Response to NWMO's Draft Study Report: *Choosing a Way Forward: The Future Management of Canada's Used Nuclear Fuel*

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Introduction

The latest report by the Nuclear Waste Management Organization (NWMO) recommends that the Government of Canada accept an *Adaptive Phased Management Approach* for nuclear fuel waste (NFW). Three hundred years will be required for implementing this proposed initiative. From one perspective, this initiative can be viewed as action-oriented, confident and purposeful. Alternatively, and when viewed in the larger context of nuclear energy development in Canada and abroad, the proposed solution to NFW management is consistent with the inexorable and incremental pattern of the nuclear enterprise worldwide.

The discussion initiated within the NWMO, as guided by the *Nuclear Fuel Waste Act*, propagates the decoupling and separation of the numerous aspects of nuclear energy that, to give context and coherence, should logically be addressed simultaneously, or in a different order. We and many others have argued that it is not logical or ethical or just to address one part of the nuclear industry in isolation of its numerous other components and in relation to other issues and economics within Canada. What is the future of nuclear energy in Canada? How does the NWMO's proposed solution affect Canada's overall nuclear energy strategy? How does Canada's overall nuclear strategy affect the NWMO's proposed solution? Unfortunately, these issues are not addressed.

Lois Wilson, a member of the Nuclear Waste Management and Disposal Concept Environmental Assessment Panel (the Seaborn Panel) wrote in her book *Nuclear Waste: Exploring the Ethical Dilemmas* (2000), that …"the public wanted to discuss the entire nuclear fuel cycle and not just one part of it". The opportunity for the public to address the nuclear waste issue in a comprehensive and complete manner has still not emerged.

Admittedly, the NWMO has a difficult mandate as established by the Nuclear Fuel Waste Act. They have indeed solicited comments from many Canadians and groups within Canada. Their requirement to consider ethical, social, economic, environmental, technical etc. principles, arguments and facts is a challenge that few other agencies have had to incorporate. As can be expected, the NWMO has solicited and received a vast amount of material (reports, dialogues sessions, "expert panels" etc). As also expected, the views and opinions expressed fall within and without of the NWMO's interpretation of its mandate and support and oppose the nuclear industry or support or oppose a particular aspect of NFW management. As we have noted in our earlier submissions to the NWMO, the criteria the NWMO used to select and adopt some views should be transparent. We noted particularly, that the conclusion by the Assessment Team favouring the geologic disposal options needed to be clarified. Unfortunately, this has not occurred. As the recommended approach (*Adaptive Phased Management*) is essentially geologic

disposal on a protracted time scale, we feel that it is critical that the "judgements" made by the Assessment Team favouring this option be made explicit.

Further, while the NWMO clearly made great efforts to solicit views from the Canadian public, their selective use of some comments and not others, while necessary, needs justification. We note particularly in Chapter 3 ("*What People Told Us*") the formulation used when reporting the results of the "dialogues" on almost every issue: "some respondents/participants" … [usually a negative statement] followed by "however, others have expressed……" [usually something favouring the NWMOs proposed solution]. This is a tedious formulation. Of course conflicting viewpoints were expressed; NFW is a contentious issue. What is important is how are competing views reconciled (i.e. what criteria are used)? Who reconciles the competing views? Without clear justification by the NWMO on **how** they sifted through the vast amount of material they collected over the past two and a half years, and **by what criteria** they filtered that material, the role of the public in the process may be questioned, particularly by those who did not fully endorse the NWMO's conclusions.

A) Options Study

Overall, we find the NWMO's consideration, evaluation, and assessment of the options to be deficient. We have concerns about: (1) the robustness, repeatability, and transparency of their analysis; (2) the adequacy and appropriateness of their definitions of analytical criteria (objectives); (3) the legitimacy of the assumptions which structure and guide their assessment; and (4) the application of the principles they claim guide their assessment. We have flagged many of thee issues at earlier stages of the study, and have repeatedly brought them to the attention to the NWMO (please see responses to NWMO discussion documents 1 and 2). We are disappointed to see these issues repeated, and in some cases magnified in their draft recommendation to government.

1. Analysis

The quality of the analysis presented by the NWMO in the draft of their final recommendation to Government is lacking. Two assessments were conducted which compared the different management options judged against eight objectives. The first assessment was conducted by the Assessment Team of people selected by the NWMO, the second by Golder/Gartner Lee, both studies were accepted by the NWMO and form the analytical component of their options study.

- Very little to no *justification* is presented by the NWMO in their summary of this analytical work of the many *assertions* made by both the Assessment Team and Golder/Gartner Lee about the relative merits, disadvantages, safety, and risks of the different options measured against the objectives. In the near total absence of argumentation, evidence, and rationale provided to justify or legitimize the analytical conclusions used by the NWMO in their decision making , this work comes across as a series of assertions. For example, for each option it is asserted that the transportation risks are "low" (or "very low" or "small" or "very small") and that radiation exposures for normal and off normal scenarios are expected to be low (or "very low"), but it is not at all clear why such assertions are justified nor how these conclusions were reached.

Either more transparent reporting of the assessment exercise (which includes the rational for and justification of analytical conclusions) is required, or a more robust and analytically sound analysis should be made of the options.

- Contradictory statements are made in the assessment of the different options which make the analysis inconsistent. For example, when assessing the Public Health and safety of Deep Geologic Disposal, Centralized Storage, and Adaptive Phased Management, it is stated that although these options require transportation of the waste, "overall, radiation exposures for normal and off normal transportation activities are considered very small" (79; 81;82). However, when assessing storage at nuclear reactor sites, the lack of transportation risk is considered an important benefit of the option: "No transportation of used nuclear fuel is required, as the used fuel would remain where it is generated; therefore there are no of-site transportation related risks" (80). In the case of Storage at reactor sites the risk associated with transportation is represented as significant, in the case of the other three options this same risk is represented as insignificant. These inconsistencies do not inspire confidence in the NWMO's analytical reasoning.

- The presentation of the different management approaches in the analytical work is at times misleading. Frequently, the ways in which the management approaches are described and considered in the analysis affects the conclusions made in the assessment and the overall quality of the assessment. For example, the safety afforded by centralized storage options (that the waste will be located in only one place), and especially the safety afforded by deep geologic disposal options (that the waste will be passively contained and inaccessible), is shown in the assessments to be one of the most important strengths of these management options. It is not clearly stated that the centralized options (1, 3 and 4) (whose safeness is the result of the waste's containment at only one site) will actually entail at least eight sites where nuclear waste is available and stored for an undetermined period of time. The waste will be produced at seven locations in Canada , at least (assuming a phase out of nuclear energy) until the end of the reactor lifetimes; and will be stored at the reactor sites for ten's of years for each fuel cell cohort until it is sufficiently cool for centralized emplacement. To present centralized options as safer than non centralized option as a result of the limited number of sites at which waste must be contained is misleading. Similarly deep geologic disposal options (1 and 4) are represented as safer than the other options as a result of the passive nature of their safety which relies in large part on the repository's permanent closure and the waste's inaccessibility. To then present these options (1, and 4) as more desirable to the public because of the possibility for postclosure monitoring and access (figure A3-1), without mention of the resultant reduction in safety and the difficulties associated with these operations, is misleading.

  A second example is the representation of the relative financial costs (and economic viability) of the 4 options. In the Assessment, storage at reactor sites is judged to have the highest long term cumulative financial costs, while deep geologic disposal, the shortest. The costs of the different approaches were, however, not factored consistently: Storage at reactor sites (the most expensive option) is the only one of the 4 options for which costs for transportation, interim storage, and retrieval were not excluded from the

cost estimates. Were retrieval and transportation costs for deep geologic disposal factored into the cost equation, perhaps the results would change. This does not represent a consistent transparent or particularly objective consideration of the options, nor does it reflect a transparent disclosure of the uncertainty related to cost estimates.

- The analytical work reflects an overwhelming reliance on the work of the "joint waste owners" who are the owners and producers of nuclear fuel wastes (for example cost estimates, and descriptions of the management approaches). This work, especially the conceptual designs of the management approaches form the basis of much of the NWMO's analytic work. The joint waste owners, as owners, producers, and key players in the Canadian nuclear industry have a vested interest in the continuation of the nuclear energy program and the public legitimation of nuclear energy. Recent policy reviews (Manley Report) and initiatives taken by the nuclear industry (AECL's plans to build 8 new reactors, and OPG's constant attempts to refurbish old nuclear reactors etc) evidence this. The nuclear industry since the establishment of an 1971 AECL-Ontario Hydro committee to investigate nuclear waste management have shown a clear preference for deep geologic disposal. Given the connection of the NWMO to the nuclear industry through the makeup of its Board of Directors (some would say that the NWMO is legitimately part of the nuclear industry) and the attempt of the NWMO to appear unaffected by their close association to the nuclear industry, it is unfortunate that they rely so heavily on the information provided by the joint waste owners. We feel that this compromises the objectivity and independence of the analysis and at best reduces public confidence in the honesty of the NWMO. It behoves the NWMO to consult and make more extensive use of the independent scholars with expertise in engineering and nuclear sciences.

2. Analytical criteria: definition of the eight objectives

The definitions of the eight study objectives, against which all of the options were measured in both of the NWMO's assessments of the options, and which together form the analytical framework, are unsubstantiated and problematic. The particular way in which these objectives have been defined uniquely by the assessment team of nine people and reused without modification or testing for subsequent analyses, likely affects the conclusions of the analysis. For only one group of nine people to define and develop the analytical framework on the basis of their subjective judgements and "gut feelings" (as admitted by the NWMO and the assessment team) upon which the entirety of the NWMO's analytical work is reliant is simply shocking. At the very least, several groups of people from diverse backgrounds and areas of knowledge, independent from the nuclear industry (including aboriginal peoples, ethicists, members of nuclear awareness groups, environmental groups, sociologists, and other types of groups representative of societal difference and opinion on nuclear issues and independent scientists) should have be asked to define "fairness"; "environmental integrity"; "community well being"; "adaptability" and the other objectives. A methodology to compare, synthesize and debate the different definitions of the objectives and come to agreed upon and democratic definitions should have been used to define the objectives. As it stands, the definitions of the objectives are unsubstantiated and represent only one particular perspective on how to realize the objectives in relation to NFW management .

This is problematic from the point of view of a robust and socially legitimate democratic analysis. The definition of the objective (fairness for example) will certainly affect the ways by which different management options measure up against the objectives, and therefore the conclusions about the relative merit of each option in the analysis. Many assumptions which are by no means neutral, unproblematic or true (but rather matters of opinion, politics, and subjective judgement) structure the definition of the objectives. The assumptions that structure the definition of the objectives, and affect the results of the analysis are discussed below. Our objection is certainly not that subjectivity and politics enter into the definition of the objectives, rather that (1) robust and democratic methodologies guide their incorporation, and (2) that they be incorporated transparently and honestly without pretence of objective truth. Neither of these conditions have been satisfied, and so we conclude that the objectives and the analytical framework do not represent democratic, transparent and inclusive decision making, and that the framework and its conclusions are not socially acceptable nor analytically rigorous.

3. Assumptions

As a result of the method used to define the objectives against which the options were considered, several unsubstantiated assumptions (problematic for reasons described above) structure the definition of the objectives, the consideration of the options and the results of the NWMO's analytical activities. The following assumptions, found to structure the definition of objectives and consideration of options, are not only arbitrary (for methodological reasons described above) but are also problematic in that no rational or justification for the assumption is provided. For example:

An unsupported preference for "scientific and technical" over "societal" uncertainty is assumed in the definition of multiple objectives. The analytical framework, assertions about the options in relation to this framework, and conclusions about the relative merits of the different options all show an unsubstantiated preference for "technical uncertainty over societal uncertainty". Technical and scientific uncertainties are assumed to be more manageable, and more easily overcome than societal uncertainties, which are presented as impossible to overcome and know about. While understanding and making knowledge claims about future societies and the behaviour of radioactivity over millions of years are certainly both difficult and riddled with uncertainty, it is unclear why the NWMO places more faith in predicting the health effects of a repository in an unknown location over hundreds of thousands of years than the nature of human society. Given the overwhelming preference for so called technical uncertainty, this assumption must be legitimized.

This assumption affects the results of the analysis. Passive safety, for example is preferred over active safety. The NWMO assumes that it is predictably safer and more socially acceptable to manage NFW through confidence in engineered and natural barriers (deep geologic disposal) rather than manage waste in ways which would require confidence in ongoing societal engagement in ensuring the isolation of the waste. This assumption requires justification as it structures the majority of the NWMO's claims about the safety and acceptability of NFW management options.

Other assumptions which structure the definition of the objectives include:

That all negative effects or consequences of nuclear fuel waste management, including danger, harm and hazard can and should be measured and known in terms of risk. That the effects and outcomes of NFW management, such as safety, fairness, and health can be defined in terms of risk and judged on the basis of the distribution of risk requires justification. To measure and understand something as a risk means that *all* the possible outcomes are known and that the probability of occurrence of each outcome is known (such as rolling a dice). Predicting the exposure to radioactivity tens, if not hundreds of thousands of years into the future for each option is perhaps more complicated. That risk is the best way to make knowledge about the outcomes, as is suggested in the definition of objectives, requires justification

That flexibility and robustness are opposites. Especially in the consideration of uncertainty in the definition of the objective "adaptability", it is assumed that flexibility (the ability to adjust to unforeseen and unknown events) and robustness (resistance to stresses) are opposites. For example the objective of "adaptability" meant to evaluate the management approach's ability to handle uncertainty, formulates adaptability as a matter of balancing flexibility (the ability to respond) to robustness (resistance and stasis on the face of stress), defining them as opposites. Thus it is possible for something to be adaptable (accommodate uncertainties- things that cannot be known) by being either robust (resistant to stress and therefore not requiring flexibility) or by being flexible (able to respond). This reasoning and assumption makes deep geologic disposal options (1 and 4) the most adaptable because deep geologic disposal is "robust" and will therefore be able to weather uncertainty and withstand the unknown and unforeseen surprises (a circular proposition that defeats the necessity for adaptability in the first place if the unknown can be reasoned away through robustness).

4. Principles

The principles said to guide the assessment are not sufficiently developed or evident in the analysis. The following principles are said to ground the overall approach to the NWMO's analytical work in assessing the options: Sustainable development; an holistic systems approach; adaptive management; and the precautionary principle. As we have indicated in our earlier submissions, we find a lack of evidence to indicate that these principles are being applied in a coherent or consistent way and suggest that if they are not to be applied, that they not be invoked for fear of creating a misleading impression.

The NWMO's work invokes but does not apply sustainable development. The notion of sustainable development involves taking actions now to ensure that current generations will be able to meet their needs, without compromising the ability of future generations to meet their needs. Sustainable development, involves a serious examination of resource use and an analysis of the needs of society, and results in: the reduction of consumption; the reduction of harmful or wasteful methods of meeting the needs of society; implementation of conservation measures; and an overall a holistic examination of the use of a resources (i.e. a society's "ecological capital"). The NWMO's analysis of different NFW management options does none of this. It does not consider the production of waste, it does not analyze consumption patterns, it does not separate

energy needs from desires, and does not suggest more effective and sustainable methods for meeting the needs of society. The NWMO's analysis certainly does not consider needs reduction, conservation, or alternatives to the continued production of nuclear fuel wastes. We conclude that it is misleading for the NWMO to continue to invoke the notion of sustainable development.

The NWMO's work invokes but does not apply a "holistic systems approach". Systems analysis is a method which at its most basic requires the deliberate inclusion of all components of an issue in the definition of the problem and consideration of a solution. Applied to an analysis of NFW management, a system's approach would involve *at the very minimum* an examination of nuclear waste in the context of the entire nuclear fuel chain; including nuclear power generation, nuclear waste production, and other activities and their impacts such as uranium mining, milling, refining and transportation. Following a systems approach would mean defining the problems posed by nuclear waste through consideration of these aspects, and especially energy policy, and would articulate a solution to the waste problem that considered the production of the waste (in whatever manner) and not only the end result. The NWMO's analysis considers NFW management in isolation of energy policy and the rest of the nuclear fuel chain, advocates managing only the end result of the system (nuclear waste) without consideration of its production, and in fact shows resistance to the many calls from diverse parts of society (including environmental, academic, and social justice groups, independent citizens, and First Nations organizations) for an analysis which includes and takes seriously the different components of the nuclear system. This is not a matter of the NWMO's legislated mandate: the NWMO is *not* explicitly excluded from considering NFW production or the management of the entire waste stream in its examination of NFW management approaches. We conclude that it s misleading for the NWMO to continue to invoke a holistic systems analysis without applying it.

The NWMO's work invokes but does not apply adaptive management, especially in its support of option 4 (Phased Adaptive Management")**.** The notion of adaptability, and the term adaptive management imply the possibility for a flexible and continuous process of change. Adaptability describes the power to adjust to variation and to change according to and along with fluctuating circumstances. This is important in NFW management, if for no other reason than the unfathomable timeline over which waste must be isolated from humans and the environment. Adaptability is desirable because of the high levels of uncertainty (knowledge of outcomes but not of the probability of the outcomes) and ignorance (knowledge of neither the outcomes nor their probabilities) that accompany claims and predictions made about the performance of management approaches over very long time periods. Under these conditions the possibility of "unforeseen surprises" must therefore be planned for and management systems must be able to react to changes that cannot be foreseen, predicted[1]. The NWMO's analysis of the different options, definition of the objective "adaptability" (critiqued above for its conflation of robustness with adaptation), and especially recommendation of option 4,do not reflect serious consideration of adaptability. The NWMO proposes deep geologic disposal over a longer time frame as adaptable. Real adaptive management does not foreclose any management strategy, and true adaptive management always maintains the possibility for change. The NWMO's definition of

[1] G. Holling 1994. Simplifying the complex: The paradigms of ecological function and structure. Futures **26**(6):598-609.

Holling 1986. The resilience of terrestrial ecosystems: Local surprise and global change. *In* W. Clark & R. Munn 1986 (Eds). Sustainable Development of the Biosphere. International Institute for Applied systems Analysis. Cambridge: Cambridge University Press.

Adaptability (as a balancing of flexibility (indicating flux and responsiveness) and robustness (stasis) is opportunistic and not in the spirit of adaptive management. The NWMO's choice of option four, deep geologic disposal over 300 years as most adaptive because of its robustness (proclivity towards stasis) is in fact the opposite of adaptable management. Adaptable management would never foreclose a particular option, and would never consider an inflexible management option as an adaptable option especially under conditions of uncertainty and ignorance.

The work of the NWMO invokes but does not apply the precautionary principle.
The precautionary principle states that when full certainty about the health and environmental outcomes of a possible action is impossible or unlikely (especially when confronted by uncertainty and ignorance) that decisions be taken to protect explicitly human health and the environment. Application of the precautionary principle involves making every effort possible to take decisions which favour human health, safety and the environment when considering the evidence or lack of evidence supporting a possible course of action. In the case of NFW management applying the precautionary principle would involve making decisions that protect human health and safety at every step of the way- and take preventative and precautionary steps to avoid courses of action which *might* result in harm. Applying the precautionary principle has everything to do with the treatment of uncertainty and ignorance associated with the knowledge produced about NFW management and its effects: when certainty is not possible (which is the case with most of the predictions about NFW and its management) the precautionary principle obliges decision makers to take steps to avoid the *possibility* of harm to people and the environment. The NWMO's treatment of uncertainty and ignorance is, however, not in the spirit of the precautionary principle. The NWMO uses methodologies of risk, (risk determination, identification , assessment, and management) to understand the effects, harm, consequences, danger and hazard associated with different management options; to make claims about the human health, safety, and environmental integrity of the different options; and then to make decisions about which provides the best (relative) protection for human health and the environment. Risk, and risk assessment methodologies treat uncertainty very differently than is required by the precautionary principle. Risk assumes that all the possible outcomes of an event and the probability of each of these outcomes are known, and therefore that the human health and safety outcomes of an approach can be determined appropriately over very long time frames under hypothetical conditions; thus risk determination, assessment and management techniques treat conditions of uncertainty (extreme uncertainty) and ignorance as much more certain, predictable, and knowable than they are. Decisions about the health and safety effects of the different repositories are based on risk and are therefore not precautionary: they are predictive and offer a different way of dealing with uncertainty. For example, the precautionary principle, might require that the NWMO at least consider reducing the production of nuclear waste to limit the hazard, and the potential for harm to humans and the environment; this because predictions about the effects of NFW on humans hundreds of years into the future under unknown environmental conditions using unproven techniques, are too uncertain, involve too much ignorance to guarantee safety, and that to act for the benefit of human health and the environment requires an elimination of the hazard where possible. We conclude that it is misleading for the NWMO to continue to invoke the precautionary principle when really what they are basing their decisions on is risk management.

B. The recommendation: Phased Adaptive Management

The above analysis, we feel calls into question the legitimacy of the NWMO's recommended management approach. A few very brief comments about the adequacy of the approach itself are provided.. Overall we find that the recommended approach is not in fact a distinct approach.

Phased Adaptive management is only deep geologic disposal by a different name, implemented over a longer timeline. It is unclear why this merits consideration and presentation as a separate option. It is condescending to suggest that this option was arrived at through the consideration of public and aboriginal groups' comments when it is no different than a softened-up and more palatable version of the course that the nuclear industry and natural resources Canada have been supporting since the early 1970's. This option should in fact be option 1 b- one of several possible versions of deep geologic disposal. We feel it is best to call a spade a spade in the interest of transparency and disclosure.

Why is a centralized storage facility desirable or required when the waste will inevitably be moved into deep geologic storage? What advantages does it add and how exactly does it contribute to safety, adaptability and security? Why are three different stages more adaptable and why do they accommodate uncertainty better than any of the other approaches? Is it possible to choose not to move to a deep geologic disposal facility? And is post-closure monitoring and testing possible without jeopardizing the integrity (safety and security) of the facility?

The option is also inaccurately characterized and qualified according to the NWMO's own analytical framework, Three examples are provided:

(a) The option is not relatively more "adaptive". The option cannot be considered adaptive because it precludes management options other than deep geologic disposal. True adaptive management does not foreclose options. (see above critique). Also, deep geologic disposal cannot be considered flexible and responsive to change (the definition of adaptive) because it is the least mutable, and most static option considered by the NWMO. (see above critique). Note that as stated in the above critique we do not consider it acceptable to define adaptability (in light of uncertainty) as a balancing act between flexibility and robustness.

(b) The option is not relatively more "safe" or more "secure": the option is considered to be secure by the NWMO for two reasons- (1) it ultimately requires passive containment and sealing (implying irretrievability); and (2) because it provides for centralized containment of the waste at one site (once the decision is taken to move the waste from reactor sites). Both of these claims are debatable. First, the possibility of post-closure monitoring, introduced as a way to reduce uncertainty and increase adaptability would infringe on the security and safety of the option. Passive containment and safety require that the facility be sealed and in fact relies on a lack of intrusion- otherwise the merit and protection afforded by passive safety is compromised relative to the other approaches. (see above critique). Second, the claims that this option is secure because it confines the waste to one location is misleading. Even if nuclear power is phased out once the lifetime of the current reactors expires, waste will continue to be stored and cooled at reactor sites before transportation and emplacement in the facility or repository. Waste will then be stored at 8 sites and will be constantly in transit, even if no new waste is produced. This

reduces the relative safety and security of this option- something not considered by the analysis which recommends this option (see above critique).

(c) The claim that option four "shares the same benefits as option 1 and option 3" (p. 76) is perhaps true. However, by definition, option 4 shares, and in fact has all of, the risks (to stay with the NWMO's conceptualization) associated with option 1, option 2 and option 3. If we accept the dictums of the risk management literature, option 4 has the greatest risk.

C. Knowledge

The NWMO's consideration of the contributions of different groups in society is uneven and unbalanced. This affects the quality of consultation and engagement legally required with the various publics, including aboriginal peoples, the quality of the knowledge used to define the options, make judgements, and analyze the merits of the options, and the NWMO's commitment to democracy and democratic decision making. Specifically the NWMO's consideration of the contribution of different groups: (a)conflates the knowledge claims of most publics (including aboriginal peoples) with 'values'; (b)conflates the knowledge claims of the nuclear industry and its associate scientific and technical nuclear experts with factual and objective knowledge; and (c)diminishes the knowledge claims of aboriginal peoples. We have brought these concerns to the attention of the NWMO throughout the development of their work on several occasions. Unfortunately we find it necessary to repeat our concerns.

(a) conflation of various publics' knowledge claims with citizen values.
Firstly, the NWMO's analysis, decision making , and work in general makes a clear distinction between knowledge and values. Their work associates values with the contributions of citizens, Canadians, and the public in general, and in so doing confines the contribution and indeed the knowledge claims of citizens uniquely to values. The claims that various publics and various public opinion leaders and groups make (including environmental groups, women's groups, social justice groups etc) are repeatedly cast as relevant only to the elaboration of "social issues" or "societal concerns", or are cast *as* values, perceptions or concerns. This has the effect of representing the contributions of various publics not as knowledge about NFW, or as critiques of the claims of the nuclear industry, or as alternative claims about the effects of nuclear fuel waste, but as values. The contrast between values and facts (knowledge) is important, as it succeeds in reinforcing the irrational spontaneous, subjective and affected character of public claims to appropriately confine their contributions. the knowledge claims made by the nuclear industry by contrast, is constructed as objective factual, value and interest free, and unhindered by emotion.

Secondly, the NWMO associates the values of various publics with ideas of nationalism and citizenship. The contributions of various publics are considered important, and indeed are sought, because of their origin in citizenship and shared Canadian identity that is articulated around a common (and positive) experience of the nuclear industry. Here it is assumed that he claims of various publics (including aboriginal peoples) stem from their shared identity as Canadian citizens, and reflect their common and limited experience with the nuclear industry. Here a distinction is drawn not only between values and facts, but between identity based claims (citizenship claims) and objective (subjectivity free) claims that are not based on identity and shared experience (however positive) of the nuclear industry.

An important result of conflating the claims and contributions of various publics with *citizen values* is that it firstly obscures the different experiences that different peoples in different places (especially aboriginal peoples) have had with the nuclear industry. These experience are the basis for the knowledge claims that these groups make. A second result, is the dismissal of the content of these claims. Many publics (especially environmental, social justice and aboriginal groups with experience of the nuclear industry) make claims that contradict the claims of the nuclear industry, challenge the claims of the nuclear industry, express dissent at the plans of the industry, and articulate alternative ways in which to define the problems posed by nuclear waste. These contributions and knowledge claims, are dismissed, diminished, ignored, and in fact rendered impossible by the model: citizen values/expert knowledges. While we are not criticizing the inclusion of values in attempts to formulate policy about nuclear waste, we object to the model which reduces public claims and contributions (including dissent , alternative experiences, and criticism) to values based on citizenship which not all publics share, and more egregiously to a citizenship based on the polite fiction of a shared, common and positive experience of the nuclear industry.

(b)The claims of the nuclear industry and its associate nuclear experts are conflated with knowledge, and with rational, objective and authoritative facts about NFW its effects and its management. These claims are represented as value free, not based on a group identity. The result is that these claims, and the content of these claims are protected from critique, challenge, dissent, and external examination, not only by various publics with scientific or anti-scientific methods of judgement, but by experts on nuclear issues including radiation safety etc that are outside the nuclear industry. As such the NWMO's decision making structure promoted for nuclear fuel waste management: one of "science in service of Canadian values", is anything but democratic and inclusive because of the rigid distinctions it maintains between the claims of the nuclear industry and the claims of those outside of it. We are <u>not</u> categorically stating that the claims made about nuclear waste its effects and its management made by members of the nuclear industry is not knowledge, and is not legitimate. We are claiming that the nuclear industry has a history and culture of barricading itself against debate, scientific controversy, and external criticism of its assertions, and that the work of the NWMO actively maintains these barriers through the mechanisms described above.

(c) The NWMO's consideration of the contribution of aboriginal peoples to the management of nuclear fuel waste ghettoizes, diminishes, and homogenizes the knowledge claims of aboriginal peoples about NFW, its effects and its management.

- The articulation of a common Canadian experience of the nuclear industry (critiqued above) which describes the experience of all people in Canada with the nuclear industry as positive (economically beneficial) limited (restricted to the consumption of nuclear energy, availability of medical therapies, and an awareness of nuclear power generation) and as homogenous (the same for everyone everywhere) obscures and erases the very different experiences that many aboriginal peoples have had with the nuclear industry. First Nations peoples (for example) and their lands have overwhelmingly been affected by the development and expansion of the nuclear industry including the generation of nuclear power and the production of nuclear wastes. Aboriginal peoples, First Nations in

particular, have had in-depth and extensive experiences with uranium milling, mining nuclear power production and nuclear waste storage in various forms in their territories and communities. Based of their exposure to and experience of the activities processes and consequences of various parts of the nuclear industry aboriginal peoples have continuously articulated knowledge claims which are of extreme relevance to the consideration and management of nuclear waste and the determination of its effects. Aboriginal peoples have repeatedly made claims about the behaviour of radioactivity in human bodies; the cumulative effects of radioactivity in complex ecosystems (including the uptake of radioactivity and other chemicals in food chains, bio-accumulation, and bio-magnification); the effects of long term low level exposure to radioactivity; the effects of all of these (including their relationships with the nuclear industry) on their self determination and aboriginal and treaty rights; and the limits to and conditions under which knowledge claims can legitimately be made about environmental and social continuity, radioactivity, and time. These claims (which tend reveal overwhelmingly negative experiences and to contradict challenge and provide alternatives to the claims of the nuclear industry[2]) are obscured and ignored by the NWMO because it does not recognize the unique experiences of aboriginal peoples with the nuclear industry.

- When treated separately from citizen values, the knowledge claims of aboriginal peoples are either objectified or essentialized and thus dismissed. When discussing knowledge and knowledge claims it is important to distinguish between substantive knowledge (the content of a knowledge claim- its substance), and epistemology (the methodology according to which a particular knowledge claim is reached, and the cultural rules according to which any knowledge claim should be reached). The NWMO miss-represents the substance of aboriginal peoples claims about NFW, presenting their possible contribution as: localized and locally relevant data about a particular ecosystem or place that conventional knowledge may have missed; information about lifestyle practices to be taken into account during the siting and implementation of a facility; and generalized statements about the interconnectivity of all things to be taken into consideration by the NWMO when making decisions. These are methods by which the knowledges of aboriginal peoples is objectified; turned into an object of contemplation for the NWMO, and their actual claims based on their experience of the nuclear industry described above, dismissed (because they do not fit the NWMO's representation of their knowledge).

- The NWMO dismiss the epistemological components of aboriginal peoples' claims by representing these claims as essentialized and trivial guidelines for decision making. Aboriginal knowledge is often idealized and romanticised by the NWMO as traditional and spiritual guidelines for decision making (such as the seven generations teaching), as protocols about who speaks when, or a as out of de-contextualized statements about the spirituality of all things, and the relationship of aboriginal peoples to the land. This

[2] Stanley A. (2004) summary and analysis of the Testimonies and submissions of aboriginal peoples to the Environmental assessment Panel on the Concept of deep geologic disposal . In, NFW management, reports prepared for the AFN, edited by A. Stanley. This comment is also based on the comments of the Seaborn panel in their 1998 report about he testimonies of aboriginal peoples, and a review of the transcripts of the testimonies and written submissions of aboriginal peoples to the panel between 1990-1997.

trivializes, essentializes, and locks the knowledge claims of aboriginal peoples in the past, without recognizing the subtle epistemological messages about when it is possible and legitimate to make a knowledge claim and when it is foolish to do so given the time horizons and the environmental conditions under which the claims is made. Framing and limiting aboriginal knowledge claims and obscuring their epistemological components obscures the history of experience of aboriginal peoples with the nuclear industry and they knowledge claims which arise from this experiences, especially those which challenge scientific and risk epistemologies, and the claims made by the nuclear industry about the predictability of the future.

D. The involvement of Aboriginal peoples in the options study

We are concerned with the NWMO' marked lack of attention to the knowledge, concerns, and rights of aboriginal peoples displayed throughout their course of their work and summarized in their recommendation to government.

(a) Knowledge
The misrepresentation, dismissal and obscuring of the knowledges of aboriginal peoples with respect NFW its effect and its management has been described at length above and in our earlier submissions and will not be repeated again. We are also concerned with the NWMO's misuse and mis-application of aboriginal knowledges. We wish to echo the numerous statements made by aboriginal peoples and organizations that the NWMO cease applying so called "aboriginal knowledge" in a decontextualized and inappropriate way, without the explicit review of its application by legitimate and representative aboriginal authorities and express permission and consent of the aboriginal society(s) from which it originates. Aboriginal peoples and organizations have been clear and consistent in their objection to the NWMO's use and application of so called aboriginal knowledge to NFW management [3] .

We would also like to underscore, as we have done several times in the past, the importance of the knowledge of aboriginal peoples to the management of nuclear fuel waste. Aboriginal peoples experience the effects and consequences of the nuclear industry (as discussed above) and are in the unique position to provide knowledge about such things as the effects of radiation in humans, animals, and ecosystems, and about the epistemological limits to claims made about the environment and radioactivity over thousands of years. It is our belief that the nuclear industry has a lot to learn from the nuclear experiences and knowledges of aboriginal peoples in Canada, and we are surprised that the NWMO has yet to commission aboriginal initiated and designed research on these topics, or to consider the experiences of aboriginal peoples with the nuclear industry.

(b) Consultation:
Aboriginal groups have been clear and consistent in their message to the NWMO that the NWMO engagement and dialogue activities do not constitute consultation as enshrined in the Canadian constitution and as defined by Supreme Court rulings. They state three reasons: (1) the

[3] Please see the three working group reports submitted by the AFN to the NWMO on this issue; Maclaren, D. (2005)Notes on the nuclear waste management organization "choosing a way forward" draft study report, prepared for the Assembly of First Nations 14 June, 2005. Also note pages 48-51of the draft recommendation

NWMO is not a federal body and has no status or legitimacy to consult; (2) the national Aboriginal umbrella organizations with whom the NWMO are targeting their dialogues are lobby groups for the interests as expresses at National Assemblies of Chiefs of their constitute aboriginal peoples, and do not have a popular mandate to consult or a constitutional mandate to consult. These aboriginal groups and organizations, and students of constitutional law, assert that consultation can only take place between the Crown (i.e. the federal government) and an aboriginal nation (a distinct First Nation, Inuit nation, or Métis nation); and (3) the NWMO's aboriginal dialogues have not been undertaken in the spirit of understanding and respect necessary to constitute consultation according to their diverse community standards. Their concerns include that the NWMO has yet to show serious consideration of the concerns raised in dialogue activities, or respond to specific requests for aboriginal designed research and reporting about aboriginal and treaty rights and the implication of nuclear waste management for aboriginal peoples. As well, it has been pointed out that distinct aboriginal nations have developed their own consultation guidelines that the NWMO would be required to abide by[4].

The NWMO states on page 51, that aboriginal peoples have yet to have the reach a point where they can comment on the proposed options. We see this a clear indication that consultation has not occurred to a point where the NWMO can make an adequate recommendation to the government about nuclear fuel waste management, and that the NWMO has not fulfilled its legislative requirement to provide a summary of the comments of aboriginal peoples on each of the proposed options, within the required timeline. Clearly, the legislation indicated that Aboriginal peoples contribute to the deliberation about NFW management.

(c) The NWMO have yet to commit in a meaning-full way to the rights of aboriginal peoples, and to their meaningful inclusion in the NFW management process. We note that the NWMO has yet to clearly and meaningfully state how it will meet, respect and uphold treaty rights of aboriginal peoples and manage NFW. The NWMO also, have yet to commission, supply research, or engage in discussions about: how the aboriginal and treaty rights of aboriginal peoples might be affected by the nuclear waste management options; how diverse aboriginal peoples themselves, including their lifestyles and health, might be affected by nuclear waste management options; what waste management techniques and approaches aboriginal peoples might suggest to manage NFW in a manner that does not infringe on their rights. The NWMO also have yet to justify to Canadian society why the rights, and knowledge of aboriginal peoples must be considered in the study. Instead they continue to conflate aboriginal inclusion (including the recognition, affirmation and accommodation of their rights, knowledge and experiences with the nuclear industry) with the inclusion of aboriginal "values and concerns".

E. Public Engagement

1) Page 12 asserts that the NWMO believes their consultation processes encourage listening, learning and genuine engagement and that they have tried to be "responsive to a variety of views and perspectives." Certainly the NWMO is to be commended for undertaking a wide variety of public consultation processes and for reporting the various perspectives they heard, even those that contradict industry views or that are outside their mandate. However, we note two

[4] Please the three AFN working group reports prepared for the NWMO on this issue, and pages 48-51 of the discussion document.

significant problems. First, although public engagement has been extensive, it has not been open and inclusive, as in the model followed by Seaborn. Virtually every public consultation has been carefully orchestrated by the NWMO, with invited participants and/or pre-set agendas. There has yet to be a well advertised, open forum where groups/individuals can express their concerns and hear those of other interested parties. Second, although the NWMO reports the views held by a variety of stakeholders, the way those views are reported in Chapter 3 is general and innocuous and does not give the reader any sense of the importance of the perspectives nor of the NWMO's own perspective on the plethora of views presented. For instance, no magnitude or importance can be associated with terms such as 'many people 'some participants' and 'others'. This way of reporting the data raises more questions than it answers – which people, how many, from which communities? Further, it is only on a close reading of the later chapters that the NWMO's preferred viewpoints become apparent. Thus, for example, the consultation process clearly identified a number of views regarding the continued generation of nuclear power including that 'a number of people told us that the assessment of management approaches needs to be undertaken in the context of a broader public policy debate about energy' (p. 44). Yet, having stated this perspective, the NWMO makes no attempt in their later outlined management approaches to address this concern, instead implicitly siding with the views of Canadians who 'took an opposite view', e.g. that the nuclear energy question does not need to be addressed before considering ways to deal with the waste. This pattern was repeated throughout the document, with the NWMO reporting the various views expressed during public consultation in a vague and apolitical manner in Chapter 3, then choosing an approach in the later chapters that reflects industry mainstream viewpoints, rather than 'other' positions. The NWMO approach appears to be one that outlines without comment a range of views about a particular issue in the front end of the document, then, later, in their preferred approach, remains silent on the discourses that conflict with their preferred perspectives (see comments below regarding chapter 4, for other examples).

2) Page 24 states "Engagement will need to become increasingly a local dialogue." This idea is mentioned again on p.169 where it states "we want to understand the concerns of citizens in regions and communities". While we agree that (in)directly affected communities must be active participants in the decision-making process, no rationale is given for excluding non-local participants. Framing the issue of nuclear waste management as a local issue, serves to truncate on-going discussion of broader issues associated with nuclear fuel waste management, such as the association of nuclear power and waste with war and arms proliferation. This approach also appears to be associated with a limited understanding of the meaning of community, as one associated only with geographically delineated places. Ultimately, this attitude will disenfranchise the views of other interest-based communities such as environmental and industry lobby groups, as well as those of umbrella groups, such as the Assembly of First Nations. For instance, on p. 187 the engagement process in the activity flowchart involves 'potential site, transportation route, aboriginal and non-aboriginal communities'. While a liberal interpretation could include communities of interest, this does not appear to be the main focus (see discussion below).

F. Discourse on Community

We note in this discussion document that the idea of community is foregrounded on several occasions. Some of our concerns associated with this have already been mentioned within the context of public engagement. While the provided definition of community is relatively inclusive, we have some concerns regarding how 'communities' are envisioned as participants in the various aspects of nuclear fuel waste management. Section 12.8 (p. 183) clearly indicates that the NWMO defines community as both placed-based and interest-based. Further in section 15.2 (p. 213) important communities of interest are identified such as government, industry and members of civil society. However, Table 4-11, also in section 15.2, lists only place-based communities under a column entitled 'Communities of Interest'. There appears to be a disconnect between NWMO's theoretical understandings of community and the reality of the envisioned 'community' participation in the management of nuclear waste. Again, this limited vision of community precludes broad-based discussion and involvement of all interested stakeholders, regardless of scale or community affiliation.

The implicit view of community as place-based, is further supported by the governance role outlined for communities within the long-term management of used nuclear fuel (p. 172). Here the role of communities are said to be associated with municipal permitting, emergency response and other activities of that ilk. Again, while place-based examples of responsibilities are provided, the way in which communities of interest would be involved is not clearly indicated.

Beyond that context, the NWMO also includes as an objective the idea of 'community well-being' (p. 89). This is laudable in that it moves us away from using only economic or technological criteria in the evaluation process. Also, the 'bubble' diagram provided in this section outlines in great detail many of the key issues that should be addressed in any evaluation of community well-being. We were dismayed, therefore, when we read the subsequent evaluation of this objective. Not only is the evaluation very brief (e.g. the summary is comprised of four scant paragraphs), it does not address most of the important issues outlined by the various 'bubbles'. As in other parts of the document, we further note some serious limitations in the implicit definition of community, as being associated with a geographically bounded community, that seems to underpin the discussion of this objective.

G. Economic Regions

As specified in the Nuclear Fuel Waste Management Act 12.(3), "The study must include a detailed technical description of each proposed approach and *must specify an economic region for its implementation*" (emphasis added). The NWMO acknowledges this on page 154: "We [the NWMO] have an obligation … to address economic regions …". We have written for the NWMO a Background Paper on economic regions and the NFWA that both defined economic regions and discussed the implications of the use of these regions for the NWMO. We believe that the Act is clear, as noted above. The NWMO **must** specify **an** (i.e. one) economic region for each proposed option. The imperative to select one region per option is obviously not required for storage at nuclear reactor sites (option 2).

We are surprised by the NWMO's conclusion (p. 154) that their reading of the NFWA "does *not* requires us [the NWMO] to identify a particular region for implementing each management approach" (emphasis in original). We are not lawyers but we are confident enough to believe that our interpretation of the law (12.(3)) is correct regarding the imperative to select a specific economic region for each proposed NFW management option.

The NWMO argues that the selection of an economic region is inappropriate for a variety of reasons (see pages 154-155). While we do not necessarily dispute the fact that the foisting of economic regions on the NWMO at this stage will dramatically alter the NFW "landscape" and that perhaps the author(s) of the legislation may have made a less that brilliant move in requiring the NWMO to specify a region, but the law states quite unequivocally that the NWMO **must** do so.

The background study produced by Golder/Gartner Lee Limited examining "illustrative economic regions" neither fulfills the legal requirement stipulated in 12 (3) nor makes for an easy read. The following quote from the Technical Report (*Assessment of benefits, risks and costs of management approaches for used nuclear fuel by illustrative economic region*) page 125 is revealing: "The tight time constraints imposed on this study precluded any original research to develop an appropriate database for any of the influencing factors". Still, perhaps to their credit, the authors are able to report on page 260 that "the comparative assessment has found that all approaches have strengths and limitations in comparison with each other". They go on to endorse (though not in so many words) the NWMO's Adaptive Phased Management approach.

At some juncture, and by law it should be now, the NWMO should specify WHERE their management option will go. Since the 1970s when the geologic option was first proposed, it has always been abstract and placeless. It continues to be.

The NWMO's reinterpretation of the NFWA (i.e. 12 (3)) has further implications, specifically with respect to section 8(2)(c) of the NFWA. This section of the Act deals with the composition of the Advisory Council which is appointed by the NWMO Board of Directors. The Advisory Council clearly is influential within the NWMO edifice.

According to section 8(2)(c) members of the Advisory Council are to include: "representatives nominated by local and regional governments and aboriginal organizations that are affected because their economic region is specified for the approach that the governor in council selects under section 15 or under subsection 20(5)" . By not selecting an economic region as required, the NWMO is effectively eliminating participation on the Advisory Council by those who will be most affected by the (eventual) implementation of a NFW management facility.

At the very least, the NWMO should articulate clearly why it is not adhering to section 12(3) of the Nuclear Waste Management Act. Simply stating that the inclusion of 12(3) was not a good idea is insufficient.

Conclusion

We hope that are comments and observations are of use. They are given in the spirit of ensuring that the legacy of nuclear energy development and use in Canada is managed in a fair, open and democratic fashion. We look forward to reading the final report on November 15, 2005.