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Elizabeth Dowdeswell  
President, NWMO  
49 Jacques Avenue, First Floor  
Toronto, Ontario M4T 1E2

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**RE: Comments arising from the June 22 Pinawa dialogue session on the Draft Study Report**

Thank you for inviting me to the dialogue session held at Pinawa on June 22, 2005. As part of that meeting you invited us to submit a letter to the NWMO outlining our concerns with respect to the content of the Draft Study Report, as well as any recommendations we may have to improve the report. Although brevity is not a quality that is usually attributed to my writing, I shall try to keep this letter somewhat succinct.

In general the report, and the adapted phased management approach, has many positive attributes and the authors should be commended. My biggest concern is that there are a number of distracters in the report that will tend to derail discussion away from what I understand to be the essential elements of the adaptive phase management approach. These distracters include:

1. the label of the adaptive phase management as a fourth option, distinct from the previous three;
  2. the optional phase of centralized underground storage
  3. the time scale for implementation
1. I believe the recommended approach does not represent a fourth option and is not distinct from the other three studied. The report recommends "Option 1" deep geologic isolation (not "disposal") implemented with an adaptive phased management approach. I agree with the terminology of 'isolation'. 'Disposal' implies that there is no onus on future generations to manage the waste, whereas 'isolation' provides future generations with the option of retrieval or continued monitoring if they so choose. The positive attributes of the adaptive phased management approach, as I understand them, include:
- an adaptable, staged decision making approach
  - a citizen engagement program
  - future generations are not precluded from making decisions with respect to implementation as it progresses, with built-in decision points that allow rescheduling, redesign, redirection or setting alternative paths
  - ability to incorporate new learning
  - periods of possible retrievability and extended monitoring
  - an implementation philosophy designed to establish public trust
- I propose that references to a "fourth option" be replaced with a "new management approach" since the above bullets identify a management system and not an alternative option.
2. In my opinion, the inclusion of Phase 2 (centralized near surface underground interim storage) will promote unnecessary and irrelevant arguments among reviewers of the Draft Study Report. The possibility of interim centralized storage at the selected site, either above or below ground, should be viewed as a decision point in the deep geologic isolation option. Elevating it to its own Phase, but then calling it optional and not allowing for decisions other than centralized below-ground storage, presents a contradictory view of its overall importance in the deep geologic isolation option. The prescription of shallow underground storage is also seemingly out of sync with the philosophy of adaptive phased management that allows future generations to decide. In addition, the report provides no supporting rationale for interim shallow underground storage that is based on any technical merit. To avoid this phase acting as a distracter, it should be removed. In its place should be a yes-no decision point for

interim centralized storage (either above or below ground) at the selected site, while development of the deep geologic isolation design continues irrespective of the outcome of this decision.

3. The adaptive phased management option proposes a 60 year design and construction time, while at the same time placing value on taking action now and not abdicating responsibility to future generations. To put this in context, 60 years represents three generations. I have no knowledge of three generations past in my own family history and I would disparage them if they placed handed down such responsibilities to me. There is no underlying explanation for the time intervals given in the report and this will be a subject of great debate. Rightly or wrongly, the report gives the impression of recommending that we take a long time to accomplish very little during the siting and initial design stages. I propose that the adaptive phased management approach be first presented without a timeline to highlight the positive attributes that are independent of schedule. I understand a truly open and transparent process will include debate and will require time to accomplish our goals. I worry that by prescribing timelines in the report they will become carved in stone and in so doing design activities that must be started now be deferred until the last few years before they are due. Deferral has consequences of loss of knowledge, loss of quality, greater expense and disservice to the public. I propose that the report could be improved by 1) providing examples of the timelines of other countries and using these as guidelines for timelines in the report, and 2) recommending that a first activity will be the preparation of a critical path timeline of activities.

I have an additional three inter-related concerns respect to the report that include the following:

- a. growth of our current knowledge base,
  - b. the development of a truly Canadian solution, and
  - c. implementation responsibilities prior to construction
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- a. Research and intellectual capacity is discussed in Chapter 16 as well as on pages 254 to 257. The requirement for continual learning is well imbedded in the report as well as the need to develop expertise. However, the current Canadian expertise and capabilities are not given due reference, and maintaining, and building upon, these capabilities should be front-and-centre in these sections. Across the country we have hundreds of individuals who have researched various aspects of the nuclear waste isolation issue for the past twenty years and have produced a significant body of internationally respected work. In contrast, the Canadian nuclear waste management industry has hired virtually no young scientists/engineers in the past 15 years to carry forward the study of waste isolation technology. Graduate students exposed to the topic in university-based research will all have moved into other industries during the past decade. I fear that without a plan to develop and grow the intellectual capability now, every passing year will result in permanent loss of a bit of Canada's current expertise. Within ten years, the capabilities developed at a cost of hundreds of millions of dollars will have been for naught. The time for continued learning described in the report, therefore, will have instead become a time for knowledge loss. To grow this current capability three attributes are needed:
    1. Repository design needs to be brought to the forefront in the report to have almost equal status as siting during "Phase 1" of the adaptive phased management approach. A robust, credible and practicable design must be required, in addition to a defensible site, when proceeding to construction licensing. The design-related technologies required during the first phase are provided almost as a footnote in Chapter 16, and must be assigned greater value. I fear that engineered barrier and environmental science technology will be seen by planners as less important now than siting, and as an expense that can be deferred for decades into the future.
    2. Young scientists and engineers will not only need interesting work to be attracted to the industry but will need work that is seen to have value to others, with an achievable goal in their working lifetime. Thirty years is too long. An end goal should be a site and design description to be defended for licensing in 25 years or less. A program that spans more than one generation will not attract the best people, and will have a high risk of losing critical capabilities midstream.

3. We need to bring leaders into the industry. The young people hired now should be seen as the leaders in twenty-five years. These people will be working to achieve career goals in seeing their own work come to fruition, and will be the cornerstones of the transition from design/siting to construction.

The demographics of scientists and engineers having waste isolation expertise should always be important to the NWMO. Being mindful of demographics will help to ensure appropriate representation of gender and cultures within the industry, and will also help avoid a recurrence of the aging of the expertise, with another *en mass* retirement one generation from now.

- b. My perception is that much reliance is placed in the report on making use of technologies that are being developed in other countries (Sweden is mentioned often). We need to develop a solution that is right for Canadians and uses Canadian technology. Importing a design from another country will not only have the risk of being inappropriate for Canada but also Canadians will not have the sense of ownership needed for its experts to support the proposed plans. International collaboration is important but should not come at the expense of establishing Canadian expertise. An example is the recommendation to participate in the underground laboratory in Sweden (p. 222) with no mention of the possibility of working in a similar laboratory in Canada. We already have such a laboratory constructed and its use would not only be cost effective but would be paramount in developing a Canadian solution. It is a mistake to preclude the use of Canada's URL by not giving it mention in the report. Waste isolation requires development of underground technologies that are not site specific, which is the reason Sweden and Finland are working at Äspö, a non-site specific laboratory. A Canadian underground laboratory, one that could be managed by NWMO, is not only fundamental in developing a Canadian technical solution, but will also be essential during the siting and public engagement process. Residents and administrators of potential host communities will need an opportunity to see and understand first-hand the nature of the facility before they can make an informed decision. This, too, is an important role of non-site specific underground labs being built in other countries.
- c. Currently, Ontario Power Generation funds waste isolation technology development for about two dozen Canadian institutions, while at the same time NWMO is separately addressing its mandated public engagement issues. The report should, but does not, clearly describe responsibilities for leadership in technology research and development in the future. This responsibility is not highlighted in the Chapters on Governance (12) or Finance (18). The cost of research during Phase 1 is provided only on a difficult to find line on page 222 (Section 16). For reasons mentioned earlier, technological capabilities can not just be maintained but need to grow, and the next generation of scientists should be hired before current expertise is lost. The report should recommend that assurances be built into Canada's waste management plan that funding for research and technology continues at a rate appropriate for maintaining and building upon the current Canadian expertise and capabilities.

These are my concerns and recommendations arising from both the meeting held in Pinawa on June 22, and from my review of the Draft Study Report. I hope my comments are of use to you.

Yours truly,



Neil Chandler