

The Seaborn Panel Process and Conclusions

~background~

- The Seaborn Panel held public hearings in many locations in Eastern Canada. They also made special efforts to solicit input from aboriginal communities.

- After due deliberation, the Panel concluded in its final report that:

"As it now stands, the AECL concept for deep geological disposal 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 for managing nuclear waste."

- The Panel did not reject the concept of geologic disposal altogether, but noted that it had failed the test of "public acceptability" and only earned a mark of 50 percent on the question of the long-term safety of geologic disposal:

"From a technical perspective, safety of the AECL concept has been on balance adequately demonstrated for a conceptual stage of development, but from a social perspective it has not."

"The concept in its current form does not have the required level of acceptability to be adopted as Canada's approach for managing nuclear waste."

- There has been much discussion over what the Seaborn Panel meant in saying that the "safety of the AECL concept" has not been demonstrated "from a social perspective" but only "from a technical perspective".

The Panel's thinking can be found in Chapter 5 of the Seaborn Report, especially in section 5.2.2, which is entitled "Safety from a Social Perspective". Because of its importance, that section of the Seaborn Report is attached to this summary.

- The Seaborn Panel was unanimous in recommending to the Government of Canada that a Nuclear Fuel Waste Management Agency should be established quickly, "at arm's length from the utilities and AECL".

The Panel specified that "its board of directors ... be representative of key stakeholders", and that the Agency be subject to "multiple oversight mechanisms" including "regular public review, preferably by Parliament."

- Instead, the Chrétien government has set up the Nuclear Waste Management Organization under the control of the nuclear industry, whose board of directors consists solely of those producing the nuclear wastes: Ontario Power Generation, New Brunswick Power Corporation, Hydro-Québec, and AECL (Atomic Energy).

Moreover, in the law as enacted, the NWMO will communicate its recommendations in November 2005, directly to cabinet. There is no legal requirement for any kind of public oversight or Parliamentary Review.

THE HISTORY OF THE CITY OF BOSTON FROM 1630 TO 1800

The city of Boston, Massachusetts, was founded in 1630 by a group of Puritan settlers who sought a place where they could practice their religion freely. The city grew rapidly and became one of the most important centers of commerce and industry in the eastern United States. In 1773, the city was the site of the Boston Tea Party, a protest against British taxation. The city was then occupied by British troops during the American Revolutionary War. After the war, the city continued to grow and became a major center of industry and commerce. In 1800, the city was still a small town, but it was on its way to becoming one of the largest and most important cities in the United States.

Report of the Seaborn Panel on High-Level Nuclear Wastes

verbatim excerpts from the Executive Summary

Criteria for Safety and Acceptability

The Panel examined the criteria by which the safety and acceptability of any concept for long-term waste management should be evaluated (Chapter 4 of this report). In doing so, it came to the following key conclusions.

Key Panel Conclusions:

1. Broad public support is necessary in Canada to ensure the acceptability of a concept for managing nuclear fuel wastes.
2. Safety is a key part, but only one part, of acceptability. Safety must be viewed from two complementary perspectives: technical and social.

On this basis, the Panel defined the safety and acceptability criteria as follows:

To be considered acceptable, a concept for managing nuclear fuel wastes must:

- a. have broad public support;
- b. be safe from both a technical and a social perspective;
- c. have been developed within a sound ethical and social assessment framework;
- d. have the support of Aboriginal people;
- e. be selected after comparison with the risks costs and benefits of other options; and
- f. be advanced by a stable and trustworthy proponent and overseen by a trustworthy regulator.

To be considered safe, a concept for managing nuclear fuel wastes must be judged, on balance, to:

- a. demonstrate robustness in meeting appropriate regulatory requirements;
- b. be based on thorough and participatory scenario analyses;
- c. use realistic data, modelling and natural analogues;
- d. incorporate sound science and good practices;
- e. demonstrate flexibility;
- f. demonstrate that implementation is feasible; and
- g. integrate peer review and international expertise.

Safety and Acceptability of the AECL Concept

After applying these criteria to the AECL disposal concept, the Panel arrived at the key conclusions listed below. The rationale for them, and an elaboration on the technical and social perspectives of safety, are documented in Chapter 5.

Key Panel Conclusions:

3. From a technical perspective, safety of the AECL concept has been on balance adequately demonstrated for a conceptual stage of development, but from a social perspective, it has not.
4. As it stands, the AECL concept for deep geological disposal 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 for managing nuclear fuel wastes.

Future Steps

The Panel considered the steps that must be taken to ensure the safe and acceptable long-term management of nuclear fuel wastes in Canada (in Chapter 6 of this report). It arrived at the following key recommendations.

Key Panel Recommendations

A number of additional steps are required to develop an approach for managing nuclear fuel wastes in a way that could achieve broad public support. These include:

- *issuing a policy statement on managing nuclear fuel wastes;*
- *initiating an Aboriginal participation process;*
- *creating a nuclear fuel waste management agency (NFWMA);*
- *conducting a public review of AECB regulatory documents using a more effective consultation process;*
- *developing a comprehensive public participation plan;*
- *developing an ethical and social assessment framework; and*
- *developing and comparing options for managing nuclear fuel wastes.*

Note to reader: This entire text (both pages) is taken verbatim from the Seaborn Panel Report.

Taking into account the views of participants in our public hearings and our own analysis, we have developed the following basic recommendations to governments with respect to a management agency:

- that an NFWMA [Nuclear Fuel Waste Management Agency] as described in Chapter 6 be established quickly, at arm's length from the utilities and AECL, with the sole purpose of managing and co-ordinating the full range of activities relating to the long-term management of nuclear fuel wastes;
- that it be fully funded in all its operations from a segregated fund to which only the producers and owners of nuclear fuel wastes would contribute;
- that its board of directors, appointed by the federal government, be representative of key stakeholders;
- that it have a strong and active advisory council representative of a wide variety of interested parties;
- that its purposes, responsibilities and accountability, particularly in relation to the ownership of the wastes, be clearly and explicitly spelled out, preferably in legislation or in its charter of incorporation; and
- that it be subject to multiple oversight mechanisms, including federal regulatory control with respect
 - to its scientific-technical work and the adequacy of its financial guarantees;
 - to policy direction from the federal government; and
 - to regular public review, preferably by Parliament.

Until the foregoing steps have been completed and broad public acceptance of a nuclear fuel waste management approach has been achieved, the search for a specific site should not proceed.

If the AECL concept is chosen as the most acceptable option after implementation of the steps recommended above, governments should direct the NFWMA, together with Natural Resources Canada and the AECB or its successor, to undertake the following:

- review all the social and technical shortcomings identified by the Scientific Review Group and other review participants;
- establish their priority; and
- generate a plan to address them.

The NFWMA should make this plan publicly available, invite public input, then implement the plan.

from the Seaborn Report, Executive Summary

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Section 5.2.2. from the Seaborn Report is given verbatim and complete, as is Section 5.3 .

5.2.2 Safety from a Social Perspective

We present these views of the safety of the AECL concept to clarify the question of safety as seen from a social perspective, a complementary view to the technical perspective. Not all members of the Panel subscribe to all of these views, but all think it important to present them.

5.2.2.1 Introduction

In applying the safety criteria in Chapter 4 to the AECL concept of deep geological disposal, we take a different approach than if we were applying them strictly on a scientific and technical basis. We have three concerns.

First, some components of high-level nuclear wastes will pose a serious hazard to human health and the environment for hundreds of thousands of years. Hence, more so than for most human activity, we have to think of potential repercussions far into the future. This leads us to take a very cautious approach to any decisions on safety flowing from judgments made now. Society must be confident that human institutions will have the knowledge and capacity to manage a risky situation and to change direction to deal with things that might go wrong.

Second, we are very concerned about the number, nature and importance of the scientific uncertainties that are inevitable in such a new field over such a long time frame. Few precedents guide us, but we do have previous historical and community experience with similar undertakings to inform our view of safety. We are also concerned about the specific shortcomings in the AECL proposal that many eminent scientists identified. We are not greatly reassured that these same scientists nonetheless suggest that the concept is suitable for proceeding to the next stage.

Whatever the claims of some technical experts to the contrary, in the public mind and in the mind of many risk experts any risk assessment which has to take into account the behaviour of natural and technological to say nothing of social and political systems over spans of time far exceeding those of recorded human history will be dogged by high levels of uncertainty.

[Dr. Conrad Brunk, University of Waterloo [Transcripts, March 13, 1996, p. 98.]

Third, we recognize that the public tends to be concerned less about the probability of extreme events than about their potentially negative consequences and the magnitude, the reversibility and the extent over time of these consequences. For the public, safety is not a matter of probabilities and meeting standards and regulations. It is, rather, the opposite of danger; it is protection from harm.

These three basic concerns, which we share with many members of the public, are critical to our analysis of safety from a social perspective. They are reflected in what we have to say about each of the safety criteria, and are vital to the following overall conclusion.

Social Conclusion

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

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5.2.2.2 Social Commentary on Safety Criteria Applied to the AECL Concept

Our evaluation of the proponent's concept from a social perspective appears below in terms of each of the seven safety criteria previously noted.

a) Robustness in meeting appropriate regulatory requirements

In addressing this criterion, various questions arise. Can AECL's concept assure the same level of protection to generations living far into the future as it does to current generations? Do AECB standards represent what Canadian society deems to be acceptable risks to human health and the environment? Our view on this criterion relate to two points. One is the lack of confidence in the methodologies and some of the critical scientific tools AECL used to demonstrate that its proposal will meet the regulatory criteria. The other is the adequacy of the regulatory requirements.

The presentations to the Panel show that the scientific community's opinion is divided on the issue of robustness. Many experts expressed confidence in the safety of the concept. They based this confidence on AECL's statement that its concept would meet the regulatory requirements by a wide margin of safety (three to six or seven orders of magnitude for the first case study [Atomic Energy of Canada Limited, Environmental Impact Statement, p. 319.] and one order of magnitude for the second one [A.G. Wikjord, P. Baumgartner, L.H. Johnson, F.W. Stanchell, R. Zach, and B.W. Goodwin, The Disposal of Canada's Nuclear Fuel Waste: A Study of Postclosure Safety of In-room Emplacement of Used CANDU Fuel in Copper Containers in Permeable Plutonic Rock, Volume 1: Summary (Atomic Energy of Canada Limited Report, AECL - 11494 - 1, COG - 95 - 552 - 1, 1996, Part of Undertaking 58, Additional Information 60), p. 25.]). Others criticized the adequacy of AECL's scientific tools, particularly the modelling systems, and the rigour and comprehensiveness of the demonstration of safety. They expressed reservations and doubts about the validity of the safety results obtained through AECL's research because of the shortcomings and weaknesses found in the methodologies, and the use of arguments based on unsupported assumptions, to draw conclusions on safety.

AECL has claimed, on the basis of its probabilistic and deterministic risk characterization, that impacts are well below the AECB guidelines, both in terms of the total annual radiation dose and of chemical toxicity effects. This claim, however, assumes that the reference system functions as intended, that the models and data used are valid and that the underlying assumptions are justified or conservative. The SRG review of the postclosure assessment document shows that many of these assumptions are not acceptable and that AECL's risk characterization does not convincingly demonstrate compliance.

[Scientific Review Group [Report of the Scientific Review Group (1995), p. 14.]

Later in its report, the SRG concludes that the results of the assessment of postclosure performance are not reliable. Some of the reasons for this conclusion are that the uncertainty analysis is not convincing; the choice of input parameters, initial boundary conditions and source terms for the model are not satisfactory; and the modelling of the exposure of human and other living organisms to contaminants passing through the biosphere does not accommodate the likelihood of environmental or ecological changes over a 10,000-year period. [Scientific Review Group, Report of the Scientific Review Group (1995), p. 16.]

The AECB staff statement to the Panel presented five main deficiencies. The following is the first of these statements.

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AECL does not attempt to demonstrate the overall safety of the deep geological disposal concept. The postclosure safety assessment is intended only to demonstrate how the assessment tools could be used at an early stage of concept implementation. . . . Demonstrating a methodology to assess safety falls short of demonstrating the overall safety of the disposal concept.

||Atomic Energy Control Board Staff [AECB Staff Response, pp. 13-14.]

AECB staff also submitted the following statement:

It is not clear if the 6 to 7 orders of magnitude between the predictions and the risk limit is adequate considering the possible large variation in predicted results and when, contrary to what is stated in Section 1.3.5 (Postclosure PRD, p. 13), the postclosure assessment appears to be neither conservative nor realistic.

||Atomic Energy Control Board Staff [AECB Staff Response, p. 33.]

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

The public at the end of phase II [technical hearings] was left with a feeling of grave unease. The best that could be said in favour of AECL's concept was stated by the SRG—that it could, might, should be doable.

||Provincial Council of Women of Ontario [Presentation to the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel, Phase III Hearings (February 26, 1997, PH3Pub.130), p. 5.]

Scientific bodies expressed an overall confidence in the safety of AECL's concept and recommended a move to siting. However, several of them used very careful wording.

. . . in principle, the concept could be implemented safely and effectively. . . . this needs to be demonstrated for each individual site.

||Scientific Review Group [An Addendum to the Report of the Scientific Review Group (1996), pp. 1-2.]

The Committee considers the concept, as set out in the several concept documents, to be sound in principle and achievable, and . . . endorses it.

||Joint Committee of the Canadian Academy of Engineering and the Royal Society of Canada [Presentation to the Canadian Environmental Assessment Agency Panel Reviewing the Environmental Impact Statement Prepared by Atomic Energy of Canada Research Limited on the Management and Disposal of Canada's Nuclear Fuel Waste, Phase II, Technical Aspects of the Concept of Geologic Disposal, Engineered Barriers and the Vault System (May 1996, PH2Tec.010), p. 2.]

NRCan believes that, while the assessment methodology developed is adequate to demonstrate the feasibility of the concept, it should not be used in its current form for future site-specific assessments.

||Natural Resources Canada [Submission to the Environmental Assessment Panel, Nuclear Fuel Waste Management and Disposal Concept (Phase II: Technical Sessions) (June 5, 1996, PH2Gov.001(a)), p. 21.]

Many participants again felt a sense of unease, based on their judgment that the case for safety had not been made.

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CCNR considers that the recommendations of the AECB and the Scientific Review Group to proceed to siting are based largely on the belief that the problem will be solved because it must be solved, despite the fact that the scientific evidence is not at all conclusive, convincing or complete.

|| Canadian Coalition for Nuclear Responsibility [Summary Argument Submitted to the FEARO Panel on the Management of Canada's Nuclear Fuel Waste (April 18, 1997, CSS.031), p. 4.]

The AECL "concept" should be rejected; AECL has failed to demonstrate safety and acceptability.

|| Northwatch [Final Submission to the Nuclear Fuel Waste Environmental Assessment Review Panel, (North Bay: April 18, 1997, CSS.029), p. 3.]

Some participants questioned how the scientific and technical community could conclude that the AECL concept was safe after it had expressed major caveats. Furthermore, they questioned how a concept designed for the Canadian Shield could be judged safe by relying significantly on work done in other countries.

For more than 15 years the proponent has researched a concept recommended 20 years ago, and made a significant investment of \$575 million to verify its safety. Nevertheless, we believe 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.

Also, participants during the hearings criticized the adequacy of the current AECB standards because they felt a wider range of Canadian society should help establish acceptable levels of risk. The standards did not adequately address social concerns related to human health and ecological integrity, as discussed in criterion d).

Regulatory Document R-104 does not require quantitative analysis to determine when estimated doses reach their peak if this occurs more than 10,000 years after closure of a facility. AECL's studies acknowledge that the estimated dose rate does not peak before 10,000 years and is still increasing at 100,000 years. [Atomic Energy of Canada Limited, Environmental Impact Statement, p. 309.] 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.

The primary problem with it [R-104] is the clause which states that: "The period for demonstrating compliance with the individual risk requirements using predictive mathematical models need not exceed 10,000 years." The US National Research Council (NRC) in its recent (1995) report on a proposed used fuel repository at Yucca Mountain, Nevada, found no scientific basis for so limiting the time period of an individual risk standard, and noted that some potentially important exposures might not occur until after several hundred thousand years from now.

|| Canadian Coalition for Ecology, Ethics and Religion [A Report to the FEARO Panel, Volume I, p. 30.]

In its analysis, the OECD/NEA Review Group mentioned that "large portions of dominant radionuclides remain in the waste form and container over time periods longer than 100,000 years." We agree with this group in advocating that the presentation to the public should have emphasized what happens over long periods to this remaining inventory and its almost unchanged hazard potential. [Organization for Economic Co-operation and Development, Nuclear Energy Agency Review Group, The Disposal of Canada's Nuclear Fuel Waste, p. 14.]

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Furthermore, Regulatory Document R-104 fails to reflect the new and still evolving standards that the ICRP recommended in 1991 and subsequently. Yet, AECL followed Regulatory Document R-104. [For AECL and AECB staff points of view on whether it was appropriate to follow R-104, see Nuclear Fuel Waste Environmental Assessment Panel Public Hearing Transcripts, June 17, 1996, pp. 55-56 and Atomic Energy of Canada Limited, Response to Request for Information, p. 83-84.]

For all these reasons, we recommend in Chapter 6 that the public be allowed greater input into the development of AECB standards.

We think that major scientific uncertainties about the long-term safety performance of the disposal system have not been adequately resolved and shortcomings have not been addressed. The impacts of miscalculations or mistakes are potentially grave for future generations and the environment. It is therefore better to delay decisions than to approve a concept that could generate serious negative consequences, even if some might consider the margin of safety adequate.

In summary, it is our judgment from a social point of view 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. Moreover, we believe that robustness in meeting appropriate regulatory requirements to protect human health and the environment has not been convincingly demonstrated.

b) Based on thorough and participatory scenario analyses

In presenting its most reasonable case scenarios, AECL failed to address a wide enough range of different possibilities about which participants expressed concerns. It did not, for example, deal adequately with the consequences of cumulative minor accidents, with the handling of emergencies or with major unforeseen events. It did not identify the extent of the consequences of scenarios at various points in time. Nor did it seek wide public input when developing scenarios.

Compliance is judged by risk rather than by extreme consequences. This, however, does not mean that it is without interest to know the size of extreme consequences and the associated probabilities.

|| OECD Nuclear Energy Agency Review Group [OECD NEA Review Group, The Disposal of Canada's Nuclear Fuel Waste, p. 13.]

Moreover, where firm predictions were impossible, the proponent ignored or downplayed issues of interest.

... in the face of this uncertainty [on the future impact of human activity on the biosphere], any attempt to predict the effects of humans on the evolution of the biosphere would have been futile. Accordingly, we have assumed that future human activities, whether for better or worse, would not alter the biosphere in any fundamental way over long periods of time.

|| R-Biosphere [P.A. Davis, R. Zach, M.E. Stephens, B.D. Amiro, G.A. Bird, J.A.K. Reid, M.I. Sheppard, S.C. Sheppard and M. Stephenson. The disposal of Canada's nuclear fuel waste: The biosphere model, BIOTRAC, for postclosure assessment (R-Biosphere) (Atomic Energy of Canada Limited Report, AECL-10720, COG - 93 - 10, 1993), p. 57.]

Following the direction it received from Regulatory Document R-104, AECL did not make any "attempt in the model to incorporate temporal changes in man's cultural or social behaviour, in his physiology, or in the changes in the biosphere caused by anthropogenic effects." [P.A. Davis et

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al, R-Biosphere, p. 20.] Although we recognize the difficulty of making long-term predictions, we believe that the sensitivity of the safety results to the nature of these assumptions should have been more extensively tested and discussed. For the sake of completeness, AECL should have called upon other disciplines in a co-ordinated way to contribute ideas about future developments that would have led to the assessment of other or modified scenarios. Examples of these other disciplines would be economics, demography, sociology, history, anthropology, ethics and nuclear medicine. [Scientific Review Group, Report of the Scientific Review Group (1995), p. 78.]

If we accept that the future will be like the present, the model seems reasonable. But is it reasonable to think that the future will be like the present?

|| Raymond Vles [Appendix A of Maurice Elzas and Raymond Vles, Review of the AECL Post-closure Assessment and Related Documents, p. 56.]

The EIS presents three groups of scenarios. There is no mention that any non-expert stakeholders were involved in developing and screening risk factors to be analyzed. The consequences were estimated for limited scenarios. These scenarios do not reflect the full reality of life on the Canadian Shield. One could have legitimately expected to benefit from more scenarios modelling various unexpected events that would have an impact on non-human biota, as well as on different human settlements—that is, rural, urban, remote and Aboriginal communities.

There is a need to examine the Concept for both optimistic and pessimistic scenarios for future generations in terms of technical capabilities, resource availability, social stability, etc.

|| United Church of Canada [A Submission from The United Church of Canada Program Unit on Peace, Environment and Rural Life Division of Mission in Canada to the Public Hearings of the Canadian Environmental Assessment Panel Reviewing the Nuclear Fuel Waste Management and Disposal Concept (Toronto: March 1996, PHPub.124), pp. 3-15.]

The SRG and other participants felt that some scenarios were dismissed too easily.

The scenario analysis methodology is not described in sufficient detail to allow a thorough evaluation of the resulting three [groups of] scenarios used by AECL. The absence of detailed screening arguments from either the postclosure assessment document or other primary reference documents creates concern that some questionable selection mechanisms might have been used to eliminate factors (events, processes, and features) during scenario screening.

|| Scientific Review Group [Report of the Scientific Review Group (1995), p. 13.]

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 scenario analysis that could adequately protect human health and the environment.

c) Use of realistic data, modelling and natural analogues

In the earlier section on the technical perspective, attention was drawn under this criterion to the shortcomings of the modelling used in the EIS. In this we concur. However, the conclusion was reached that, while considerable improvement and updating would be required for future models, the models the proponent used "are sufficiently well developed to demonstrate that [the proponent's] concept of deep geological disposal can be used as the basis for designing a site-

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specific facility." We do not share this optimism. We consider that the shortcomings of the modelling make it impossible to say that the AECL concept meets this criterion.

The major problem with this report is a philosophical one: the model is trying to demonstrate that, if reasonable assumptions about the future hold, then there should be no problems. What it should do instead is to demonstrate the robustness of the waste disposal concept: how extreme do situations have to get before they start getting dangerous? In other words, the model should show what has to occur to cause unacceptable exposure, and let decision makers and the public judge the probabilities and therefore the acceptability of the risk.

|| Raymond Vles [Appendix A of Maurice Elzas and Raymond Vles, Review of the AECL Post-closure Assessment and Related Documents, p. 55.]

It is our judgment that the models used are insufficiently developed to demonstrate that the proponent's concept of deep geological disposal 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.

d) Sound science and good practices

AECL's proposal deals with a nuclear mega-project that presents a unique social and political challenge. Many communities along transportation routes, or potential host and other communities, might be affected. Clearly, the development of an approach to managing nuclear fuel wastes must be based on sound physical science. While this is necessary, it is not sufficient. The approach must equally be based on sound social science and traditional Aboriginal knowledge. Without these complementary bases, there can be no assurance that public safety issues have been comprehensively identified, nor that they have been adequately addressed in the concept as presented.

AECL has conducted several interesting participation exercises to identify public issues related to the nuclear fuel waste disposal concept. However, this did not satisfy members of the Canadian Coalition for Ecology, Ethics and Religion.

... it [R-Public] fails to assess the real content of those concerns, and their actual merit. Public concerns are never matched to those expressed by the scientific community, for example. By failing to present the debate as also a feature of current medical and social scientific analyses, the authors wrongly characterize it as a battle between pro-nuclear experts and anti-nuclear laymen. . . .

|| Anna Cathrall, Mary Lou Harley, Brenda Lee and Peter Timmerman [A Report to the FEARO Panel, Volume 2, p. 47.]

We concur with this view.

Although it is likely that such a project could have the greatest impact on Aboriginal communities, their unique perception of safety was not considered. The Aboriginal community views safety in a holistic sense, in that it considers potential impacts on all elements of the natural world. AECL did not consider the potential risk to the health of Aboriginal people, especially given their health status, which is below average. In addition, incorporating traditional knowledge would bring a different dimension to the perception of safety.

Our closest tie to these beings from our earth is from the people who have the traditional knowledge of the land, knowledge passed on to them by the thousands of years of inhabiting this island. The elders are the best indicator of the truth of the

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harm to our beings from the earth. They are the biologists, the chemists, the archaeologists, and their titles come without diplomas and degrees. Their titles come from the knowledge of generations.

||Jamie Leary, Norway House First Nation [Transcripts, January 16, 1997, pp. 98-99.]

The Panel accepts the World Health Organization's definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." This is an all-embracing definition that requires a very broad review of all the possible implications of developing a high-level waste facility, for both the individuals and the communities concerned. In its assessment of postclosure health effects, AECL used only fatal cancers or serious genetic effects as significant consequences.

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.

||Health Canada [Submission to the Public Hearings of the Environmental Assessment Panel for the Nuclear Fuel Waste Management and Disposal Concept (June 11, 1996, PH2Gov.011), p. 4.]

The proponent has not addressed the risk and potential consequences of significant social turmoil and opposition, at least at the individual and community level. Experience in Canada and elsewhere in the world indicates, however, that these would be likely.

Although many countries have researched passively safe deep underground disposal, no country has ever implemented it. Many of the operations that will be carried out routinely will be unique to this type of facility. It is therefore very difficult to determine the potential consequences of these operations on the workers, the public and the environment.

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

In our judgment, more sustained and comprehensive use of the social sciences would have provided additional key information to identify and assess societal safety concerns, particularly those related to impacts on Aboriginal communities, conflict situations and significant social turmoil.

e) Flexibility

AECL was asked to develop a passively safe deep underground disposal concept that would not rely on long-term institutional controls as a necessary safety feature. Both the AECB and the ICRP consider institutional controls to be unreliable beyond a few hundred years. [Atomic Energy of Canada Limited, Environmental Impact Statement, p. 76.]

We recognize that there is no known precedent for institutional controls being successfully implemented over periods extending beyond tens of thousands of years. However, many participants and groups viewed institutional controls, imperfect as they may be, to be an indication of responsible management, at least for a significant time period. These participants and groups considered such controls to be a greater guarantee of safety than disposal, which was

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seen as an unsafe "out of sight, out of mind" approach, for which there is also no precedent. Prudence requires that control and verification capability be included and maintained as a safety factor that is strategically as important as technical passive safety capability.

Long-term monitoring is, in many people's minds, an essential safety feature. AECL has considered it mostly as an add-on, to detect radiation, especially at or near the surface, after the disposal system is closed. This is understandable. Built-in intrusive monitoring could easily be seen as contradictory to a passively safe system. Furthermore, AECL confirmed that such monitoring could jeopardize the passive safety of its concept. Nevertheless, along with many other participants in the hearing process, we believe that a system of early detection of failures, inside the vault or close to it, should be built into the defence-in-depth approach.

A management strategy that can adapt to changes is essential. While AECL presented the engineered barriers as being adaptable to a range of site conditions and not fixed in design, it did not clearly define or limit them. AECL also stated that design options included in the case studies were not meant to be standard components of the disposal system and would not necessarily be selected for a final design. There was no definition of the range within which site conditions could vary, or engineered barriers could be flexible, and still conform to concept specifications and safety.

It is clear that there is still a great deal of confusion regarding what constitutes the concept and what constitutes illustrative examples of the concept. . . . The public wants some brackets, some frame within which safety of any example is assured.

|| Dr. Stella Swanson, Scientific Review Group [Nuclear Fuel Waste Environmental Assessment Panel Public Hearing Transcripts, June 19, 1996, pp. 137-138.]

The lack of a clear statement on the limits to this flexibility impinges significantly, in our view, on the ability to foresee the potential consequences of implementing the concept, and its safety performance at a real site. In such a context, the concept becomes an abstraction that can be safely adapted to almost all site conditions. In our view, the proponent should have presented, compared and assessed designs and site characteristics that enhance long-term safety.

Our conclusion is that a system of early detection of failures inside the vault or close to it should be researched further. Such monitoring would provide forewarning and trigger appropriate safety action, including retrieval if deemed necessary, if a series of unexpected events were to thwart the passive safety system.

f) Feasibility of implementation

We believe that a favourable judgment on the feasibility of AECL's concept can be made only if there is reasonable evidence of the likelihood of finding a suitable site on which to implement the concept. We need to know if there is a wide range of potential siting areas in Canada where AECL's safety results could be obtained. This is necessary to develop confidence that a suitable site can be found despite the social and technical constraints.

. . . the case study geosphere model, although hypothetical, is a realistic representation of the site-specific conditions that were known to exist at the URL site. Another site would require the development of another geosphere model to represent the specific arrangement of features at that site.

|| Atomic Energy of Canada Limited [Response to Request for Information, p. 111.]

. . . an analysis based on the specific properties of one site does leave open the question of the transferability of the safety and engineering feasibility to other sites,

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with different characteristics, i.e., until a site is chosen only the potential of a concept can be judged.

|| OECD Nuclear Energy Agency Review Group [OECS NEA Review Group, The Disposal of Canada's Nuclear Fuel Waste, p. 4.]

It is absolutely essential that the siting process is seen to be completely open and transparent, a fact recognized by AECL. Therefore the Panel should recommend that prior to any final decision on concept suitability, AECL demonstrate the applicability of the safety assessment methodology to one or more other sites. . . .

|| Philip J. Richardson, for Northwatch [Site Characterization and Site Evaluation: Comment on Atomic Energy of Canada Limited's Nuclear Fuel Waste Management and Disposal Concept (North Bay: prepared for Northwatch, June 20, 1996, PH2Pub.009), p. 16.]

According to many participants in the hearings, few quantitative data were presented by which the properties of the underground research laboratory's rock mass could be compared with those elsewhere in the Canadian Shield. According to the SRG, AECL's R-Siting does not reflect the information gathered during extensive geotechnical investigations at several sites in the Canadian Shield nor incorporate it in developing methods for site characterization, siting criteria or site ranking. [Scientific Review Group, Report of the Scientific Review Group (1995), pp. 106-107.]

Another important issue to be addressed is the siting inclusion and exclusion criteria. AECL has failed to describe clearly enough the critical factors and the range of these factors that would allow a site to be considered suitable. On the contrary, to allow for flexibility and community input, it has put forward a strategy where it would apply only a limited number of criteria in the early siting stage. For a significant number of participants, this approach avoids difficult questions, putting them aside for the next phase. As mentioned by the SRG, R-Siting is largely generalized and qualitative.

The document does not indicate how either qualitative or quantitative and defensible criteria for siting a nuclear fuel waste disposal facility will be developed and ranked to determine which sites can be disregarded and which sites merit further evaluation.

|| Scientific Review Group [Report of the Scientific Review Group (1995), p. 105.]

Clearly spelling out the siting inclusion and exclusion criteria would allow us to estimate whether the socio-economic and technical considerations can be adequately reconciled to guarantee the safety, acceptability and feasibility of the concept.

If the siting process is to be recognized and accepted by the affected publics further down the site screening road, it is crucial that the screening criteria are seen to have been drawn up in an open and transparent fashion. Otherwise the process will be laid open to charges of manipulation.

|| Philip J. Richardson, for Northwatch [Site Characterization and Site Evaluation, p. 3.]

For a process to be credible, the proponent has to specify clearly what knowledge it expects to acquire about the technical and social factors that determine safety at various stages in the site selection process, prior to the selection of any site. The proponent also has to indicate how the sites would be compared for priority.

With regard to voluntary siting processes, AECL states that applying the principles of safety and environmental protection, voluntarism, shared decision-making, openness and fairness "could

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result in a site for a nuclear fuel waste disposal facility that is both technically and socially acceptable." [M.A. Greber, E.R. Frech and J.A.R. Hillier. The disposal of Canada's nuclear fuel waste: Public involvement and social aspects (R-Public) (Atomic Energy of Canada Limited Report AECL - 10712, COG - 93 - 2, 1994), p. 195.] But there were contrary views from many participants.

Covering less than two pages, it [R-Public's discussion on experience with voluntary siting processes] contains virtually no information on what made the successful processes work, what their key components were, what opposition they met, what other problems they faced, or how the siting organization addressed such problems.

|| Elizabeth Brubaker, Borealis Energy Research Association, for Energy Probe [Siting a Nuclear Waste Disposal Facility: Energy Probe's Submission on the Adequacy of Atomic Energy of Canada Limited's Environmental Impact Statement on the Concept for Disposal of Canada's Nuclear Fuel Waste (Toronto: Energy Probe Research Foundation, July 28, 1995, Pub.014), p. 2.]

No comments were made about the conflicts that could occur between communities and their neighbours and the implications of these conflicts on the siting process. We realized, especially in discussing the siting process for low-level radioactive wastes with people who participated in its implementation, the complexity and the usefulness of a detailed analysis in judging the feasibility of AECL's concept.

The experience of other countries demonstrates that social processes and financial considerations might dominate the site screening stage. The EIS does not provide any assurance that the current technical characterization and assessment tools can adequately address this contingency. 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.

... AECL clearly states that siting is the first stage of implementation of the concept, and the likelihood of abandoning this project gets progressively more remote as new milestones are passed and more money is spent.

|| Voice of Women [Presentation to Nuclear Fuel Waste Environmental Assessment Panel (Toronto: February 26, 1997, PH3Pub.129), pp. 2-3.]

In summary, we believe that the proponent has not provided the Panel with sufficient information, available through the social sciences, as to how it would proceed to site a disposal facility. That comprehensive information would be needed for the Panel to conclude that a site that would be socially as well as technically feasible could be found.

g) Peer review and international expertise

The EIS reflects little peer review by social scientists and ethicists who have thoughtfully studied the nuclear waste question. Nor is much attention given to international experience with the actual siting of disposal facilities for high-level and low-level wastes. We conclude that peer review by social scientists, as well as consideration of international experience in actually siting disposal facilities, could inform the social perspective on safety, and bolster confidence in the entire process.

In light of all the foregoing, the safety merits of the AECL concept should be carefully compared with those of realistic alternatives.

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5.3 Acceptability of the AECL Concept

In this section, the Panel comments on the acceptability of the AECL concept, following the criteria set forth in Chapter 4.

a) Broad public support

Broad support from an informed Canadian public is a prerequisite to being able to make decisions on the long-term management of nuclear fuel wastes. An agency for managing nuclear fuel wastes must engage the public through a sustained information and communication program. The public must know about the scientific considerations and the social implications of the proposal. It must be aware of, and have participated in developing, the decision-making process, which will include the key points at which safety and acceptability are assessed, who makes the decisions, how disputes are resolved and how the needs of significant minorities are addressed.

. . . there has to be a much more broadly distributed communications strategy to bring home the nature of the kind of issue here because this is an issue that we believe affects all Canadians.

[David Smith, Joint Committee of the Canadian Academy of Engineering and The Royal Society of Canada [Transcripts, March 25, 1996, p. 130.]

The AECL concept does not, in our view, meet this criterion. In one of its supporting documents to the EIS, R-Public, AECL describes earlier government attempts to obtain public advice. AECL also describes its own attempts to inform the public about its proposals and to seek the public's views. These have, we think, helped to broaden public understanding of the facts and issues involved, as have hearings of this Panel. But data are lacking that would indicate how widespread this understanding is, let alone what kind of public support there is. Even if there were better understanding of the technical aspects of the question, clear information is lacking as to how and when the broader Canadian public and the provinces would be involved in decision-making related to future steps.

When he put forward his recommendation in 1977 that deep geological disposal was the most promising approach for Canada, Dr. Kenneth Hare called for wide public discussion and broad public support before adopting a national plan for managing radioactive wastes. [F.K. Hare et al, *The Management of Canada's Nuclear Wastes*, p. 51.] When he was asked at our hearings whether, in his view, such consultation had taken place, he replied in the negative.

I don't think it has. I'm not sure that it can. . . . But not to carry it out, or not to attempt it is—and I will use an old-fashioned word—immoral in my judgment.

|| Dr. F. Kenneth Hare [Transcripts, June 20, 1996, pp. 68-69.]

We recognize that it is difficult to determine whether participants in our hearings, both those opposed to and those supportive of the AECL concept, were representative of the larger public. We recognize also that it may be difficult to gauge with precision the extent of support for or opposition to the AECL concept, particularly in the absence of a real site and a real design. We judge, however, that significant numbers of the public are currently sufficiently opposed to the AECL concept that it would be ill advised to proceed with it now.

It is evident from the record of the public hearings to date that the participants in this issue do not represent Canadian public opinion. Presenters are very clearly drawn from extremes and the views expressed indicate a polarization that is difficult to accept exists in the Canadian public.

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|| Risk Assessment Society, Saskatchewan Division [Submission to the Nuclear Fuel Waste Environmental Assessment Panel (Regina: February 28, 1997, PH3Pub.175), p. 5.]

I have counted 144 separate presentations since mid-January by citizens and spokespeople for organizations that either completely reject AECL's proposal or have grave doubts about it. That's 144 people who read up on the subject, consulted their peers, took a day off work, travelled sometimes long distances to the hearing to say their piece. Most of them were not paid for this.

|| Penny Sanger [Transcripts, March 26, 1997. p. 186.]

After 7 years of public hearings, it is obvious to us that the concept is not acceptable to the majority of citizens and interest groups that have participated.

|| Marc Chénier, Canadian Coalition for Nuclear Responsibility [Transcripts, March 25, 1997, p. 58.]

These considerations indicate to the Panel that the AECL concept for deep geological disposal has not been demonstrated to have broad public support.

b) Safety from both a technical and a social perspective

As noted in this chapter's analysis of the safety of the AECL concept, conclusions on safety differ, depending on whether they are based on technical or social perspectives. The Panel considers that from a technical perspective, safety has on balance been adequately demonstrated for a conceptual stage of development, but from a social perspective it has not. Safety is a key part of acceptability. Thus the concept cannot be regarded as acceptable if it fails to demonstrate safety from both perspectives.

c) Development within a sound ethical and social assessment framework

In Chapter 4 and elsewhere in this report, we have stressed the importance of reaching decisions on the long-term management of nuclear fuel wastes that are consistent with the predominant ethical and social values of Canadian society. It is difficult to describe these values with precision, both because they vary within a society as diverse as Canada's, and because they vary over time.

The Panel wishes to acknowledge that AECL addressed a number of the aspects of such a framework, either in its EIS or in other ways, to a greater extent than is usually found in technical proposals. In doing so, it drew on work done by the ICRP, OECD/NEA and AECB. It held a workshop in Canada in 1991 on the moral and ethical implications of its concept [See Hardy Stevens and Associates, *Moral and Ethical Issues Related to the Nuclear Fuel Waste Disposal Concept. Report on AECL's Consultation Workshop: Toronto, Ontario, Canada: March 7-8, 1991 (Toronto: April 1991, Undertaking 1).*] and participated in an OECD/NEA workshop on the environmental and ethical aspects of long-lived radioactive waste disposal. [See Organization for Economic Co-operation and Development, Nuclear Energy Agency, *The Environmental and Ethical Basis of Geological Disposal. A Collective Opinion of the NEA Radioactive Waste Management Committee . (Organization for Economic Co-operation and Development, 1995).*]

In the EIS and R-Public, AECL gave its views on a number of ethical issues, including justification for disposal and its timing, and the responsibilities of present and future generations. In proposals regarding siting, it also put forward thoughts on distributional fairness. We commend AECL for that work, but suggest that it has to be taken somewhat further.

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Section 2.3.3 of this report outlines AECL's views on the need for and timing of disposal, and the reaction of participants, many of whom were not persuaded by its reasoning. In brief, these participants' concerns stemmed from considerations such as:

- lack of confidence in technical solutions to cover such a long period;
- confidence in the safety of present storage practices, which could be retained for 100 years or more to allow for development of options and greater scientific certainty;
- discomfort with the lack of monitoring and an "out of sight, out of mind" approach; and
- lack of flexibility and choice for future generations to make decisions in the light of their own social and ethical framework.

In these participants' view, such considerations argued against hasty decisions now and in favour of monitored, retrievable storage, with the greater control this implies, at least for the present.

Given the availability of storage technologies, there is no imperative to proceed with a geological repository until such time as safety can be reasonably assured and public acceptance of the concept has been achieved.

|| Dr. Michael Kraft, University of Wisconsin, Green Bay [Transcripts, March 27, 1996, p. 114.]

AECL argues that those who have benefited significantly from nuclear power should assume disposal responsibilities, and that the burden on future generations is best minimized by moving now to a passive disposal system. Some participants found this argument unconvincing on the grounds that it denied future generations freedom of choice with respect to monitoring, retrieval, recycling and new technology. This question requires further examination in the context of an ethical and social framework. The panel's view is that, while greater attention should be paid to an enlarged choice for future generations, the present generation should not use this as a basis to justify postponing decisions indefinitely. Specifically, there should be an element of passive safety in any concept in the event future generations should be unwilling or unable to care for a storage or disposal facility.

On the matter of distributional equity, AECL has put forward principles for siting with a view to protecting the interests of host and affected communities. For those principles to be effective, however, they must be translated into safeguards and procedures. Yet even principles and procedures do not deal adequately with some of the larger questions. Do the principal beneficiaries of nuclear power bear an appropriate share of risks and costs? Are risks, costs and benefits distributed equitably among different groups in society, among areas in the country, and between present and future generations? Does the AECL concept provide for a net benefit to society at large and for those directly affected? All of these require more elaboration in an ethical and social framework than appears in AECL's proposals.

Many participants said it was not ethically possible to consider the AECL concept in isolation from other questions related to the nuclear fuel cycle, such as the future of nuclear power in Canada and the importation of nuclear fuel wastes. These may be outside the mandate of this Panel, but they cannot be ignored when looking at acceptability.

Several of the less technical barriers to acceptability are items which are themselves, on their face, outside this panel's mandate. I would submit, on the other hand, that

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their impact on the acceptability of the concept cannot be totally ignored on that basis.

|| Norm Rubin, Energy Probe [Transcripts, November 21, 1996, p. 175.]

On the question of importation, which I know we're not supposed to talk about, but we really can't avoid it if we are going to talk about ethical concerns. . . . this level of uncertainty and, as noted previously, the number of unknown and unknowable variables in this process, are unacceptable for an environmental review in which the public is called upon to give an opinion.

|| Anne Lindsey, Concerned Citizens of Manitoba [Transcripts, April 29, 1996, pp. 40-42.]

Finally, many participants felt the relative lack of systematic input into the EIS by social scientists and ethicists led to an inadequate balance between the technical and social considerations that ought to govern thinking on the AECL concept.

There is really no sort of matching level of knowledge in the social and ethical issues that matches that of the technical side of the report . . . the level of social expertise and ethical expertise seems to us not as strong in the report as the technical. . . .

|| David Smith, Joint Committee of the Canadian Academy of Engineering and The Royal Society of Canada [Transcripts, March 25, 1996, pp. 130-134.]

Based on these considerations, we have concluded that the development of the AECL concept did not take place within the context of a comprehensive social and ethical framework. In the absence of this framework, the concept cannot be said to have met this criterion for acceptability.

d) Support of Aboriginal people

Any approach to managing nuclear wastes that involves lands inhabited, claimed or used by Aboriginal people will affect them in particularly acute ways. Aboriginal people rely on the land for sustenance and hold deep beliefs about humankind's relationship with and responsibility for the natural environment. Hence their active involvement, consent and co-operation are essential throughout all phases, from acceptance of the concept through its implementation.

This consideration applies strongly in the case of the AECL concept, as the facility is expected to be located on the Canadian Shield, where there is a significant Aboriginal presence. In its guidelines document, the Panel admonished AECL to pay special attention to the viewpoints of Aboriginal people. Yet the EIS gave little indication that AECL had attempted to do this, or of how the traditional knowledge and experience of Aboriginal people might be incorporated into any analysis of the effects of a facility.

Throughout the hearings process, during our visits to Aboriginal communities, and in 20 Aboriginal association and band council resolutions opposing disposal and transport in treaty areas covering virtually all of central and northern Ontario and elsewhere, we heard that Aboriginal participants were mistrustful of AECL's concept. They felt that the proponent—and the Panel—had shown lack of respect for their cultural differences and consultative processes. They said that they lacked the knowledge to reach their own judgments on the concept and they resented what they viewed as the proponent's failure to involve them in dialogue at the concept's inception and during its development.

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. . . . Due to health concerns and our dependence on the land, we will

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be the most vulnerable group exposed to such a depository. . . If our opinions and knowledge are not valued by AECL, then how can we have any confidence in this process or in the proposal itself?

|| Chief Earl Commanda, on behalf of the Union of Ontario Indians [Transcripts, February 13, 1996, pp. 61-65.]

We believe that the disposal of something so toxic and so dangerous as high level radioactive waste requires this level of commitment to wide ranging and thorough consultation. . . . Yet neither AECL or Ontario Hydro seriously engage in a consultation process with our people. Neither AECL or Ontario Hydro offered to provide us with the appropriate timing or necessary resources to conduct our consultation in a manner respecting our culture, our relationships and our leadership and our rights.

|| Deputy Grand Chief Brian Davey, Nishnawbe Aski Nation [Transcripts, March 11, 1996, pp. 239-240.]

For these reasons, the panel's view is that Aboriginal people do not support the concept as presented. Whether the concept might in future gain that support depends in part on whether governments and their agents are prepared to take the steps we recommend in Chapter 6.

e) Selection after comparison with the risks, costs and benefits of other options

The Hare Report suggested that primary attention be given to plutonic rock but that "careful attention be paid to the work of other scientists in other countries on different rock types." [F.K. Hare et al, *The Management of Canada's Nuclear Wastes*, p. 44.] The AECB also endorsed plutonic disposal but said that AECL "should maintain a current awareness of studies on other disposal methods." [Atomic Energy Control Board, *Regulatory Document R-71*, p. 6.] The proponent, in putting forward only one option for the long-term management of nuclear fuel wastes, acted in accordance with the instructions given by governments. AECL was asked to demonstrate whether nuclear fuel wastes could be disposed of safely in deep geological formations, particularly intrusive igneous rock, and its research and the EIS set out to do just that. It was not instructed to make a comparative assessment of options.

We must point out, however, that the panel's guidelines document of 1992 explicitly asked AECL to discuss possible alternatives to its concept, and in sufficient detail to permit a meaningful comparison. [Federal Environmental Assessment Review Panel. *Final Guidelines for the Preparation of an Environmental Impact Statement on the Nuclear Fuel Waste Management and Disposal Concept* (March 1992), p. 12.] We drew special attention to storage alternatives in the guidelines and in requests for presentation during Phase II of our hearings. In spite of these requests, AECL provided little comparative information about alternatives.

The issue is whether the Canadian public wants sealed, walk-away disposal of spent fuel, or would prefer monitored, retrievable long-term storage. In the original 1977 Federal Inquiry report we opted for permanent disposal in a walk-away repository, because the evidence we could gather in the brief period available pointed to a strong public demand for it. But in the early 1990s I heard from several sources that public opinion—where the public had any opinion—had moved towards long-term, monitored and managed storage of the fuel, in most cases because there were doubts as to the wisdom of sealing the chambers until there was assurance that the performance was as predicted. I tended to agree with this view. . .

|| Dr. F. Kenneth Hare [An Addendum by F. Kenneth Hare to the Joint Submission, p. 1, in Albert A. Driedger, F. Kenneth Hare, Jon H. F. Jenneken, J. Terry Rogers, and Leslie

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||W. Shemilt, A Submission to the Nuclear Fuel Waste Environmental Assessment Panel on the Environmental Impact Statement by AECL (Oakville: PHPub.150, April 2, 1996).]

It seems to us that the Canadian public no longer finds it acceptable to be asked to make a decision based on one option only. A choice of one is not a choice. People want to know, at least in some reasonably comparable way, the implications of other options; their risks, costs and net benefits; and the implications if deep geological disposal is rejected.

... people generally are more likely to judge a risk acceptable if they see all the other alternatives as even more risky. ... If the deep geological disposal concept appears to reduce most effectively the risk to the values the public takes most seriously this will, of course, come to be regarded as the "safe" alternative, but only because the imposed alternatives are perceived to involve even greater risk.

||Dr. Conrad Brunk, University of Waterloo [Transcripts, March 13, 1996, pp. 107-108.]

... the situation today is that above ground spent fuel dry storage facilities are accepted by the public, are judged safe, use the very simplest of technologies, require only rudimentary care, are inexpensive and have considerable siting flexibility.

... we believe that the ethical arguments for preferring deep disposal to other management strategies are not convincing and that above ground storage should be explored technically to determine if it is an alternative solution.

||New Brunswick Power [The Ethics of the Management of High-level Radioactive Waste (PH3Pub.225, March 26, 1997), pp. 2-3.]

AECL has told us there is no urgency to move to permanent disposal. They should be asked to go back and produce a proposal for an extended temporary storage system and for replacement and renewal of such a system as needed in the expectation that it will probably be many decades before it is possible to consider a permanent solution.

||Ann Coxworth, Saskatchewan Environmental Society [Transcripts, March 11, 1996, p. 340.]

From the public hearings process and from our study of the subject over a number of years, the Panel now believes that the concept of deep geological disposal could be accepted only if it is placed in the context of other alternatives. In our judgment, the proponent's proposals and concept do not meet this basic criterion of acceptability.

f) Advancement by a stable and trustworthy proponent and supervision by a trustworthy regulator

Trust in both the proponent and the regulator is critical to gaining public acceptance of a concept. Among other factors, a concept will be more acceptable if it is advanced by the same proponent that intends to implement it, and if both the proponent and the regulator are free of conflicts of interest.

The CNA believes that it is very important that the corporate entity which undertakes the siting process, and in the course of which makes promises and undertakings to the public, should be the same entity responsible, and held accountable, for all subsequent phases of the process. Such continuity, and assurance of funding stability, is necessary if the public is to place their trust in the integrity of the siting process.

||Ian Wilson, Canadian Nuclear Association [Transcripts, March 29, 1996, pp. 52-53.]

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AECL has made it clear that it expects to have no primary, and perhaps not any, responsibilities in the area of nuclear fuel wastes in the future. To that extent, it cannot be regarded as a "stable" proponent and its concept cannot meet this part of the criterion. Ontario Hydro indicated at our hearings that it was prepared to act as implementing agency and it presumably will continue in existence in one form or another. However, neither AECL nor Ontario Hydro could give details and guarantees that participants sought on how the proponent would proceed in future since the potential implementing organization for the concept has not yet been identified.

Rightly or wrongly, and for a variety of reasons, AECL does not appear to enjoy—at least in some quarters in Canada—the degree of trust the Panel considers essential for any agency responsible for long-term management of nuclear fuel wastes. Many participants complained about AECL's alleged lack of openness and transparency, its insensitivity to a wide range of stakeholders, and its failure in practice to ensure effective public participation. Ontario Hydro received many of the same criticisms. There was, moreover, at least a perception of conflict of interest in that both were said to be looking for a solution to the nuclear waste problem as a means of ensuring either continued sales of CANDU reactors or continued use of reactors in power generation.

. . . the preferred option is neither the utilities running the implementing organization, whether it be directly or through some joint parties that the utilities jointly create—I don't favour that option. I think it leaves too much control with the utilities who will have a vested interest to undertake disposal as cheaply as possible and as quickly as possible. I don't trust the utilities to do this job. Nor do I think that we would necessarily be as well served by the standard federal Crown corporation model. AECL is a federal Crown corporation and look where it's got us.

|| Peter Prebble, Saskatchewan Environmental Society [Transcripts, March 29, 1996, pp. 192-193.]

The whole issue of nuclear energy—and particularly, perhaps, the issue of nuclear wastes—is such a controversial one that a high degree of public confidence in the responsible agency is a prerequisite to acceptability. We doubt whether that degree of confidence exists at present in either AECL or Ontario Hydro.

There were also criticisms of the regulator, the AECB, during our hearings. These criticisms were based on its slowness in adapting to changes in international standards, on its reporting to the same minister as AECL and on its failure to ensure wide public participation in setting standards.

R-104 . . . was developed with a handful of written comments from outside the AECB, almost all of them from government and industry, and clearly was not an attempt to reflect the values of the Canadian public, and clearly did not have the input that this process does in testing the values of the Canadian public, or indeed that the public information polling and other mechanisms used by the proponents have.

|| Norm Rubin, Energy Probe [Transcripts, November 21, 1996, pp. 174-175.]

We note the importance of this aspect of acceptability. We hope that the changes in the AECB's mandate under the new legislation, passed by Parliament but not yet proclaimed as of the date of this document, as well as the AECB's stated willingness to encourage greater public input, will make it the trustworthy regulator we consider an essential element of acceptability.

Finally, we note that 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.