

“Wasteful Procrastination”

Comments by J.A.L. Robertson on

The NWMO’s Draft Study Report

The purpose of the Nuclear Waste Management Organization (NWMO) is to recommend an approach for the long-term management of used fuel in Canada. In the Draft Study Report (DSR) it proposes a promising fourth option to the three that it was directed to study, one that it terms Adaptive Phase Management (APM). In principle, this is the best option to ensure long-term safety for future generations while allowing in the shorter term for confirmation of, and confidence in, that solution. However, there are possible improvements in the APM concept that would reduce costs to electricity rate-payers while providing better confirmation:

- The proposed schedule of 60 years to the emplacement of the first bundle and 300 years to closure of any rooms is unnecessarily protracted and could only lead to changes along the way that would add to the costs. Thirty years to the first emplacement and progressive closure as rooms are filled is more realistic and would still allow plenty of time to monitor and assess the technology.
- The proposed underground interim storage facility at the repository site, costing \$2 billion, is unnecessary. Used fuel can continue to be safely stored at the reactor sites in more containers of the type already licensed until the repository is ready to receive bundles.
- The so-called underground laboratory, proposed for the repository site, is apparently intended primarily as a demonstration of the technology. This function would be more convincingly achieved by making the initial section of the repository a heavily monitored demonstration, thereby saving the cost of the proposed laboratory.

These modifications to the APM can be readily justified through the NWMO’s Adaptability Principle.

The NWMO should plan for the most cost-effective approach, incorporating decision points at which the society of the day can review whether and when to proceed to the next stage.

In this way, the APM as described in the DSR may eventually be implemented but only if each component is justified when a decision is needed. Schedules can be extended but not easily shortened. To paraphrase former Prime Minister Mackenzie King:

“Delays if necessary but not necessarily delays”.

In addition to these modifications to the proposal,

there is an urgent need for the NWMO to prepare its strategy for siting,

since experience shows that organized opposition will arise as soon as siting is announced and this results in the public being prejudiced by erroneous and misleading information.

This rest of this submission consists of three parts. Part 1, Substantive Comments, substantiates the foregoing assertions. Part 2, NWMO's Mindset, suggests that the NWMO's protracted schedule and unnecessary facilities may stem from an exaggerated fear of radiation, due in turn to a lack of familiarity with the technology; and a misreading of Canadian public opinion. Part 3, Detailed Comments, identifies the evidence for what is said in Parts 1 and 2 and includes some editorial comments.

Part 1, Substantive Comments

A cost-effective approach

The Nuclear Fuel Waste Act (NFWA) requires that the Nuclear Waste Management Organization (NWMO) recommend an approach to the long-term management of used nuclear fuel. Three specific approaches must be included in the study: 1) deep geological disposal, 2) reactor-site storage and 3) centralized storage. Other approaches may be considered.

The NWMO in its Draft Study Report sets out the advantages and disadvantages of the three required approaches then recommends a fourth, a combination of the first and third, designated Adaptive Phased Management. This submission suggests that a hybrid of the first and second would be more responsible. The major reason for this difference in judgement is that the NWMO's economic criterion is only to ensure that the necessary funds can be available: my criterion is that public funds, whether from tax- or rate-payers should be expended responsibly. Over the past decade there have been several examples of the public's abhorrence of unbridled expenditures of its money. Canadians expect appointed officials to manage their money responsibly.

The NWMO schedule appears to have been deliberately protracted beyond what could be reasonably achieved. A project planned to last 325 years is unrealistic and ridiculous. Flexibility is desirable in the abstract but there is no recognition in the DSR that this involves costs that the public would be required to pay. Protracted schedules encourage policy changes resulting in increased costs. A horrible example is the cost overruns for the construction of the Darlington Nuclear Station, conventionally blamed on Ontario Hydro's management. An analysis, available at www.magma.ca/jalrober/CANcosta.htm, shows that most of the escalation was due to delays imposed by each of the three political parties in turn.

I suspect that the protracted schedule is intended to placate two opposing constituencies: those who want storage and those who want disposal. The NWMO is irresponsible in dodging the issue, thereby passing the burden to future generations, contrary to one of its own principles. The protracted schedule would also burden the current generation with higher costs than necessary. A contributing factor may be a lack of comfort for nuclear energy and radiation on the part of the Assessment Team (AT): another the absence of any engineering experience in the management of major projects on the AT – see Part 2, NWMO's Mindset. The hybrid approach that I proposed, put in place without any deliberate delays, would occupy a few decades, not centuries, before reaching a decision on whether to seal the repository. This would allow sufficient time for reasonable people to satisfy themselves on the acceptability, particularly since the issue has been the subject of public debate for three decades already.

Expenditures on the proposed underground laboratory are not justified in the DSR. Science and Technology (S&T) spans the spectrum from basic science through applied science, development, demonstration to technical support. Basic science is not being considered here. For applied science the need defines the program and the program defines the laboratory and

equipment needed. A vast amount has already been spent on waste-management research, over \$½ billion, enough to satisfy the BS Panel's independent Scientific Review Group (SRG) on the concept. What will still be required is characterization of the proposed site. Some of this research must be done on site, e.g., bore-hole drilling, but any laboratory work would be best done by shipping samples to existing well equipped and well staffed laboratories. For instance, it would be wasteful to have an electron microscope and electron microscopists sitting at the site in case they were needed some day. A small control laboratory would be needed for day-to-day operations, but this could be part of the surface administration building. As for demonstration, in the hybrid approach the first rooms to be excavated and to receive used fuel would provide the best demonstration since they would be exactly what is intended. This would eliminate the need for an underground laboratory.

The NWMO has performed a thorough analysis of the *relative* costs of its four approaches (but not for the hybrid, or compromise, approach proposed in my submission of 2004 October 12). However, it has not justified the cost of the APM approach as value for money. Throughout the DSR there is an implicit assumption, sometimes explicit, that the NWMO should seek the *best* approach, not just the best of four but the best possible. This is not so. The NWMO, like its predecessor the Blair Seaborn (BS) Panel, is required to recommend an *acceptable* approach. The NWMO may claim that in recommending an excessively safe approach it is only responding to public demand. This would be neither justified nor ethical. Fewer than one per cent of Canadians were sufficiently concerned over nuclear waste to show any interest in the NWMO: the remainder are unlikely to demand increased measures. Also, those who did express a wish for versatility, adaptability, etc., were never asked what they were prepared to pay for these. Those polled were not presented with a fair question. Ethics requires that the NWMO be *responsible* in its recommendations. Money saved from excessive safety for used-fuel management can be better spent elsewhere, by individuals or governments. To tailor recommendations to satisfy public opinion where this is based on false or misleading beliefs would be irresponsible. Anti-nuclear activists do not want a cost-effective solution: they want costly waste management to penalize nuclear energy in comparison with other energy sources. For every one anti-nuclear activist opposing resolution of the wastes issue there will be a hundred electricity consumers objecting to their money being wasted. The ONSR would do well to remember Voltaire's words:

“Le mieux est l'ennemi du bien”.

My proposal, recommended to the NWMO in the submission of 2004 October 12, is:

“A compromise system would seem to satisfy the objectives as a whole better than any one of the present three. The final result would be deep geological disposal but this would be implemented in a manner to provide maximum adaptability. The design of the repository would be modular in that waste capacity could be expanded as needed. Siting, construction of surface facilities, vertical mining and preparation of a few passages and rooms for placement of the wastes would be carried out without undue delay. Used fuel would be emplaced in these demonstration rooms that would be back-filled and sealed locally. It would thus be possible to monitor the demonstration's behaviour while further passages and rooms were excavated. As these became ready, used fuel could be emplaced but these would not be back-filled or sealed. Any necessary technology for final sealing would be developed and proven; and all necessary materials would be stockpiled on site.

“This solution ensures that the present generation provides the know-how, commitment and most of the cost of permanent disposal of its own wastes while providing

decision points along the way and allowing some future generations to decide if and when to expand or seal the repository finally. A consequence of this solution would be that on-site storage would continue to be needed until the disposal facility is ready to receive used fuel, i.e., at least a generation. During this period policy changes are possible but would involve tremendous costs and delays.”

The NWMO process has been exemplary in its openness, in forecasting its activities and in publishing for public comment interim reports, especially this DSR. However, by introducing the favoured option at the eleventh hour it has greatly reduced the opportunity for full debate of its proposal. This problem is exacerbated by two omissions: the advantages and disadvantages of my hybrid approach have been ignored and there is no information on the extra costs of interim storage, an underground laboratory and unnecessary extension of the schedule.

The NWMO should compare its APM approach with the hybrid proposal.

This recommendation should be implemented before the NWMO presents its proposal to the public in any interactions such as the forthcoming Dialogue Sessions. Otherwise, the NWMO will be unable to claim that its proposal has the public’s *informed* consent that is an aspect of acceptance.

The siting process

A glaring omission from the DSR is a meaningful discussion of the siting process. This is particularly serious in view of the facts that gaining siting acceptance has been the major impediment to previous waste-management proposals and that the NWMO stresses public acceptance. The DSR demonstrates that the NWMO is assuming that siting will follow the discredited and paternalistic “DAD” approach (Decide, Announce, Defend). Experience with attempts to find a host community for the “Port Hope” wastes has demonstrated the value of the “voluntarism” approach. According to this, communities will be invited to state the terms under which they would be willing to host a disposal repository. The NWMO would then screen applicants for those that satisfy mandatory criteria then select one from the remaining bids.

“To help prevent conclusions being drawn precipitately, the IO (Implementing Organization) should prepare a generic proposal for the consideration of a potential host community, including reasonably typical estimates of the risks and benefits, possible forms of mitigation and a compensation package likely to appeal to potential host communities. This should be available before any approach is made to specific communities and, ideally, before the siting process is announced publicly. While such a generic proposal would not be perfectly suited to any community, it would be better than the alternative, a vacuum.”

This quotation is only one of many lessons that I drew from experience with the failed attempt to find a host community for the “Port Hope” wastes and transmitted to the NWMO in my submission of 2004 October 12. There is no evidence in the DSR that the NWMO has considered these and many other recommendations in submissions.

The DSR demonstrates a poor understanding of what concerns small communities remote from urban centres. A major concern is that the community will wither away:

- that there will be no employment opportunities,
- that their children will have to seek work elsewhere,
- that schools, hospitals and libraries will be closed,

- that public transportation will be terminated, within and out of the community,
- that the tax base will not continue to support the services, and,

worst of all, they may have to move to Toronto! For such a community, even a “boom and bust” economy would be better than nothing and the prospect of a permanent plant operated by an industry with a proven record for protecting the health of its workers, the public and the environment would be attractive.

If the NWMO wishes to succeed at the siting stage, it should edit the DSR to “accentuate the positive” and, if not “eliminate the negative”, at least put negative comments in perspective. For instance, there is repeated reference to transportation risk without advising readers that the risk is no more than that of normal traffic accidents according to the SRG. The DSR’s own repeated reference to the time-scale being unique is not only negative, it is untrue.

The NWMO should include “voluntarism” in its treatment of siting in its Final Report.

Adaptability and the future of nuclear energy

A serious criticism of the DSR relevant to siting is its failure to consider the consequences to its analysis of a decision to continue nuclear energy in Canada indefinitely, despite the fact that it claims versatility/adaptability as a desirable criterion for any approach. Any approach must be capable of accommodating either termination or continuing nuclear energy, even an expansion. The NWMO may feel that by limiting consideration to fuel from existing reactors it will reduce opposition, making its task easier. This, however, would be short-sighted. When it embarks on siting, potential host communities will want to know their future prospects. The NWMO cannot forecast the future of nuclear energy but it should be prepared to tell the communities that its approach is adaptable to either option.

Should the decision be to continue nuclear energy, all references to “boom and bust” in the DSR would be irrelevant, even misleading. The centralized repository or storage might eventually be expanded to become the centre for a nuclear fuel reprocessing industry. This would make a tremendous difference to the attraction and acceptance of the project for some communities, e.g., for those where a mine is due to close and there is no alternative employment. This point was made to the NWMO in my submission of 2004 October 12.

Unless the NWMO can guarantee that there will be no new power reactors built anywhere in Canada, something that is outside its mandate, according to its own claim of adaptability it must include the possibility of ongoing nuclear energy.

The NWMO should consider the implications of continuing nuclear energy in its comparisons.

Bias in the draft

The NWMO is to be praised for having published for comment its input, two interim reports and now a draft of its final report. Throughout, it has encouraged public participation. However, there is little evidence that it has listened to any critical comments, despite claims to the contrary. From my reading of the DSR the only reference to submissions are for those that support the NWMO’s position. Anyone taking the trouble to read the submissions on the NWMO’s website would discover a vastly different situation. Even if the NWMO has considered

these criticisms, it has not provided any response to them. “Don’t confuse me with facts (or arguments), my mind is made up.”

Among the criticisms was one of the composition and process of the Assessment Team (AT) that, apparently, is responsible for the current recommendation. The DSR repeatedly refers to the members as “experts” but fails to specify their area of expertise. In fact, none has experience of managing the design and construction of a large project and only three have even peripheral experience of nuclear energy. One would not expect a useful recommendation on the health system from a committee that excludes doctors, nurses and hospital managers. The process was criticized for being opaque and vulnerable to personal prejudice and poor understanding of the subject technology. Fortunately, tables in Part 3 of the DSR summarizing the advantages and disadvantages of the four approaches for various criteria, that could have been drafted without the AT process, are relatively non-controversial.

Impartiality is a desirable characteristic of those assessing the approaches, but impartiality should not be equated to ignorance of the technology being assessed. My critique of the AT’s report, “Assessing the Options” (submission dated 2004 November 9), provided examples of the “*AT’s ignorance of, or even mild antipathy to, nuclear energy*”. Much of this remains in the DSR. The failure to consider the prospect of nuclear energy continuing indefinitely is one example. Another, throughout the report, is the repeated reference to magnitude and duration of the hazard from nuclear-fuel waste, *without any reference to the comparable magnitude and duration of the hazards, routinely accepted, from other materials*. The DSR’s interpretation of “hazard” is examined at greater length in Part 2, NWMO’s Mindset.

Multiple examples of bias, conscious or unconscious, are noted in Part 3, Detailed Comments.

The NWMO should review the wording of the draft to provide a more balanced account of submissions and to remove anti-nuclear bias; and should provide context for any hazards.

Part 2 NWMO’s Mindset

The DSR is permeated with an exaggerated fear of radiation, and hence of the nuclear wastes. In this the NWMO, lacking experience of nuclear energy and with no scientist or engineer until this year, is only reflecting widespread public opinion based on mythology. This is presumably a major reason for proposing an excessively long schedule, unnecessary interim storage and another underground laboratory; and for demanding that the risk from the wastes be minimized, not that the welfare of society be maximized. The evidence for this is twofold.

From its start, the NWMO has maintained that the wastes present a unique hazard and, in the DSR (page 12, column 1), that “the most significant and unique feature of this issue is the time dimension”. It has been repeatedly reminded that many non-radioactive but hazardous wastes last forever. Several Background Papers contain false or misleading information that contributes to such a fear. Despite submissions pointing this out, the NWMO has failed to make corrections or even to resolve the differences. In my submission of 2004 September 10 on the Citizens’ Dialogue I itemized false or misleading information being reported by the NWMO in its publications without comment. In my submission of 2004 November 9 on the Assessment Team Report I itemized false or misleading information that the AT was presenting as factual. All this

suggests that the NWMO believed the original information or did not consider its validity to be important.

The NWMO's position on "Nature of the Hazard" in the DSR (Appendix 2) describes it only as "a source of danger or a possibility of being harmed". "Hazard" does not appear in the Glossary. Anything presents some possibility of harm, i.e., is a hazard according to the NWMO. Even ten centimetres of water is a hazard since one can drown if one lies face-down in it. Electric cables are hazardous if not properly insulated, and poisons if not properly secured: similarly, radioactive material is hazardous if not properly shielded. Thus, to say that something is hazardous tells nothing about the *risk* it represents to people or the environment. For this, one must perform a quantitative risk analysis. Atomic Energy of Canada Limited (AECL) performed one for its conceptual design very similar to the DSR proposal (AECL-10711, page 297). This was reviewed critically by AECL's independent Technical Advisory Committee and the Blair Seaborn (BS) Panel's Scientific Review Group. It predicts that the maximum radiation exposure to people as a result of possible releases from the wastes would be one microsievert per year, or one thousandths of the current regulatory limit. Readers of the DSR are not informed of this vital information that puts the risk, or "hazard", in context.

A workshop of 14 experts and others apparently agreed that the radioactivity of the used fuel would equal that of a natural uranium ore deposit after a million years. This means that one can disregard the hazard thereafter: it does not mean that there is a hazard up to that time. Quantification yields a vastly different impression of the "hazard" of the wastes than that conveyed in the DSR with its unique hazard for a million years. Yet the DSR ignored this evidence, thereby giving readers a seriously misleading impression of the "Nature of the Hazard".

"As the Alberta Energy and Utility Board helpfully explains in its Compton decision, 'Risk can be characterized as the possibility of a negative consequence. In contrast, hazards are things that present risk.' So, the gas tank in your car is a hazard. But what's the risk? Well the possibility of a negative consequence – that in a crash the car may go up in flames – is still sufficiently low that it makes headlines when it does happen."

- Nigel Hannaford, Calgary Herald columnist, Ottawa Citizen, 2005 July 2, p.B6.

The DSR claims that the deliberately protracted schedule and the extra facilities, underground storage and laboratory, are responses to the Canadian public's wish for reassurance. From its interactions with some Canadians the NWMO identified seven Canadian Values, from which it generated eight Objectives for the management approach. Canadians would generally support these values but not at any cost. I now realize that an essential factor is missing – costs. An eighth Canadian Value could be "Spending our money wisely". If Safety were an unqualified value, all highways would be multi-lane with guardrails.

Thus most Canadians would probably agree that Adaptability is desirable, but they were not asked how much they were prepared to pay on their electricity rates to keep options open beyond 60 years, especially after virtually the same concept has been the subject of public debate for 30 years already. Similarly for Learning: they were not asked if they would pay \$20 million for unspecified "research". Not one in 100,000 Canadians would know what relevant research has already been performed. Nobody was asked what they were willing to pay to reduce the radiation dose to generations thousands of years in the future from a small fraction of background to an even smaller fraction. From all this can be deduced that Canadians have not been given *informed* consent to the optional extras in the APM proposal.

In my submission of 2004 September 10 I explained why the NWMO's polling methods do not result in views representative of all Canadians. The working poor, shift workers, families with young children, sports enthusiasts and the apathetic are among those unlikely to participate in NWMO activities while those who already hold opinions on or related to nuclear energy are likely to be over-represented. When one remembers the lengths to which the NWMO went to encourage participation the fact that more than 99 per cent of Canadians did not do so strongly suggests that the issue is not a serious concern to the public as a whole. There is also the fact that people's deeds often do not match their words:

"Citizens always agree in the theory to giving foreign aid but what are they willing to lose themselves to support increased aid?" – Will Cove, Ottawa Citizen, 2005 July 5, p. A9.

Whatever recommendation the Government adopts, nothing will change the committed: the nuclear industry will respect lawful directions, those opposing nuclear energy will continue to oppose it, while the vast majority of Canadians will go on using electricity until it runs out.

Part 3, Detailed Comments

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- 9/1 Lack of context for hazard. Ignores possible ongoing nuclear energy.
- 10/1 Ignores responsible expenditure of resources. Ignores that flexibility has costs. Failure to cost interim storage. Implementation subject to government approval.
- 11/1 The mission should be "economically *sound*", not just *feasible*, as admitted later in "The cost must be *reasonable*".
- 11/2 "We are not confused or conflicted about this objective and common vision." But I am by the wording. There is no recognition here of the degree to which individual components of the model have been tested; or to the confirmation obtained from the behaviour of prehistoric reactors, e.g., Oklo, and various natural ore bodies. Note demand for "highest quality".
- 12/1 "The time dimension" of "this issue" is **not** unique: there are many hazardous materials that last forever. This is simply untrue and grossly prejudicial. Reference to "polluter pays" is defamatory when applied to an industry that has gone to extraordinary lengths to *avoid* polluting. There is no recognition that in CANDU we bequeath a system that can provide future generations with clean energy for hundreds, even thousands, of years. To make it fully sustainable we wish to gain acceptance for a safe and responsible means of waste management.
- 13/1 The same people understand "disposal" and "storage" – no need for "To others". Note that some options are dismissed here as not "economic", but there is no consideration of the economics of the preferred approach.
- 13/2 "... to allow its heat and radioactivity to decrease naturally ..."
- 14/2 There is a need here for an explanation of, or at least a cross-reference to, an explanation of, what the APM is.
- 15 No justification is provided for the inordinate duration of the schedule; or for the need for underground storage and underground research laboratory. Here, and in a few other places, there is mention of "Decide" whether to construct these, but the DSR is based on the implicit assumption that they will be constructed. There is no discussion of how much time can be saved by all the relevant work done for the previously proposed underground repository. A proposal not to decide the key issue for sixty years is absurd and a denial of responsibility.

- 16 Claiming that transportation will occur over only 30 years is implicitly assuming that there will be no more nuclear energy. By its own statements, the NWMO's proposal has to be flexible.
- 17 The \$2 billion cost of the underground storage and underground research laboratory has to be justified.
- 19/2 There is repeated reference to an absence of *proof* of the concept over thousands of years, but this applies to all human activities. Also, see 11/2.
- 20/1 "The approach is designed to be highly adaptive" ... e.g., to ongoing nuclear energy. This is blatantly untrue given all the implicit assumptions that only the wastes from existing plants need be considered. Interim storage may be an "option", but it is assumed throughout the DSR.
- 22/1 Reference to "unprecedented time horizon" was addressed under Part 1, as was the unacknowledged costs of adaptation, and the lack of any control on spending.
- 23/2 There is no mention of the voluntarism process for siting. This would be an important contribution to ensuring acceptance.
- 24/1 There is reference to "informed consent" but the NWMO has not demonstrated adherence to the doctrine elsewhere – see Parts 1 and 2. It is not clear that the NWMO recognizes how widespread are the benefits to Canada of nuclear energy.
- 24/2 "... assurance that commitments made will be met" Applies most to the agreement between the government and the host community. It was a failure in this area that terminated the proposed management of "Port Hope" wastes in Deep River. There is no definition of "community": this will be controversial and should be addressed for discussion. Similarly "participate in decision-making" means different things to different people.
- 25/1 Claims to have conducted a dialogue are hypocritical given the failure to respond to submissions and the lack of acknowledgement in the DSR of any criticisms – see Part 1. Any mention of "engagement" should admit openly that the NWMO, despite its best efforts, has succeeded in engaging only a tiny fraction of the Canadian population. The demand for "improvements" and a robust R&D effort are examples of requiring the best, not the adequate and acceptable as discussed in Part 1. Adaptability is again presented as a virtue without regard to cost.
- 25/2 There is no recognition of the need for technically qualified people to oversee any contracted research: to date, the NWMO has been woefully lacking in this regard – see Part 2.
- 26/1 "... focus on the time dimension" – see 12/1. In fact, there is no consideration to the "expansion of nuclear power" in the DSR. "Others" have done more than "suspect" that including the "real costs and benefits" would favour nuclear energy.
- 26/2 By ignoring the possibility of ongoing nuclear energy the DSR has made a *de facto* judgment. The claim to "recommend a responsible path" ignores the failure to consider responsible expenditure of public funds – see Part 1. In this, the DSR does not take a "financially conservative approach". For "improvements", see 25/1.
- 27/1 For "responsible", see 26/2.
- 29/1 "The views of Canadian society" have to be accepted for values, as done by the NWMO. However, the NWMO has been warned of the ethical problem of accepting unchallenged views on technical issues that are based on false or misleading beliefs. The NWMO has to be more than a public opinion poll. Unfortunately, the AT has demonstrated an inability to detect false and misleading beliefs. The statement later (29/2), "The study has been designed so that the approach which emerges as most responsive to these *values and objectives* will be judged the most socially acceptable of the options studied" (stress added), is correct in excluding uninformed views on technical issues.

- 30/1 “We learned, early on, from public attitude research, that the public attaches high importance to this issue, once it is brought to its attention, and expects to play an important role in the study” cannot be supported by facts. Despite the NWMO’s best efforts that brought its activities to the attention of many people an insignificant fraction of the population sought any active participation. I identified deficiencies in the NWMO’s attempts to gauge public opinions in my submission of 2004 September 10.
- 30/2 The DSR refers to “Commissioned papers” by “experts” but fails to acknowledge that several were severely criticized, and some authors criticized for pontificating beyond their areas of expertise. The NWMO has neither responded to the criticisms nor resolved the differences. The wording of the DSR creates the suspicion that the NWMO has ignored the criticisms.
- 33/1,2 It is grossly misleading to claim that “Canadians” as a whole told the NWMO anything. Only a minute and unrepresentative fraction was sounded.
- 33/2 “... very long time-frame ...” – see 12/1. Apparently Global Business Networks and a Scenarios Team were important in formulating the DSR proposal but no evidence is presented to allow assessment of their *relevant* expertise and what success they have achieved in projects of similar magnitude.
- 34/1 The cross-section of Canadians was not representative; there was no response to submissions; criticisms of the commissioned papers were ignored.
- 34/2 The NWMO lacked the relevant in-house expertise to judge the findings of the “50 scientific and technical experts”.
- 35/1 The DSR again fails to mention that some “expert papers” were severely criticized and the differences were unresolved.
- 36/2 At least one of the Dialogues went beyond values and drew conclusions on technical issues, based on false information, e.g., a belief that the nuclear industry had implemented power reactors without any consideration for management of the wastes. A “cross-section”, yes, but not a representative one. The AT may have been multi-disciplinary but the disciplines did not include engineering management of major projects and was weak in hands-on nuclear energy. “The team was asked to apply, *in a preliminary manner*, this framework to the short list of options specified in the” NFWA (stress added), but its report drew firm conclusions and, in a Dialogue session, the team leader resisted any suggestion that these would be revised in the light of comments.
- 37/1 Again, “representative” is not justified. For instance, many of us hang up on unsolicited telephone surveys at meal times.
- 38/2 The qualifications of the “group of experts” are not described.
- 39/1 There is no mention that some sessions were attended by very few people; that the public attitude research has been criticized; and that there has been no feed back (“dialogue”) to the submissions.
- 39/2 There is also no mention of the criticism of at least one Regional Dialogue, the Assessment Framework and the AT, and of the composition of the “experts”.
- 40/2 The NWMO may have listened but there is no account of what they learned.
- 41/2 “Some have suggested that this divergence is a result of the imperfect distribution of knowledge among those who have engaged in the study.” The situation is much worse since the NWMO has contributed to the “divergence”. It continues to endorse Background Papers and other material published under its imprimatur that have been challenged as containing false or misleading information, yet it has failed to resolve the “divergence”.
- 42/1 I consider that since waste exists it should be dealt with, but I do not believe that the future of nuclear energy is irrelevant to the study.
- 42/2 From the start the NWMO has stressed ethics but the DSR does not consider the ethics of procrastination. This adds not only to the cost burden for the current generation but also

- to the responsibility burden on future generations. Because the DSR fails to consider ongoing nuclear energy it fails to acknowledge the potential value of the “wastes”.
- 43/1 The reference to “socially acceptable” in reference to the BS Report is a distortion. The Panel’s terms of reference required it to determine acceptability, but it rejected the concept on the grounds that it did not have widespread public support, a far more rigorous requirement that no waste management proposal could satisfy. The fact that the few people who participated in the Panel’s hearings, half of whom showed no evidence of having even read the proposal’s summary, found something “controversial and difficult” is meaningless. Some participants may have thought that the NWMO’s inclusion of ethics was original but the NWMO should not perpetuate this myth in the DSR, particularly since it was informed of the inclusion of ethics in AECL’s Environmental Impact Statement. In 1978 the “Bayda Report” included a chapter on ethics.
- 43/2 “... as safe as possible ...” and “... to the greatest extent possible ...” are other examples of demanding the “best”, discussed in Part 1.
- 44/1 There is no warning that adaptability probably involves costs – see Part 1. New information should be *considered* but approved plans should not be altered for minor perceived benefits. This could be considered an application of the Precautionary Principle that the NWMO endorses. This is an area where there is a need for an experienced senior engineer in the NWMO’s decision process. There is no need for technological advances for used fuel to be recycled – it is already being done elsewhere. As explained elsewhere, for Canada it is largely a question of current economics.
- 44/1 “... what is *perceived* to be a self-interested and secretive manner ...” (stress added). I have challenged these perceptions in submissions. Unless the NWMO has evidence for their validity its repetition of the unfounded accusations unfairly malign a whole industry and its members. This is unethical.
- 45/1 The DSR fails to recognize that the vast majority of Canadians are not sufficiently concerned about nuclear fuels to want to be informed. The wording again reveals the negative bias of the DSR in referring to “challenges” but not opportunities. “... respect for all forms of life ...” is political correctness carried to extremes. I do not respect mosquitoes carrying West Nile virus, etc., and I suspect that most Canadians feel the same. See also 45/2.
- 46/1 The DSR repeatedly fails to acknowledge that most Canadians do not want to be involved in the decision-making.
- 46/2 There is no discussion of what constitutes a “community”. This caused great difficulty in seeking a host for the “Port Hope” wastes. The issue should be resolved before proceeding to implementation. However defined, the term should be restricted to those around the site: others are “general public”. In particular, great care should be taken to avoid giving communities on potential transportation routes a veto. This would be a dangerous precedent for all other goods, hazardous or not.
- 47/1 “Security” here and in the Glossary does not properly represent the meaning in the present context. There is no mention of unauthorized diversion by governments or terrorists. “Safety” is considered separately.
- 48/1 Under “Adaptability” the possibility of ongoing nuclear energy has to be included.
- 49/1 In referring to Aboriginal values there is no mention of the fact that these almost completely duplicated those of other Canadians.
- 49/2 Many Aboriginal people may feel that they do not benefit from nuclear energy but they share in the benefits of a healthy economy, a clean environment and nuclear medicine, all of which are aided by nuclear energy. This is another example of how the DSR cites negative statements without any mention of the fact that they have been challenged in submissions and elsewhere. There is no recognition that an Aboriginal community might

- welcome the employment opportunities of an industry with an excellent record for protection of health and the environment.
- 52/1 Note that future technologies should be “cost-effective” but that this is not required of DSR proposals.
- 53/1 Readers of the DSR are not informed here, or elsewhere, that the Scientific Review Group (SRG) of the BS Panel, composed of reputable and independent scientists and engineers, found the concept of deep geological disposal to be feasible and safe. Also, there is no mention of the supporting evidence provided by prehistoric reactors at Oklo and natural mineral deposits.
- 53/2 It would be more correct to say: “These participants claimed”
- 54/1 The DSR ignores indirect benefits of nuclear energy.
- 56/1 “Cost efficient” is a factor in comparing approaches but not in assessing the preferred one.
- 57/1 “Long time period” – see 12/1.
- 57/2 Both safety and security should be balanced with accessibility. The fear of “many” over transportation is based on a questionable assumption: the NWMO should at least inform DSR readers that the SRG concluded that the risk would be that of normal road traffic.
- 59/1 This APM approach is being proposed at the eleventh hour, too late for proper review and discussion. This despite the fact that a hybrid approach (described as a compromise system) was recommended in my submission of 2004 October 12, to which there has been no response. Specifically, no justification is provided for the proposed “protracted storage”, for interim storage at the central site, for “a period of learning” or for “surface or shallow underground” on-site interim storage: Also for the proposed underground laboratory, not mentioned here.
- 59/2 “Participants with this view were more likely to see a hybrid approach as potentially introducing unnecessary delays, uncertainty and costs in implementation.” It is not the hybrid approach but the DSR interpretation of it that causes “unnecessary delays, uncertainty and costs in implementation”. In my hybrid proposal the used fuel would remain in already approved storage at reactor sites until the underground repository is ready to receive it, thereby eliminating the need for new interim storage at the central site: and it would exploit the initial portion of the repository as a demonstration for the rest, thereby eliminating the need for an underground laboratory. The inevitable delays for siting, environmental assessment and necessary approvals would provide plenty of time for public interaction. Any deliberate delays beyond this would constitute wasteful procrastination.
- 60/1 There is an implicit assumption that reducing the hazard would be desirable. If the existing hazard is already acceptably low any associated cost would have to be critically examined – see the value-for-money warning in 60/2.
- 61 Some people would like to “learn more, understand better, and build greater confidence” without end. However, in any practical endeavour, it is necessary to reach a decision and implement it. Modifications can be made subsequently, but only if the benefit justifies the cost.
- 63/2 “Sustainable development” is said to be fundamental but it is defined neither here nor in the glossary. In view of the many meanings for the term in the literature and the submitted criticism of the Background Paper on the subject, this omission is serious. See Part 1 and 30/2 for doubts about “experts”.
- 64/2 See 30/2 for misplaced reliance on Background Papers. The NWMO did not “select” these options, the NFWA required it to review them.
- 65/1 Deficiencies in the AT are noted in Part 1, and a criticism of the process was provided in my submission of 2004 November 9. None of this is acknowledged or refuted.

- 65/2 The AT's methodology was criticized for being opaque, far from "transparent". It is claimed to be logical but the scoring and weighting is largely subjective and sometimes based on false beliefs, as demonstrated by the wide variation in scores. The AT Report noted only six applications, of which only two were reported to have been implemented. This is hardly "numerous". Note the admission of "emphasis on the judgments of the decision-making team", despite the earlier claim that the methodology is "logical". It is theoretically possible for an individual to replicate the "judgments and assumptions" but very few, if any, members of the public are going to wade through eight complex diagrams, involving about 200 "influences". Practically, the DSR is hiding behind a black box.
- 66/1 Distinguishing between "active" and "follow-on" periods again assumes no ongoing nuclear energy, without justification. See also 66/2.
- 67/1 The AT was "multi-disciplinary" but weak on hands-on nuclear energy and project management. Bias and lack of relevant knowledge on the part of the AT members may have contributed to the wide range of scores – see my submission of 2004 November 9. "Understanding the Choices" failed to mention any criticisms and the DSR notes only favourable comments.
- 67/2 Again, there is no warning that "flexibility and adaptability" usually involve costs, and that the more the process is drawn out the greater the costs are likely to be – see the admission at 111/2..
- 68/1 The credentials of Golder Associates Limited and Gartner Lee Limited are not provided. It is not obvious that they are any better qualified than the AT for this assessment.
- 68/2 The economic and social benefits to a host community would be vastly changed if ongoing nuclear energy resulted in continuing waste management and possibly a fuel-recycle industry based on the repository. The DSR completely ignores this possibility despite the fact that the AT and the NWMO were advised of the omission.
- 69/2 I question "the study team's own extensive experience with nuclear and mining industry developments". The assessment was subjective throughout, not "objective", hence the variation in scores.
- 70-120 "4.3 / Our Assessment Findings" closely duplicates what was published in "Assessing the Options" by the AT. I have already provided a detailed critique in my submission of 2004 November 9, yet none of my criticisms is acknowledged or refuted. Accordingly, most of them should be repeated here. The two most serious are a failure to consider the possibility of ongoing nuclear energy (except for one sentence at the foot of 106/1) and a repeated implicit assumption that transportation of used fuel would constitute a significant hazard, despite the SRG's findings, not even mentioned. A new, and serious, criticism is the failure in first describing Option 4, to justify the protracted schedule, the interim centralized storage and the underground laboratory.
- 89/1 Delete "of".
- 113/1 Two of the four paragraphs are not economic benefits.
- 118/2 "Requires" versus "require" in otherwise identical paragraphs.
- 120/1 The opening paragraph seems to have little to do with the rest of the page. See 12/1 for long-term hazard. Here and elsewhere putting proof and prove in quotations suggests that the DSR cannot explain what it means. See 11/2 and 19/2.
- 122/1 "New learning and technological innovation" should be considered but there is no need to delay in expectation of them if the existing proposal is acceptable – see reference to the "best" in Part 1. Why is the interim storage more robust and secure? Compared with what?
- 128/1 The DSR fails to provide a fair summary of the comments received as required by the NFWA: criticism has been suppressed.

- 130/1 Reprocessing may include recovery of fertile material as well as fissionable material. Note “fissionable” here but only “fissile” in the glossary.
- 130/2 Reprocessing could also be introduced for economical factors. Commercial reprocessing is carried out *elsewhere*.
- 131/1 Transmutation, like fusion, is always 50 years away.
- 135/1 The possibility of ongoing nuclear energy is again ignored. Readers have to take on trust the “third party review”.
- 135/2 A sensitivity analysis should be provided for the “possible timelines” in implementation.
- 137 Again, 30 years assumes no ongoing nuclear energy. Also 143.
- 138 The protracted Implementation Schedule and the need for interim storage are not justified.
- 141 Again, the protracted Implementation Schedule is not justified. Also 144.
- 145 “Centralized storage” is mentioned three times, but never justified.
- 146 All the previous comments on 30 years, protracted schedule, central storage and underground laboratory apply here and on 147. Note \$2B for the unnecessary underground storage (147).
- 148 The wording of Phase 1 indicates that the NWMO is still intending the discredited and paternalistic DAD (Decide, Announce, Defend) process for siting. Part 1 proposes voluntarism. “Continue research” is proposed without any explanation of why this is needed. Part 1 addresses this.
- 149 The underground laboratory and storage are not justified. See also 150 and 152.
- 152 This protracted schedule never actually shows *construction* of the repository.
- 155/2 “... provinces that have benefited *most* from activity ...” – all of Canada has benefited.
- 163/1 “Respect for life ...” - see 45/1. If fairness is applied “particularly” to one group it is not fair to all. Canadians have not been asked if they support public funds being given to special interest groups to duplicate work being performed by publicly funded bodies, including the NWMO.
- 163/2 The third bullet should refer to the “best *available* knowledge”, i.e., there is no justification for a perpetual search for the “best” – see Part 1. According to my submission of 2003 November 28 on Stirling’s Background Paper the precautionary approach should include assessing and comparing the risk of not adopting the proposal. In the fifth bullet, “fully *informed* and consulted”. The sixth bullet ignores social, cultural and ethical *benefits*. In the seventh, “are bearing *commensurate* costs and risks”. In the final paragraph, “provided in advance with *valid* information”, i.e., not some of that in NWMO Background Papers.
- 165/2 The AT assessment involved many subjective judgements, sometimes based on false or misleading assumptions – see my submission of 2004 November 9.
- 168/1 As discussed in Part 1, implementation planning should already be preparing an information package to pre-empt negative reaction based on false assumptions.
- 168/2 “Unprecedented time horizon” – see 12/1. Of what are these protracted schedules typical? The need for assurance that commitments will be met applies particularly to governments since it was the Federal Government’s failure to honour its negotiated commitment to Deep River that ended the long-lasting search for a host for the “Port Hope” wastes.
- 169/1 “We will seek to continue real dialogue.” The NWMO has yet to initiate real dialogue where this includes responding to submissions. “Selection of a site” implies the DAD approach – see Part 1. Communities have to be informed not only of the risks but also the benefits – see Part 1.
- 169/2 The absence of any consideration of voluntarism and ongoing nuclear energy is a serious omission under “societal considerations”. The protracted schedule is a major cause for concern over “ensuring intellectual capacity”.

- 171/3 Provincial governments and their utilities have a vital role in deciding whether nuclear energy will be ongoing.
- 172 “Communities” has not been defined. This gave much intercommunity resentment during the search for a host for the “Port Hope” wastes.
- 173/1 “Polluter pays” – see 12/1.
- 173/2 It is to be hoped that the summary of comments to the Minister will provide a more reliable account than does the DSR – see Part 1.
- 176/1 The DSR should advise readers that the CEEA defines “environmental effects” to include several of the factors that the DSR considers separately, e.g., social and cultural factors. “Short periods of time” are usually three years.
- 177/2 It is misleading to include CNSC’s responsibilities under “12.4 / Transport Canada”.
- 178/1 “Almost all”.
- 180/2 It is to be hoped that the Board of Directors, in deciding whether to expand its membership will have regard to what happened to the Ontario Hydro Board in the 1990s when it expanded to include representatives of various interest groups.
- 186 Thirty years to first operation is appalling. Similarly for the other schedules.
- 188/1 The public is being ignored in this further assumption of the DAD approach – see Part 1. As explained in my submission of 2004 October 12, before inviting public participation in the siting the NWMO should prepare a list of site requirements, divided into mandatory and desirable, so that communities have the information on which to base their decisions. One desirable requirement is that the site should be suited for co-location of an integrated fuel recycling plant in the event of ongoing nuclear energy. Whether or not the Environmental Assessment process requires “no significant adverse effect” this is nonsense. Any project sufficient to trigger the process will have some “significant adverse effect”. The real questions are whether there is a *net* adverse effect, and whether proposed mitigation and compensation would be satisfactory.
- 189/1 By ignoring the possibility of ongoing nuclear energy the DSR fails to recognize that Decommissioning may have to occur in steps as sections of the repository are filled, sealed and closed.
- 190 There is no provision in this option for possible future reactor sites.
- 192/1 There is no recognition of how much relevant work was done for AECL’s Environmental Impact Statement, by the BS Panel’s SRG and in responses to the Panel. There seems to be a danger of the NWMO reinventing the wheel at public expense.
- 194/1 Again DAD. Key components of the siting process should be voluntarism and adequate prior preparation. “No significant adverse effect” – see 188/1.
- 197 Underground laboratory and storage are not justified. Also 198/1.
- 198/1 “No significant adverse effect” – see 188/1.
- 199/2 “The last fuel bundle” repeats the unjustified assumption of no ongoing nuclear energy.
- 201 Obtain three construction licences and operate three facilities, but never construct them!
- 202/1 The NFWA, as quoted here, does not acknowledge beneficial effects.
- 203/1 “Unprecedented nature and time horizon” – see 12/1. An important incentive for host communities would be ongoing nuclear energy. That public involvement results in trust and is the “key to success” is a pious hope unsupported by facts. Involvement in the “Port Hope” wastes process and the BS Panel destroyed trust.
- 204 This view of what concerns “small communities” omits factors discussed in Part 1. The DSR also ignores the possibility of founding a new community as was done at Deep River for Chalk River.
- 205 “Transition” ignores voluntarism and hence the need to prepare an information package before any announcement about seeking a site. In the bottom box, this period should be used to provide education to local inhabitants to qualify them for all employment

- opportunities at the site. For professional positions and skilled trades a long lead-time is needed.
- 206 This table fails to acknowledge the possibility of ongoing nuclear energy.
- 207 It appears that the sociological “experts” who conducted the review were not familiar with nuclear energy in Canada. They ignored the most relevant innovation, voluntarism, developed during the life of the “Port Hope” Task Forces.
- 208/2 It is the DSR’s refusal to consider ongoing nuclear energy that results in an assumed “rise and fall” in numbers, being criticized here. See also 209/1.
- 210/1 This section on “Socio-Economic and Cultural Effects” reads like text-book sociology without any attempt to apply it to the present issue. Experience with the “Port Hope” wastes Task Forces demonstrated problems with defining “communities”, with selection of members for a Citizens Liaison Group, with this Group’s role and the public’s perception of it, and with the role of elected officials. “Benefiting from International Experience” merely emphasizes that Canadian experience is being ignored.
- 210/2 Training should not be confined to Aboriginals – see 205.
- 211/2 The proposed “NWMO’s Role” again suffers from ignoring past experience. Much of the difficulty with the “Port Hope” wastes Task Forces was due to the lack of a proponent or champion. The Task Forces, and staff, were rarely in the host community, those opposing the proposal were vociferous, the CLG was obliged to be neutral, AECL (with its major laboratories in the municipality) and the Town Council stayed out of the debate, and there was no one with the job of explaining and defending the proposal. The public was therefore presented with a biased account. The NWMO must champion its own proposal and cannot expect to be regarded as independent.
- 212/1 This is one of very few references to a “voluntary host community” but none explains the form of voluntarism that was proposed in my submission of 2004 October 12.
- 212/2 “Drawing from International Experience” merely emphasizes that Canadian experience is being ignored.
- 213/2 The “Engagement Strategy” is just more of the same without admitting that to date the NWMO has completely failed to engage more than 99% of Canadians.
- 214/1 Seeking input from participants will be useless if the NWMO ignores it as it has done in the past. It received 140 submissions (p.271) but I am unaware of any response on its website. I have received no response from my 20-odd submissions. The NWMO claims to have learned lessons but these are not revealed in the DSR. Background Papers by “experts” in “Socio-economic Research” were challenged and criticized in submissions but the differences were never resolved. In view of this record the NWMO cannot claim “Information Exchange and Knowledge Enhancement”.
- 214/2 Some participants may have suggested a “multi-year engagement strategy” but it was not unanimous and I question that anyone intended 12 for “multi”.
- 215/1 There is no recognition that a protracted schedule, in giving opportunity for “improvements”, would almost certainly result in further delays, reworking, redesign and a resulting increase in costs. Perpetually seeking “the best” can be counter-productive – see Part 1. See also 215/2. Later, Section 6.3 reveals that what is referred to here as “research” is not what is generally regarded as research.
- Ch.16 Research. Until the NWMO has staff competent to review the technical work that has already been performed, and hence identify what needs to be done, the proposals in this chapter are of little worth. Research to date has cost Canadians \$½ billion. The NWMO should not be reinventing the wheel.
- 215/2 It is said that there will be many opportunities to “minimize costs” and “enhance schedules”. However, “enhance” will probably mean “further extend” and this will increase, not “minimize” costs. This is a very rare place where any attempt to minimize costs is mentioned. It is naïve to believe that researchers will necessarily make good

- managers, or even that they will wish to manage. In general, scientists do research and engineers do project management.
- 216/1 The NWMO does not need improved understanding to “reduce unnecessary program schedule delays”, just the will. For “long duration” see 12/1. “The intense and widely varying views of the public and affected stakeholders” applies only to a minute fraction of the Canadian public: most Canadians demonstrated a lack of concern by ignoring all the NWMO’s publicity. Furthermore, nothing the NWMO does will change the committed: the nuclear industry will implement lawful directions while those opposing nuclear energy will continue to do so.
- 216/2 For “mid-course corrections” see 215/1.
- 217/1 All six “research” topics relate to sociology: the only one on hard sciences and engineering (217/2) is so vague as to confirm that The NWMO has no experience or competence in these areas.
- 217/2 A good way to maintain a pool of expertise would be to conduct R&D on fuel recycling that will be required at some time given ongoing nuclear energy.
- 219/1 What are “engineered materials”? To claim that “Canadians” require ongoing research is grossly misleading. How many of the 32 million Canadians said this? Was there any evidence that they knew what research had already been performed? Did they have any idea of what research is needed? Were they prepared to pay \$10 – 20 million (220/1) for it in their electricity rates?
- 220 The twelve items listed relate to selection, identification and decision, not research.
- 221 See 220.
- 222 See 220. Characterization of the proposed site is omitted.
- 226/1 Duration of the hazard –see Appendix 2.
- 227/1 Presumably the fuel owners would pay for transportation to the management site – not mentioned.
- 237 Comprehensive? No. The NWMO did not examine the hybrid approach that was proposed to it and it introduced its own APM approach at the eleventh hour, frustrating proper discussion.
Fair and balanced? No. Throughout the NWMO’s documents there is false and misleading information that has gone uncorrected. This is particularly true of the AT Report for which instances were documented in my submission of 2004 November 9.
Integrity? No. There is no evidence that my views were “responsibly considered and appropriately taken into account”.
Transparency? No. It introduced the APM too late and failed to resolve contradictions on its website.
The question of ongoing nuclear energy is a matter beyond the NWMO’s mandate. A broad public discussion on *all* Canadian energy policy, not just nuclear, would be welcome. However, there is no recognition that energy is a provincial jurisdiction, so that any province or its utility may decide to commit new units. The Ontario Energy Minister has stated that he is considering the possibility. In view of the NWMO’s claim that adaptability is a desirable feature, it *must* include the possibility of ongoing nuclear energy. See also Appendix 12. The Advisory Council should recognize that making contingency plans does not prejudice the policy decision.
- 239 Nowhere, here or on the NWMO website, are given the number, names, disciplines or qualifications of NWMO staff, other than the President. In submissions I have commented that the NWMO did not appear to have the competence, in a technical sense, to make an informed assessment of waste management technology. I made a similar but less severe comment on the membership of the AT in my submission of 2004 November 9. Nevertheless, I was astounded to learn that up to 2005 the NWMO had no scientist or engineer on its staff, and then only one.

- 242/1 It should be made clear that the regulations apply to anthropogenic exposures added to natural and medical ones.
- 242/2 There is no adequate explanation of the linear-no-threshold hypothesis, no quantification and no context for the risks. The Drinking Water Guidelines alone do not show whether there is, or is not, a risk – see Part 1.
- 244 The conclusion is illogical. Nobody has suffered from uranium ore deposits and hence nobody should suffer from million-year old used nuclear fuel. See Part 1 for more on this. Note that there were dissenting views, suppressed in the DSR.
- 245/1 To provide a balanced account, it should be noted that everything can be a hazard, i.e., a *potential* source of danger, so any hazard should be quantified and put in context. Otherwise, talk of hazards is scare-mongering. The initial paragraph should include radiation. There is reference to “scientific uncertainty” but more is known of the effects of radiation than of most chemical agents – i.e., context. The “radiological hazard” can only “negatively impact, etc.,” if in sufficient amount and concentration – i.e., quantify. The final paragraph does not relate to “Control and Protection”.
- 245/2 The first paragraph is inconsequential. “This has been used *successfully* for several decades ...” “Security” amounts to more than described here. “A precautionary approach” is vague and controversial – see my submission of 2003 November 28 re Stirling’s Background Paper – uncertainty in the *status quo* has to be examined also.
- 247/2 “It reflects a desire by many stakeholders ...” How many? What fraction of the Canadian population? How much were they prepared to pay?
- 248 This table assumes the discredited DAD process for siting and the need for underground storage and a research laboratory – all challenged in Part 1. Note that the stated purpose of the research laboratory is to act as a demonstration: Part 1 recommends a more cost-effective proposal.
- 249/1 “Clearly more R&D work needs to be completed” is an admission that the DSR cannot identify gaps in the R&D already performed.
- 249/2 “Three decades” is certainly not a “reasonable” time for providing what is already available at the reactor sites. “Voluntarism” is mentioned but is not defined and, from all the other implications of the DAD process, its meaning is not understood.
- 250 Construction is again omitted.
- 251 The figure assumes unnecessary storage and laboratory.
- 252/1 Another factor is adequate space for future expansion in the event of ongoing nuclear.
- 252/2 For “or” read “and”. To require a low frequency of “features” is nonsense. Eliminating the on-site storage and laboratory would render the last two factors unnecessary.
- 253/1 The factors should be divided into mandatory and desirable.
- 254/1 Design, demonstration and optimization are not R&D. The first need is to review the R&D already performed to identify what, if anything, remains to be done. The NWMO, with only one scientist and no engineers on staff, has obviously been unable to do this yet. There is no justification for having to do the R&D at the “preferred site”.
- 254/2 There is no indication of what R&D is required for all the “selection” items.
- 255/1 The need for “Protracted storage” has to be justified.
- 255/2 Ditto the Research Laboratory.
- 257/1 “Technical uncertainties” will always remain. What is required is to identify them and assess their importance – see 254/1. Without this it is meaningless to claim that the R&D will take 30 years. “Difficult to implement” and “very expensive” are relevant. Neither factor is prohibitive, given that they are already commercial elsewhere. The NWMO has not demonstrated competence to assess them.
- 257/2 The text omits the need for a construction licence.

- 258/2 The relevance of uranium deposits is not explained. If the uranium were leaching to the surface it could be detected in even trace amounts by radiation instruments, making uranium prospecting easy.
- App.4 A brief synopsis is provided for a few documents without any apparent reason for the selection. Readers are not told which ones have been the subject of critical submissions, i.e., implicit bias.
- 267/1 What are “unique visitors”? Surely every visitor is unique. The numbers conceal the fact that including everyone, even those polled who had demonstrated no interest, fewer than one per cent of the Canadian population have had enough concern to participate.
- 269/1 Similarly, the DSR should admit how few individuals attended some of the meetings. The DSR claims that those polled represented all Canadians but in my submission of 2004 September 10 I have argued why this is untrue. Even other NWMO documents claim only that the participants were selected to be “*as representative as possible*” – see also 269/2.
- 271/1 Statistics are repeated from 267/1.
- App.6 The DSR relies exclusively on an ethics panel for its advice on ethics, despite having commissioned an independent view, proposing practical ethics (2.2-C, 263/1). For instance, the panel’s assumption that a particular harm should be minimized may result in an increase in the overall harm to society. “Respect for life...” – see 45/1, also 273/2.
- 272/2 “Particularly to minorities” is a denial of fairness. The panel fails to recognize that ethics is not absolute but relative. There is no expectation that nuclear energy, or any other technology will be absolutely ethical: what the panel should require is that nuclear energy is more ethical than the available others, *including shortages of electricity*.
- 273/1 “What will the future of nuclear power in Canada be?” is easy to ask but it ignores that energy is a provincial responsibility. The independent view, proposing practical ethics (2.2-C, 263/1), recommends ten of the principles demanded here. I have repeatedly recommended in submissions that “when facts are in dispute” the NWMO has a responsibility to resolve them, or at least declare what it believes. Bias can be unconscious.
- 273/2 It is not obviously ethical to dispense public funds to all those “wishing to make their views known”, especially when public funds are being expended on multiple layers of regulation and oversight. “Best ethics” is motherhood but there is no indication of where this is to be found: perhaps the panel assumes that it provides “best ethics” despite its unwillingness to defend its position against other views. The panel’s version of the precautionary approach is no more than my principle that in making a decision all available options should be considered, including the *status quo*, since each has its advantages and disadvantages – see 272/2.
- 274/1 There is no recognition of social, cultural and ethical *benefits*. That the panel cannot identify any “special ethical issues” illustrates its lack of familiarity with the technology. The panel does not state who they believe to have benefited from nuclear energy. Even if it were assumed that only those who used the electricity benefited, this principle of the risks from a technology being commensurate with its benefits *locally*, is not generally practised. For instance, cattle are not reared in downtown Toronto where most of the beef eaters live. Fairness requires only that risks and benefits average out and/or there is mitigation. For instance, Northern Ontario exports its natural resources and in return benefits from a healthy economy and access to southern institutions.
- 274/2 There is an implicit assumption that each risk should be minimized – see App.6.
- 277/1 Other methods for reprocessing have been investigated, e.g., pyrometallurgy, but have not been commercialized. Fissionable or fissile? – see 130/1. Reprocessing may also recover fertile material. Canada and South Korea have investigated the possibility of using used LWR fuel in CANDU bundles *without* reprocessing.

- 277/2 “Reprocessing can take place *after* the used fuel is removed” Nobody has suggested doing it before. It is a simple fact that reprocessing is not “a viable option for Canada at this time”: “highly unlikely” is unnecessary. However, “in the near future” would be better expressed as “for several decades”.
- 278/1 Plutonium is not the *only* material in used fuel worth recovering in the future: the fertile uranium can be converted to fissile material in “breeder” reactors or by accelerator bombardment, and the fissile product used to create energy. Singling out the costs of expanded nuclear energy with its associated infrastructure is further evidence of bias. If large amounts of energy are wanted, large investments will be needed, whatever the energy source.
- 280/1 Fissionable, fissile and fertile – see 130/1.
- 283/1 Explain “buffering”.
- 287/2 Note the CNSC’s reasonable principle that seems to be ignored by the DSR:
 “The management of radioactive waste is commensurate with its radiological, chemical and biological hazard to the health and safety of persons and the environment and to national security.”
 The CNSC, unlike the NWMO, has staff competent to quantify and assess these hazards.
- 291/1 The DSR claims that the proposed design could accommodate more than 3.6 million bundles, but provides no estimate of how many more. Both of the NEB’s “plausible energy futures” include nuclear but the DSR refuses to consider it.
- 291/2 The “Early Nuclear Phase Out” starts shutting down the nuclear stations the same year that Ontario had intended to shut down all its coal-fired stations, but now finds that this is impossible. To lead readers to believe that “Early Nuclear Phase Out” can be accomplished without major damage to our economy, health, environment and society as a whole is irresponsible.
- 292/1 It is unrealistic to assume that the current nuclear contribution will remain constant, and that uranium will remain cheap, for 200 years without any idea of where the necessary energy will be found. The price of uranium has risen by fifty per cent so far this year.
- 292/2 The weight of used enriched fuel is reduced but not its heat output or radioactivity, both of which are proportional to the power produced. It is these factors that dictate the shielding needed in storage and transportation, and the spacing of the containers in the repository.
- 293/1 Why not use Gage’s Canadian Dictionary?
- 293/2 The NWMO’s failure to respond to submissions is not in accord with its definition of “Dialogue”.
- 294/1 See 130/1. “Half-life” is the time for half the atoms to disintegrate: the amount of radioactivity depends on the radioactivity of the daughter products.
- 294/2 This “definition” of the Precautionary Principle adds yet another version – see my submission of 2003 November 28, criticizing Stirling’s Background Paper.
- 295/1 In the context of nuclear energy, “Security” is more than this – see IAEA publications.
- 296 “BEIR” – spelling.
- 297 “Ops” is an abbreviation, not an acronym. “United Nations Scientific Committee *on* the Effect of *Atomic* Radiation”.