively from secondary sources. AECL has told this Panel that such cursory information is acceptable because aboriginal concerns and rights will be addressed at the siting level. Our problem with this position is twofold: (1) We have been involved in split hearings before, and that process inevitably acts to our detriment; (2) By failing to consider us important enough to devote any resources to us at this stage, AECL is sending a clear message to our communities and to you, the Panel.”

The proposal allows Aboriginal issues to be left to the siting stage.

There does not seem to be any research done on just how AECL intends to negotiate with the representatives of the First Nations.

“... aboriginal issues must be recognized and the distinctive world view of the Canadian indigenous population kept clearly in mind.”

### ***Aboriginal Role in Site Selection***

The principle of volunteerism and a community's right to refuse may not apply to Aboriginal people.

The voluntarism principle inaccurately distinguishes between a potential host community and an affected community.

“It is the Crown that determines who will be the “host” community. Rather than ensure public involvement, this assures that the majority of the population living in the proposed siting area will be excluded from the decision making process of whether the project will go ahead.”

“AECL's voluntary siting is inappropriate in Aboriginal territory as it does not take into account the relationship of Aboriginal communities within the treaty area.”

The voluntarism principle should include a requirement for First Nations' consent with respect to crown lands.

“At the siting level, the only question will be where this disposal site is to be located; in other words, which aboriginal community must bear the brunt of yet another development in which they have had no role from which they will receive no lasting benefits.”

“Once specific potential sites are selected, we will be played off against other First Nations, against First Nations communities. We will again receive totally inadequate funding to consider the complex technical information. We will again have to reach into our own limited resources in order to try to participate in a hearing.”

"The siting process that is being proposed as part of this process is not seen as -- or we don't view it as being voluntary."

"The First Nation's communities need to be considered to be host communities not affected communities. The communities should have the right to determine what will impact their land and people."

"AECL does not confirm that Aboriginal people must have the right to refuse the project on any Aboriginal territory."

### ***Equity***

"Why should our First Nations or other First Nations have to bear the brunt of such human error and miscalculation?"

"If this disposal project for nuclear waste is allowed to proceed, then I would expect that three disposal sites will be built in First Nation territories. These areas will be mostly populated by aboriginal people. If these settlements were mostly non-aboriginal people, would these three areas then be considered as disposal sites?"

"Why should we be forcing the people in the future to look after the waste that we generate today?"

"Many Aboriginal communities do not use nuclear power or nuclear energy. Therefore, a disposal facility should not be located on Aboriginal land."

"An ethical question, then, of can and should a well financed government such as Canada or a Crown corporation such as Ontario Hydro prey upon poor people for a specific objective, if that objective is to bury toxic materials in their lands?"

"This is a well organized, well financed government Crown Corporation, using economic leverage to impact on First Nations people."

Financial incentives will entice some Aboriginal communities/organizations to accept the proposal.

"We don't want nuclear waste on our land. It is not of our making. It has not been to our benefit and it has never been our choice."

"The question of environmental justice and cultural chauvinism I guess are two areas that should be discussed in the process."

"What we see is a clear case of environmental racism. The proposal to dispose of nuclear waste in the north is nothing more than a continuing legacy of your society to commit offenses through garbage brokering using our lands."

"This exercise has nothing to do with safety and the environment. It is much more crass than that. It is about one society trying to dump its garbage on another society, the powerless in this country. It is about environmental racism, among other things."

"Why should we suffer your waste? Our people have suffered enough as a result of your laws and your dispossession of our rights to lands and resources. Why should we now bear the burden of nuclear waste that you don't want in your backyard?"

### ***Trust and Credibility***

Some First Nations lack trust in government and industry based on past actions and outstanding grievances and their failure to provide safe guards for Aboriginal People.

“I cannot fully endorse or believe in the review process, when at this very moment my community is being subject to radioactive materials openly being dumped into the St. Clair River, which is our source of drinking water.”

“The expansion [of BPND] was authorized without a word of consultation with our people, and the importing of intermediate-level wastes into our traditional territory from all nuclear reactors in Ontario has begun.”

“Even as I address you today, Ontario Hydro is seeking to increase its capacity to store high-level nuclear waste by 100% at the BNPD, without the benefit of a public hearing.”

“Ontario Hydro's history with Saugeen and with area communities is in keeping with its blatant disrespect for public process and lack of accountability.”

“Ontario Hydro acts in flagrant violation of the rights of First Nations and area communities and fails to protect the health and the environment of people living in the area.”

“There are programs, remedial action plans which are there to clean up toxic waste, which are being dismantled because they say the funds are not there.”

“Ontario Hydro and uranium mining companies said that reactors and mines would be safe, but studies show that they are releasing radioactive material.”

There is a long history of broken commitments. Commitments made today may be broken in the future. What then will be the consequences, what are the considerations now, today, tomorrow, 20 years from now that would change that commitment?

## **1.20 Aboriginal Perspectives on Long-term Management**

### ***The Generic Disposal Concept***

“The proponent has not demonstrated the need for having a geological disposal facility for nuclear waste.”

Aboriginal people may not derive “any significant benefit from agreeing to accept a facility.”

“Site selection and concept approval should be undertaken jointly. It is difficult to assess the proposed concept when it is divorced from any particular environment or site. First Nations cultures are diverse and they live differently in many different environments.”

“Once again, it would seem that Canada is perpetuating the racist presumption of the early explorers, that the north is empty and available to the white society to do with as they please.”

The concept assumes that “the fewer people in the north together with the animals and environment here are dispensable.”

“The concept requires First Nations people to bear the brunt of Canada's nuclear waste problem.”

“Government of Canada is pursuing plans to bring into this territory the worst poisons known for storage and disposal in ways that have not been proven to be safe and to do so in a way that would make our land inaccessible to us, even as we are dealing with it at the negotiating table. This, we view as an act of bad faith.”

“The material can not be adequately monitored using the proposed concept, thus increasing the magnitude of negative impacts as a result of any failure in the containment system.”

“The concept predetermines a location on the Canadian Shield, most of which is Aboriginal lands.”

“Our government and industrial sectors should have learned a long time ago that burying waste does not solve our waste problems.”

“We, too, are concerned with questions of uncertainty, of long-term institutional capacity, of the irretrievability of buried waste, of the geological stability of rock formations if they are disturbed, of container integrity and transport issues, of the possibility of reprocessing near repository sites, and the fallacy of the concept of disposal.”

“We do not have the technology to adequately and safely manage radioactive waste from nuclear power stations.”

Storing nuclear waste in the “womb of Mother Earth” contradicts Anishnabe beliefs and responsibilities with Mother Earth.

The industry did not plan for the next seven generations.

The Free Trade Agreement may prevent the Canadian government from prohibiting waste from entering this country.

The concept may allow nuclear waste to be imported from other countries.

### ***Alternative Management Options***

"The wastes should be kept on-site where it is". Keep the waste in above ground storage.

"The radioactive waste generated so far should be stored above ground, near the point of generation. The storage facilities should be monitored continuously, with multiple back-up containment systems and very good security measures."

So what you should be looking at is finding alternative places to store your waste. ... If your nuclear waste is so safe, bury your waste, if it is safe, under Parliament Hill."

"The UCCM encourage the Federal Minister of Environment to reject the concept of disposal of the high-level radioactive waste on the basis that there are other more suitable ways of disposal of that waste."

"There should be enhanced efforts in the research and development of safe and renewable alternative energy sources."

"These hearings should recommend that the generation of these wastes be stopped immediately, and all nuclear power stations be decommissioned."

Stop producing nuclear waste. Place a moratorium on waste production and conduct full environmental assessment into the question to see what should be done.

### ***Transportation***

"We do not believe that the transport of nuclear waste has been proven to be safe in the EIS. The assertions of transport safety in the EIS are based on Canada's limited experience with transport of nuclear waste."

"We don't want our community or any community exposed to the additional risk which will result in the transport of high-level waste."

"The rights of the communities to reject transport of nuclear wastes through their midst are to protect themselves from such a risk are not respected in this proposal."

"The safety issues surrounding the transportation have not been addressed. The emergency preparedness in the event of an accident has not been addressed. The detailed handling in the transportation have not been addressed. Therefore, we charge this is not safe and is not acceptable, period."

"The transportation phase holds an unacceptable risk due to the potential for accident in uncontrolled locations and situations."

"The impact of accidents aren't fully known, and our concern is what happens when a thousand bundles of radioactive material fall into the lake."

## **The Environmental Impact Assessment**

### ***Spiritual, Cultural and Social Values***

AECL did not pay special attention to the viewpoints of Aboriginal people or “how traditional knowledge and experience of Aboriginal people might be incorporated into the analysis of the effects of the facility.”

“The cornerstone of the cultural, religious and social integrity of many First Nation Communities lies within our respect and dependency on the land, the water and the air. Consequently, to damage and disrespect these three elements is to damage and disrespect our way of life for generations to come. Our health, our land use practices, and ultimately our culture, religion and traditions, which are intrinsically linked to our territories, will be threatened. Compensation for any damage would be inadequate; a dollar figure cannot be placed on the vitality of our culture or the value of our territories.”

The EIS fails to adequately consider the perspectives of Aboriginal people and their concerns with and potential impacts from the proposal. The EIS and other documents virtually ignored the rights, interests and indeed the presence of Aboriginal peoples on the Canadian Shield.

“The Environmental Impact Statement provides an inadequate environmental impact analysis and simply no social impact assessment, at all. Impact assessment studies including studies with respect to our land use, traditional harvesting and our mixed economy, such studies must be designed and controlled by aboriginal people.”

“An impact assessment, including impact assessment studies with respect to our land use, traditional harvesting and our mixed economy must be designed and controlled by aboriginal people.”

“AECL should have funded an independent study of the impacts of the concept of disposal on our communities.”

“... aboriginal peoples bring spiritual, cultural and social values into the discussion, which we felt were lacking in the Environmental Impact Statement.”

The proponent has failed almost completely to adequately present First Nations understanding of their environments and their links to the land. The EIS fails:

- to present First Nation’s different views regarding the possible impacts of its concept.
- to integrate aboriginal social, spiritual and other concerns with technical and economic analyses.
- to understand or present these concerns at all.

Aboriginal concerns about the impact on mother earth and future generations have not been adequately addressed..

The social or the cultural or the spiritual impact that the development had in its beginning is not addressed.

A more complete assessment is required to determine the possible impacts on Aboriginal people, their lands, lifestyle, societies and culture.

“The ARC [Aboriginal Rights Coalition] insists that before any decision is made to accept the “concept” of high-level nuclear waste disposal there be a holistic, independent Aboriginal-directed study of the social, cultural, health, economic, lands, and lifestyle, and environmental impact of the geologic disposal of high-level nuclear waste.”

“We feel the priority should be the quality of life, not the standard of living, and that the perspective must be far longer than the next election.”

Aboriginal issues and particularly Aboriginal points of view, which were required by the guidelines, are not adequately addressed.

The traditional knowledge and awareness of aboriginal people is not addressed or even explored or attempted to be explored in the Environmental Impact Statement. Aboriginal people possess a large body of conceptual and technical knowledge that was not used by AECL.

The issues and concerns of aboriginal women, whose land use pattern, social, economic, political and cultural role is unique within First Nations received no attention from AECL, the panel, or the EIS.

AECL focuses on radiation doses without consideration of cultural variations in use of the land. And, AECL does not address the effect of fear of risk on use of land and the socio-economic effects.

The EIS fails to adequately address the cumulative socio-economic impacts on Aboriginal people (e.g., past effects of non-Aboriginal actions together with the effects of the repository).

An assessment is required of effects on Saugeen lands, waters and resources and Saugeen policies and other environmental issues. An assessment should include:

- Saugeen environmental assessment
- Traditional values and cultural assessment
- Social, economic and other First Nations assessment
- Health, human rights and generational rights assessment
- Fisheries and aquatic habitat assessment

Proposal does not adequately address how impacts on Aboriginal people will be mitigated.

The proponent has not discussed the impact of contamination of the environment on traditional land users, the harvesting of fish, animals, wild rice, berries and other foods as well as medicinal plants.

“I found it quite surprising that in a country like Canada, at the end of the 20th century, given 20 years since the Berger Commission Report, that that report would have appeared with so little reference to aboriginal concerns and interests as did appear.”

### ***Human Health and Safety***

“Aboriginal perception of safety and incorporating traditional knowledge was not considered by AECL but would have brought a different dimension to the perception of safety.”

“AECL did not consider the potential risk to the health of Aboriginal people”.

“The concept also violates the international right to a safe environment. There's no safe exposure to low-level radiation, we know that. There is no evidence of what long-term effects to low-level exposure to radiation, what will happen.

“There is no guarantee that there will be no radiation fallout nor spill. Such a disaster could do permanent damage to the food chain.”

“There must be a study of the health impacts of changes in diet due to contamination of the environment.”

“It's about safety, it's about a right to self-determination, to decide for ourselves, our children and the unborn what they will have to face.”

“There are just too many unknowns to take a gamble on our precious elements of life and the environment to even endorse, let alone condone such preposterous plans.”

“There is “little information about the potential impacts of the proposal on aboriginal people.”

The EIS does not adequately address the potential impacts on Aboriginal life, the potential health, social, economic and cultural impacts on First Nation's people.

“All the information that has been processed and that has been forwarded to the First Nations is ... all the pros and how good this whole issue of having a possible repository in the north would be great for the economic stability of these aboriginals. But where is the health implications?”

“Any definition of community health should include an investigation of the community's collective mental health, not just an investigation of individual health. The proponent needs to study how the nuclear industry affects aboriginal children by denying them the opportunity to pursue traditional activities and how this has an impact on the community's collective mental health.”

“There must be a study of the health impact of changes in diet due to the contamination of the environment. There must be long-term health studies of human and non-human health in places where nuclear contaminants have been dumped or have escaped into the environment... Another consideration is an investigation of the health impact of uranium as a heavy metal on humans and fauna.”

### ***Environmental Health***

The containment and buffer measures are insufficient.

“There needs to be adequate baseline studies of the potential impact of the proposed nuclear waste facilities, including on wildlife and migratory birds.”

The proposal does not adequately address the impacts to the ecosystem and traditional land users. There may be detrimental impacts on northern water basin, rivers, and lakes, and on forests, and wildlife, which in turn will affect Aboriginal livelihood for trappers, fishermen, and wild rice growers.

## **1.21 Aboriginal Perspectives on the Environmental Impact Statement (EIS) Documents**

“AECL's Environmental Impact Statement failed to provide an aboriginal definition of "community", an aboriginal understanding of the value of land to First Nation communities.”

“We contest the process and methodology in developing the Environmental Impact Statement. We deplore the lack of attention to health and safety. We dispute the thoroughness of the EIS, and we condemn the haste with which this process is being pushed forward.”

“There must be a holistic approach to address deficiencies in the following areas: That there is an inadequacy of current documentation and process; that there needs to be more attention paid to cultural considerations; there needs to be attention paid to the fact that there's a bias towards scientific knowledge over traditional knowledge; there needs to be more attention paid to treaty rights, land rights and aboriginal jurisdiction; the cumulative impact must be looked at; and community health needs to be addressed more comprehensively.”

“There is no real investigation of the potential impacts on Native peoples and their way of life, and any opinions that are inconsistent with the needs of the nuclear industry have been disregarded by the proponent and by the Panel.”

“In our opinion, AECL Undertaking No. 83 does not address a single concern that the Aboriginal Rights Coalition brought forward in our original brief to the Panel and on the concept of nuclear fuel waste disposal.”

“Cumulative impact: The impact of the concept of nuclear waste disposal must be analyzed as part of the entire nuclear industry and other development projects in the northern Canadian Shield...A cumulative impact study should include an investigation of the impact of present and future regulations that restrict traditional land use such as fish and game acts and gun control laws.”

## 7. APPENDIX B: METHODOLOGY

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## **B.1 Participants in the Hearings**

The participants in the hearings made oral and / or written submission to the Panel. Participants included:

- Public participants, i.e., individuals, groups and organizations who are not affiliated with the industry and or the proponent and who do not represent professional organizations,
- Aboriginal individuals and organizations;
- The Proponent (i.e., AECL) and supporter (i.e., Ontario Hydro);
- The Technical Review Committee;
- The Regulator (i.e. AECB);
- Federal government departments, (e.g., NRCan, Environment Canada, Health Canada);
- International participants (e.g., SKB Sweden, Member of German Parliament);
- Other technical experts (e.g., Royal Society of Canada, Canadian Geoscience Council, Consulting Engineers and Social Scientists); and,
- Invited Speakers who presented to the Panel a professional or academic opinion and/or data.

Public and Aboriginal participants include the professional / expert opinion and comment provided on behalf of those participants (e.g., consulting firms that prepared a review on behalf of a group), as well as submissions made by individuals as citizens who have professional qualifications (e.g., geologist, social worker), academics, and professional and union organizations (e.g., Canadian Nuclear Society, Power Workers Union). Many of these groups and/or their consultants and advisors raised issues also identified by the 'technical' and regulatory reviewers - the Scientific Review Group, AECB, federal government in presentations and submissions.

## **B.2 Scope of the Review**

For purposes of this research, the "concept" refers to all aspects of the concept as presented by AECL in its submissions to the Panel and all aspects of and related to the concept addressed at the CEAA hearings. Social Issues captured in this review include those concerning:

- the deep geologic disposal proposal;
- the Nuclear Fuel Waste Management and Disposal Concept Hearings and the Panel review process;
- AECL's process for researching and developing the Concept;
- AECL's process for preparing the EIS; and,
- the scope of the concept and the CEAA review (e.g. the future of nuclear energy, alternative energy sources, and the import of nuclear waste from other countries).

## **B.3 Definitions**

In their report, the Panel did not define social issues or technical issues. The Panel chose to use but not define the term "shortcoming" when referring to issues raised at the hearing. However, the Panel's application of the terms suggests a broad definition of social. In addition, the Government Response did not provide a definition of "social issues". For the purposes of

this research, definitions of “social”, “shortcoming” “issues” and “social issues” are provided below.

### **B.3.1 Definition of Social**

"Social" is defined as “of or relating to human society, the interaction of the individual and the group or the welfare [well-being] of human beings as members of society”.<sup>5</sup> The definition broadly addresses the relationship between people and society, including relations at the local, regional, provincial, national and international level. It includes quality of life, economic, cultural and institutional aspects. It can also include individual, group and community perceptions of a proposal or the perceptions of risk associated with a proposal, as well as all aspects related to a proposal that may influence or potentially influence the life, well-being and relations of individuals, groups and community, and the environment.

The definition is consistent with the implicit definition of ‘social’ used by the Panel. It also reflects the interaction and well-being considerations associated with nuclear fuel waste management in Canada. The definition is also consistent with the practice of social and socio-economic impact assessment as it addresses the well-being and relations in a social group or groups. The definition and use of the term “community” in social impact assessment practice also supports the definition of “social”.<sup>6,7</sup>

In social impact assessment, “socio-economic impacts are analyzed according to a fundamental social consideration: what are the changes that a project such as the disposal facility will bring to people as they interrelate with each other and with their natural environment.”<sup>8,9</sup>

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<sup>5</sup> Webster’s Third New International Dictionary of the English Language Unabridged, Merriam-Webster Inc., Springfield Massachusetts, p. 2161.

<sup>6</sup> M. Paez-Victor. Socio-economic Impact Assessment of the Conceptual System for the Disposal of Nuclear Fuel Waste. Support Document A-4 to the Preclosure Environmental and Safety Assessment. Ontario Hydro Nuclear. December 1993.

<sup>7</sup> Armour Environmental Consultants Inc. and Institute of Environmental research (1985) Inc. Social Impact Assessment: South Quarry Landfill Development - Final Report, Schedule 7, Prepared for Steeley Quarry Products Inc., August, 1990. p. 67 refers to and defines aspects of community character as part of the social impact assessment. ““Community character” refers to the distinctive qualities of a community which can be physical (land uses, environmental features) socio-cultural (way of life, shared values and perspectives) and economic (type of business activity taking place). The character of a community is a function of the mix of these qualities and, more importantly, the meaning which residents attach to these qualities.”

<sup>8</sup> Ontario Hydro Nuclear. The Disposal of Canada’s Nuclear Fuel Waste: Preclosure Assessment of a Conceptual System, June 1994, p. 6-121.

<sup>9</sup> In SIA, social has been applied to address social issues related to a project, program or policy. See: Hardy Stevenson and Associates Ltd. Social Impact Analysis Report: Glenridge Landfill Extension, Prepared for City of St. Catharines, January 1995. This report does not explicitly define social or social issues. However, the analysis was based on a social issues approach to impact assessment. The public issues related to the landfill were accepted as social issues and included in the analysis of the effects on individuals, groups and the community. The analysis confirmed the validity of the issues and focused on the issues that contributed to the identification of potential impacts and mitigation and management measures. The social issues included many technical, engineering, scientific issues and the natural environment due to their potential influence on the lives and well-being of the people in the community. See also: Armour and Associates and Institute of Environmental Research (1985) Inc. Investigations for Landfill Sites in Areas I, II, and VI in the City of Brampton: Social Impact Assessment, Prepared for the Regional Municipality of Peel, March, 1987, p. 1 “... social impacts are the effects of projects (or programs or policies) on the well-being of people. More specifically, social impacts are changes that occur in people’s way of life (how they live, work, play and interact with one another on a day-to-day basis), their cultural traditions (shared beliefs, customs and values) and their community (its population structure, cohesion, stability, character, aesthetics, services and facilities) as a results of the development and implementation of a new project and that are experienced by these people as significant events. ... Social impacts can result indirectly from other impacts both environmental (e.g.,

### **B.3.2 Definition of Shortcomings**

The Panel Report refers to social and technical shortcomings of the Concept rather than issues associated with the Concept. Shortcoming is defined as “a failure, defect, or deficiency in conduct, condition, thought, ability, etc.: *a social shortcoming, a shortcoming of his philosophy*”.<sup>10</sup> This definition appears to be consistent with the application of the term in the Panel Report and its use of the word in reference to technical and social deficiencies of the proposed concept in the hearings transcripts and written submissions.

### **B.3.3 Definition of Issues**

The term “issues” is not defined in the Government Response to the Panel recommendations. We have defined “issues” to mean “a point, matter or dispute, the decision of which is of special or public importance.”<sup>11</sup>

### **B.3.4 Definition of Social Issues**

For the purposes of this review, social issues are taken to mean failures, defects and / or deficiencies in or related to the AECL Nuclear Fuel Waste Management and Disposal Concept that pertain to, or are perceived to pertain to, human society and the environment, the interaction of the individual and the group or the welfare [well-being] of human beings as members of society. Therefore, social issues raised by the hearings participants may include deficiencies related to interests at the local, regional, provincial, national and /or international level, including interests of human and environmental health, science and technology, engineering, ethics, government policy, and regulation of the industry.

For submissions made by federal government reviewers, the Technical Advisory Committee, Atomic Energy Control Board, international participants, invited speakers and technical expert reviewers (non-public participants), stated failures, defects and/or deficiencies of the concept were deemed to be social issues where the deficiencies were directly related to people, their interaction and their well-being. Issues and shortcomings raised by these participants that were not directly related by the participant to people, their interaction and well-being were not considered to be social issues.

In addition to any social issues raised by non-public participants, all issues raised by public and Aboriginal participants were deemed to be social issues. It was assumed that the stated deficiency was perceived to have the potential to adversely affect the life, well-being and relations of an individual, group, community (e.g., issues related to health and safety) or the environment. These social issues include perceptions about scientific, engineering and technical matters (e.g., container and vault design, geological considerations, and natural environment considerations). They also include perceptions about aspects of the concept that could result in changes in quality of life, cultural, jurisdictional and other aspects of social and

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contamination of ground water, air pollution, loss of wildlife) and economic (e.g., property devaluation, increased tax burden).”

<sup>10</sup> Webster’s Encyclopedic Unabridged Dictionary of the English Language, Portland House, New York, 1989, p. 1319

<sup>11</sup> Webster’s Encyclopedic Unabridged Dictionary of the English Language, Portland House, New York, 1989, p. 757

community life. Therefore, the issues of concern to the public and Aboriginal participants that help to shape the public's perception of the concept are captured in this review.

All issues identified by the Panel or hearings participants as social 'shortcomings' were deemed to be social issues for the purposes of this report. The public and Aboriginal participants' expressions of failures, defects or deficiencies of the concept also capture 'points, matters or disputes' related to the concept which are considered by some of the hearings participants to be of public importance.

## **B.4 Identifying and Documenting the Social Issues**

The hearings material, which formed the basis of the review, included:

- digital versions of the transcripts of the 531 registered presentations and the additional 56 (approximately) unregistered presentations in First Nations communities made to the Panel;
- 536 written submissions presented to the Panel, either in association with a presentation or as independent written submissions;
- the Scientific Review Group Report (October 6, 1995) and Addendum (September 16, 1996); and
- the Environmental Assessment Panel Report (Panel Report).

### **B.4.1 Identification of material to be reviewed**

The following steps were undertaken to identify the hearings material to be reviewed:

- All of the transcripts and written submissions of public and Aboriginal participants to the hearings were identified, including transcripts and submissions of experts, who prepared and/or presented their review on behalf of the public and Aboriginal participants (e.g., Philip Richardson, geologist for Northwatch).
- A key word search was conducted of the transcripts of all other participants to the hearings with the exception of AECL, Ontario Hydro and the Scientific Review Group to identify those additional participants who made comments about aspects of people and/or communities.<sup>12</sup>
- The listing of all written submissions received by CEAA was reviewed to identify written submissions made to CEAA independent of a verbal presentation to the Panel.

### **B.4.2 Documentation of the Social Issues**

No attempt was made to screen participants' comments on any basis (e.g., factual correctness or accuracy). If a participant to the hearing expressed an issue related to the concept, it was recorded, either as a quotation or as a paraphrased statement. Where more than one participant raised the same issue, one statement was used to represent the issue.

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<sup>12</sup> The key words (and their derivatives) used were: Aboriginal, First Nation, community, culture, social, people, spiritual, politics, legal, jurisdictional, ethics, future generation, fairness, lifestyle, public, public health, community health.

### **B.4.3 Listing the Social Issues**

Over 1,200 statements of social issues are included in the listing presented in Table 1. These statements document the issues as they were raised by participants in the hearings. They may be broad statements of social issues of the concept or, as in most cases, they may be specific to a particular aspect of the concept or long-term management of the used fuel. There is a great deal of similarity and some repetitiveness in these statements.

The statements of issues in Table 1 were used to construct the summary in Section 3. Summary social issues were developed for each main heading of the classification (Figure 1). They represent the main theme or ideas of the individual statements of issues found in Table 1. For some headings, one issue sufficiently captures the meaning of the statements of social issue. For other headings, more than one issue is required due to the diversity of the statements of social issues related to the heading.

## **B.5 Classifying the Social Issues**

A classification system was developed to organize the issues to help the reader to better understand and address them. The large number of statements of social issues identified in this review required a detailed classification to ensure that similar statements of issues can be grouped together and identified easily.

### **B.5.1 The Approach to Classifying the Social Issues**

An approach was developed to thematically cluster, or classify the issues. The approach to classifying the social issues included a review of the classification of social issues for other projects and a review of the social issues identified in this project. The classification of the social issues was based on the following factors:

- the structure of the hearings (e.g., This environmental assessment hearing was structured to address specific considerations in an environmental assessment such as need, alternatives, and the EIS Statement. These topics were reflected in participants' comments.);
- the questions investigated during the hearings (e.g., Risk and Uncertainty, Acceptable Levels of Risk and Ethical Aspects);
- the types of social issues raised by the public and Aboriginal participants;
- the participants' statements of issues and the terminology used; and,
- the extent and importance of Aboriginal participation in the hearings.

The classification was influenced by:

- the classification/groupings used in the Panel Report;
- social and public issues classifications used in other projects and environmental assessments;<sup>13</sup> and,

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<sup>13</sup> A review was conducted of the treatment social issues in selected nuclear waste and non-nuclear management research. The results helped to inform the classification system developed for this assignment.

- experience with, and professional knowledge of, public consultation and environmental assessments.

Based on the above, the classification of social issues was developed on an iterative basis:

- as social issues were identified in the hearings material, the issues were assigned to the appropriate class;
- where an issue did not fit into an existing class, a new class was identified; and,
- where many issues were listed in a class, sub-classes were developed to group the similar subsets of the issue.

Aboriginal perspectives on, and related to, the concept are grouped separately from the perspectives of others. This separation of issues related to Aboriginal people is consistent with the Panel's treatment of Aboriginal issues throughout the hearings and in its' Report and with the extent of involvement of Aboriginal participants and communities in the hearings.

### **B.5.2 Rationale for the Classification of Social Issues**

This listing and grouping of social issues for the Nuclear Fuel Waste Management and Disposal Program:

- enables aggregation and traceability of the social issues for further analysis and planning, as required;
- facilitates an understanding of the nature of complex social issues;
- accommodates somewhat different meanings for the social issues within each class/group; and,
- facilitates the identification of social issues of a certain type among a long list of social issues.