

By W. Turner (Concerned Citizen, former Pinawa Resident)

**General Comments on the Proposed New Decommissioning Strategy for the WR-1 Reactor**

**1. What is the problem?**

CNL appears to have decided on a technology without a thorough examination of the appropriateness of that technology. Except for possibly immediate monetary considerations, CNL has not provided an unambiguous description of the problem it wishes to solve. From the project description provided, all we know is that WR-1 reactor needs to be decommissioned, and that CNL has a licence from the CNSC to do that over an extended period. CNL has provided no justification (only assertions) as why the permanent shutdown of the reactor has to be accelerated. I am not aware of any unacceptable risks to the workers, the public or the environment from the current status of the facility. So, what is the problem?

Except for assertions, the proponent provides no evidence that the “in situ decommissioned” facility will result in lower the risks to the environment, the workers and the public compared to current strategy of deferred dismantling. Further, CNL has provided no details that compares the end-state of the proposed undertaking to the resultant end-state of the current strategy. The rush to decommission in situ means the reactor will remain in place forever. This is not the case for the existing approach. Which is better in the long run, a concrete structure that will remain in perpetuity, or a greenfield (or maybe brownfield) site?

Without a proper problem definition, any solution is OK, including “in-situ decommissioning” (whatever that means, see below). To paraphrase the Cheshire Cat in Alice in Wonderland, “*If you do not know where you going, it does not matter what road you take*”. This is not an approach that I would expect of a technologically sophisticated company.

One further concern is that the current decommissioning licence covers the whole Whiteshell site, not just the reactor. CNL has provided no information as to the impact to the whole site from the entombment of a small portion of that site. How do the effects from this proposed undertaking impact the effects from decommissioning the rest of the site? In other words, what are the cumulative effects? I suggest that the scope of the problem is much larger than the WR-1 reactor alone.

**2. What is meant by “in situ decommissioning”?**

The proponent states that the reactor on the Whiteshell site is currently in storage with surveillance with the ultimate objective of removing the reactor. For reasons that are mostly financial, CNL asserts that this situation is not acceptable. Therefore, the proponent is proposing to leave the reactor in place and to encapsulate the hazards by “in situ decommissioning”.

However, “*in situ decommissioning*” is not really defined anywhere in the project description. But one can infer what the proponent means from the document. For example, in Section 2.1.1, 4<sup>th</sup> paragraph of the proponent states:

*A new approach, In Situ Decommissioning (ISD), has been proposed for the decommissioning of the WR-1 Reactor. **The below grade reactor systems**, components and structure and associated radiological and non-radiological hazards **will be permanently encased with grout**... An engineered cover will then be constructed over the below grade structure. **ISD is a permanent, passive decommissioning end state.***

See also 3<sup>rd</sup> paragraph of Section 7 which states:

*In Situ Decommissioning results in **a concrete monolith** which provides a robust and durable containment to allow for continued radioactive decay*

To me this appears to be another way of describing entombment. This is confirmed since the last paragraph of Section 3.1.1, on page 3-2, states:

*Following In-Situ Decommissioning, institutional controls and surveillance activities will be required to monitor environmental performance of **the entombed material at the WL site.***

Note the similarities with the IAEA definition of entombment, which is:

*Entombment is the strategy in which the radioactive contaminants are **encased in a structurally long lasting material** until the radioactivity decays to a level that permits release of the facility from regulatory control (Decommissioning Strategies For Facilities Using Radioactive Material, Safety Report Series #50, IAEA, Vienna, 2007)*

In other words, for the WR-1 reactor, “in situ decommissioning” means entombment.

### **3. Is “entombment” disposal?**

Although never stated explicitly, the proponent does not intend to retrieve any of the radioactive components from the entombed facility, since, once encapsulated, recovery would be virtually impossible. As such this undertaking is actually a proposal for a radioactive waste disposal site. By implication, once the radioactivity has decayed to some acceptable level, the site would eventually be abandoned.

That said, I am not aware of any Canadian standards, guidelines or legislation with respect to entombment. Therefore one needs to refer to international guidance, such as the IAEA. I quote several sections from the IAEA document *Decommissioning Strategies For Facilities Using Radioactive Material*, Safety Report Series #50, IAEA, Vienna, 2007 pertaining to entombment:

#### **2.4. ENTOMBMENT**

*Entombment is the strategy in which the radioactive contaminants are encased in a structurally long lasting material until the radioactivity decays to a level that permits release of the facility from regulatory control. **The fact that radioactive material will remain on the site means that the facility will eventually become designated as a near surface waste disposal site and criteria for such a facility will need to be met.** [emphasis added].*

#### **3.3.3. Entombment**

*Since **the end state of an entombed site is equivalent to a waste disposal site, the end state cannot satisfy unrestricted release conditions. An entombed site will need some measure of monitoring and control well into the future,** which will be undertaken by either the operating organization or the regulatory body. Since the area required for an entombed facility is normally less than that of the original facility, the remaining area of the site could be used for other purposes, including industrial applications. **This option may also be considered if a waste disposal site does not exist within a Member State; the waste disposal facility could be created at the facility site. Such a new waste disposal facility would be of the ‘near surface disposal’ type that could receive radioactive waste from other sites, but only waste containing short lived radionuclides.** [emphasis added].*

### 3.4.3. Entombment

The entombment strategy has many similarities to the immediate dismantling strategy insofar as it affects the regulatory body. The regulatory staff will initially make the transition from operations to decommissioning. However, with this strategy, the regulatory staff will also have to be knowledgeable with regard to the requirements for **near surface disposal facilities** ..., since this is the end point of the decommissioning project. Once the decommissioning is completed, **the staff will have a disposal site to regulate**. There are limited international practice precedents for entombing facilities. The main difference in the regulatory requirements for entombment will be that in addition to the decommissioning regulations being necessary there will also need to be regulations for the near surface disposal of radioactive waste. **Since it is unlikely that the site of the operating facility was evaluated to serve as a location for a near surface disposal site, such an evaluation may be conducted as part of the approval process for the entombment strategy.** [emphasis added].

In other words, entombment is disposal.

## **4. Is entombment an acceptable decommissioning strategy for nuclear reactors?**

Let's look at another section of the IAEA document *Decommissioning Strategies For Facilities Using Radioactive Material*, Safety Report Series #50, IAEA, Vienna, 2007 pertaining to the acceptability of entombment as a decommissioning strategy. Section 3.2.3. *Entombment*, states:

**Entombment is not relevant for a facility that contains long lived isotopes because these materials are not suitable for long term surface disposal.** Consequently, reprocessing facilities, fuel fabrication facilities, enrichment facilities or facilities that use or process thorium or uranium would not be appropriate for entombment. However, entombment could be a viable option for other nuclear facilities containing only short lived or limited concentrations of long-lived radionuclides, i.e. in order to comply with the site release criteria. [emphasis added].

Although the proponent does not provide inventories of any of the possible long-lived radionuclides remaining in the reactor and its associated structures, there is no doubt that they are there.

The guidance quoted above does not explicitly include nuclear reactors. A more recent IAEA document that does address reactors (*Decommissioning of Facilities, General Safety Requirements Part 6*, IAEA, Vienna, 2014), states that with respect to permanently shutdown reactors entombment is not recommended. To quote the sections 1.9 and 1.10 from this publication:

1.9. *Strategies for decommissioning that have been adopted or are being considered by States include immediate dismantling and deferred dismantling. In principle, these two possible decommissioning strategies are applicable for all facilities.*

— *Immediate dismantling: In this case, decommissioning actions begin shortly after the permanent shutdown. Equipment and structures, systems and components of a facility containing radioactive material are removed and/or decontaminated to a level that permits the facility to be released from regulatory control for unrestricted use, or released with restrictions on its future use.*

— *Deferred dismantling: In this case, after removal of the nuclear fuel from the facility (for nuclear installations), all or part of a facility containing radioactive material is either processed or placed in such a condition that it can be put in safe storage and the facility maintained until it is subsequently decontaminated and/or dismantled. Deferred dismantling may involve early dismantling of some parts of the facility and early processing of some radioactive material and its removal from the facility, as preparatory steps for the safe storage of the remaining parts of the facility.*

1.10. A combination of these two strategies may be considered practicable on the basis of safety requirements or environmental requirements, technical considerations and local conditions, such as the intended future use of the site, or financial considerations. **Entombment**, in which all or part of the facility is encased in a structurally long lived material, **is not considered a decommissioning strategy and is not an option in the case of planned permanent shutdown**. It may be considered a solution only under exceptional circumstances (e.g. following a severe accident). [emphasis added].

In other words, entombment is not an acceptable strategy for the permanent shutdown of the WR-1 reactor.

## **5. Can “disposal” be licenced?**

It is my understanding that under the Nuclear Safety and Control Act, there is no provision for a “disposal” licence. Under *Prohibitions*, Section 26 of the Act states:

*“Subject to the regulations, no person shall, except in accordance with a licence,*

*(a) possess, transfer, import, export, use or abandon a nuclear substance, prescribed equipment or prescribed information; ...*

*(e) prepare a site for, construct, operate, modify, decommission or abandon a nuclear facility; ...”*

Under current legislation, the only licence that would be available at the end of the institutional control period (which is not really addressed in this project description document) is a licence to abandon. To comply with the regulatory guide G-320, “*the predicted impact on the health and safety of persons and the environment from the management of radioactive waste are no greater than the impacts that are permissible in Canada at the time of the regulatory decision*” (Section 7.4, Assessment Time Frames, CNSC Regulatory Guide, G-320, page 24). This means that at the time of the application for a licence to abandon, the residual activity in the grouted reactor site will have to meet radioactive clearance criteria.

In other words, “disposal” cannot be licenced (at present). The only option for the proponent is to apply for a licence to abandon at the end of the institutional control period.

## **6. Should CNL be the Proponent?**

If the timeline, for the radioactivity to decay to acceptable levels, is thousands of years into the future (which is likely given that radioactive nuclides present have half-lives that are in this range or greater) institutional controls will be required to cover this time period. The 2<sup>nd</sup> paragraph on page 7-2 states:

*The WR-1 Reactor site will be returned to AECL for Institutional Control.*

This is of concern. CNL appears to be making commitments on the part of AECL, (by extension, the Government of Canada) that could last forever. The proponent must be accountable for the entire life of the project, i.e. from design, through construction, commissioning, operations up to and including final closure. Since CNL’s contract with AECL is for a maximum of 10 years, CNL should not be the proponent.

### **7. Who should be involved in the decision?**

I note that CNL alone appears to have made the decision (i.e. the choice) to change the decommissioning strategy from storage with surveillance (or deferred dismantling) to “in situ decommissioning”. However, from the project description, little evidence is provided that the local population has been involved in the decision to modify that approved strategy. The public consultation as outlined in the project description amounts to announcements only. This appears to be counter to the guidance given in the IAEA document, *Decommissioning Strategies For Facilities Using Radioactive Material*, Safety Report Series #50, IAEA, Vienna, 2007. Section 3.9. SOCIAL AND ECONOMIC IMPACTS which states:

*... An entombment strategy may be difficult for the local population to accept because **a structure containing radioactive waste is normally left** after the decommissioning activities are completed. **This structure is permanent** and may be visible to the local population. **Therefore, the potential selection of this strategy will need to take into account an extensive public information and feedback programme.** [emphasis added].*

Since disposal is forever, public engagement in the decision process is critical. Because these choices have serious implications for the future of these communities, CNL cannot be the sole decision maker.

### **8. Does the Canadian Environmental Assessment Act (2012) apply to this undertaking?**

I note that in the project description the proponent references the Comprehensive Study Report (Whiteshell Laboratories Decommissioning Project, *Comprehensive Study Report*, Volume 1: Main Report, Rev 2, 2001 March). To quote from Section 2.1.1 of the Project Description:

*“In 1998 AECL made a decision to decommission the Whiteshell Laboratories Site. A Comprehensive Study Report under the Canadian Environmental Assessment Act was completed for the decommissioning Project ... The Canadian Nuclear Safety Commission and Department of Fisheries and Oceans were the Responsible Authorities...”*

*“ ... The **current approved decommissioning approach for WR-1** is described in the Comprehensive Study Report and **includes complete removal of the facility.** ...” [emphasis added]*

Since CNL is proposing to change the decommissioning strategy from complete removal to entombment, I suggest that a modification of this magnitude should reopen the previous Comprehensive Study conducted under the previous CEAA. In other words, the CEAA (2012) does not apply to this undertaking and the Comprehensive Study must be reopened.

### **9. Will the proposed undertaking reduce the nuclear liability?**

Let us accept that reducing the nuclear liability is the “problem”. Will the proposed undertaking of entombing the WR-1 reactor solve that problem?

As stated in Comment 5 above *Can “disposal” be licenced?*, the only licence available to the proponent is a licence to abandon. From international guidance quoted above, we know that entombment is near surface radioactive waste disposal (which by the way, is not appropriate for long lived radioactive isotopes). We also know that the WR-1 reactor is contaminated with long lived isotopes. Given their half-lives, their activity will never decay away to levels that would allow the site to be abandoned. Thus, the site can never be released from institutional control and an abandonment licence could never be granted. At best, the entombed site will be a perpetually licenced nuclear waste management facility, in post closure mode. In other words, no disposal is actually achieved, and the Government of Canada will never be released from the liability.

In conclusion, “in situ decommissioning” of the WR-1 reactor will not solve the nuclear legacy “problem”.

### **10. To summarize**

The main arguments presented above are:

- The proposed strategy of entombment (in situ decommissioning) for WR-1 is not acceptable based on international guidance.
- The decision about the long-term future of the reactor site are being made without proper public engagement contributing to the perception that CNL is the sole decision maker. This is inexcusable.
- CEEA (2012) does not apply to this undertaking and the previous CSR has to be reopened.
- The nuclear liability will never be reduced, and the Government of Canada will never be released from that liability.

Until these are resolved, CNL should withdraw this proposal. If the proponent decides not to withdraw this project, then the proponent should respond to the comments below.

### **General Comments on Project Description**

(1) The proponent appears to advocate implementation of a short-term solution to a longer term problem. However, I cannot see that the proposed solution of “in situ decommissioning” is justified since (except for possibly immediate monetary considerations). CNL has not provided a description of the problem it wishes to solve. I note that in Section 3.1.1, a rationale is provided as to why entombment was selected, but selection criteria are meaningless unless there is a clear problem definition. Without an unambiguous definition (see also Comment 1 above, “*What is the problem?*”), I cannot tell whether these criteria actually address the problem.

Let us look at each of the criteria given in Section 3.1.1 and see if we can deduce the problem CNL wishes to solve.

*“Reduced risk for radiological and industrial hazards exposures to workers, meeting the As Low As Reasonably Achievable (ALARA) principle”*

I note that the current decommissioning strategy already meets the ALARA principle. If it did not, then I would expect the regulator to take action to ensure it does. That said, CNL produces an annual report to the CNSC which summarizes the worker exposure to radiological and industrial hazards. As far as I know, there are currently no unacceptable risks to leaving the structure as is.

The Figures 5 & 6 presented in the description show a facility with lots of pipes, compartments, structures, stair wells, etc. that will have to be dismantled, reduced in size, or whatever before the encapsulation process can be done. Section 3.3.2 provides no indication that the reactor and its support systems have been modified from what is depicted in these figures. Therefore, I'd expect that many of these activities would have to be done whether the facility is dismantled or entombed. By choosing the short term solution, these activities will increase the worker exposure to radiological and industrial hazards. However, by deferring these activities, the radiological risks will be reduced through radioactive decay. I suggest that postponing these activities is a better way to achieve ALARA.

Thus, reduction of risk to ALARA cannot be the problem. Possibly the problem is to reduce the risk to below ALARA, but that would be a waste of money.

*“Reduced transport/waste handling risks to workers, the public and the environment”*

This criterion is somewhat difficult to assess. I do not know what the current risks are to workers, the public or the environment from the transport and handling of the wastes (since the proponent has not provided any relevant information). Neither do I know what these risks are from the actual entombment process (again no pertinent facts are given). That said, I'd expect the risks from the latter would be short term. Without the supporting evidence, this criterion remains an assertion and not a problem definition. Assertions are not justifications.

*“Effective reduction of the nuclear liability (e.g., eliminates interim waste storage)”*

I note that costs and liabilities are not environmental effects or safety issues. Besides “interim waste storage”, what are the other liabilities that need reduction? Is this the only one?

If reduction of nuclear liabilities is “the problem”, then the proponent needs to provide more supporting evidence. For example, without cost comparisons between the current situation and the cost for monitoring, and maintaining institutional control way out to the future (possibly forever), liability reduction remains an assertion, and not a justification. The overall cost of maintaining, assessing, monitoring and verifying the institutional controls for more than 300 years could just as easily be greater than the current costs for maintaining “interim storage” until a suitable disposal facility becomes operational (my guess is within 50 years). Again without the cost comparison, this remains an assertion.

Calling the current situation, “interim waste storage”, implies there will be no final disposal site available in Canada in the future. This allegation is unlikely to be true. Even if such a disposal site is not be operational within the next 50 years, that timeframe is much less than “forever” resulting from entombment. Entombment is an eternity. I do not see waiting 50 years as presenting undue liability risks since the reactor is already in safe shutdown. Besides which, waiting 50 years ensures the radioactive inventory from short lived nuclides will decay, making it safer to dismantle the reactor.

As discussed in Comment 9 above, “*Will the proposed undertaking reduce the nuclear liability?*”, in situ decommissioning is not the solution, since it cannot reduce the liabilities. What other fully costed strategies (i.e. alternative means) has the proponent considered that would address the liability?

*The majority of the structure is below grade and inside a robust concrete foundation, making it more technically feasible than deactivation, dismantling and demolition of the facility;*

As noted previously, Figures 5 & 6 presented in the document show a complex facility that will require significant preparation before it can be filled with grout. This preliminary work will likely require some dismantling, and demolition (i.e. deactivation). So I am not sure what is meant by “*more technically feasible than deactivation*”. The only difference that I can see is that the dismantled and demolished items will not be removed, but will be entombed along with the structural components. Since this statement is a comparison, it presents an alternative solution to a problem. It does not describe the problem itself.

*Significantly lower cost than dismantling, reducing costs for the taxpayer.*

This assertion is similar to that above with respect to liability reduction claim. No supporting costing evidence is provided. For instance, we do not know the long term costs for the institutional controls that will be required, possibly forever. It could be the problem, but until a full cost comparison is done, it remains an assertion.

In summary, the criteria for the selection of the entombment option given in Section 3.1.1 provide very little insight into the problem CNL wishes to solve. Further, they are not sufficient justification for CNL’s decision to change the decommissioning strategy. As discussed above, the monetary issue is one way to define the “problem”. If the problem is monetary only, then it begs the question, “Is this the right thing to do?” I suggest, no. One should not be trading costs against the environmental impacts or any safety considerations. In other words, the monetary criterion cannot be the only way to define the problem.

Thus CNL must devote more resources to obtaining a clear problem definition. Without that description, I suggest the proponent has fallen into the trap identified by H.L. Mencken many years ago – “*For every problem there is a solution which is simple, clean and wrong.*”

**(2)** Note that entombment is forever. In the IAEA document, *Decommissioning Strategies for Facilities Using Radioactive Material*. March 2007, entombment is essentially a near surface waste disposal site and the criteria for such a facility must be met. Thus, the proponent will need to demonstrate that the project meets the requirements of the CNSC Regulatory Guide, G-320, *Assessing the Long Term Safety of Radioactive Waste Management*. I see no evidence that CNL has considered the implications of this guidance.

**(3)** In Figures 5 and 6 the structure to be entombed contains many pipes, cavities, and structures. From the complexity of the reactor depicted in these two figures, I would expect that the viscosity of the grout would have to approach that of water to ensure that all cavities, pipes, rooms, etc. are

completely filled with little or no hollows left behind. As far as I am aware, cement (or grout) is considerably more viscous than water. Thus it appears that these spaces will remain in the entombed structure thus leading to its ultimate failure over time.

What assurance can the proponent provide that the grout will fill all the cavities and provide an adequate seal to the existing walls (pipes, and structures) such that water infiltration will not occur over the whole life of the project (including any institutional control phase)?

**(4)** Clause 4.1 of the Schedule (*Prescribed Information for the Description of a Designated Project - General Information*) to the *Prescribed Information for the Description of a Designated Project Regulations* (SOR/2012-148) states:

*4.1 A description of any environmental study that is being or has been conducted of the region where the project is to be carried out.*

Since I cannot find a description of any environmental study, the project description appears to be out of compliance with this requirement. What CNL has included is several references to the Comprehensive Study Report (CSR). However, no description of that report is provided. This is a critical omission because the CSR forms the basis for the current decommissioning strategy (see Comment 8 above, “*Does the Canadian Environmental Assessment Act (2012) apply to this undertaking?*”). What changes have occurred since the CSR was written that would suggest a change in strategy is essential?

### **Specific Comments**

#### **(1) Section 2.3 – Description of Consultation Activities**

Please provide a copy of the information provided to the stakeholders. Without the information it is not clear that the material delivered included a description of “...*the risks to public health, safety and security, and the environment posed by the facility or activity ...*” (RD/GD-99.3, *Public Information and Disclosure*, CNSC, March 2012, page 3.)

#### **(2) Section 2.3.1 – Future Engagement Activities**

This section does not meet the requirements of Section 2.2.2 *Target audience(s)* of the CNSC document, RD/GD-99.3, *Public Information and Disclosure*, March 2012. To quote the first sentence in that section, “*The public information program shall define the target audiences, and the rationale utilized for their inclusion.*”

For these future engagement activities, please identify the target audience and the rationale used to determine their inclusion.

#### **(3) Section 3.5.1 Preparation for In Situ Decommissioning**

Clause 9 of *Prescribed Information for the Description of a Designated Project Regulations* SOR/2012-148, states that the project information must include:

*A description of all activities to be performed in relation to the project.*

If Figures 5 & 6 are an indication of the current configuration of the reactor building (I see nothing in the description of the current status to indicate otherwise), I'd expect there to be significant work

required to remove, dismantle, demolish, cut or otherwise modify the interior of this structure in preparation for the grouting.

Please include a description of all preparation activities.

**(4) Section 3.1.1 - Project Context (Fourth Paragraph)**

To quote this section:

*“**Other decommissioning options** have been considered for this project which include:*

- *Selective remediation of contamination such as the fuel channels,*
- *Dismantling of key contaminated systems such as the Primary Heat Transport system or Moderator system,*
- *Removal of the reactor vessel, and*
- *Complete dismantling of WR-1 Reactor.” [emphasis added]*

Please clarify. None of these are actual “options” since they are all required to achieve the original decommissioning strategy of complete removal of the facility.

**(5) Section 3.1.2 – Project Objectives**

The objective for the project is stated as:

*“The objective of the project is to safely decommission the WR-1 Reactor ensuring the prompt reduction of Canada’s long-term nuclear legacy liabilities.”*

Please provide a description of the long-term liabilities that this project will reduce. Specifically, what are the costs for maintaining the site as is and the costs for this project over its entire lifetime? (See also Comment 9 above, “Will the proposed undertaking reduce the nuclear liability?”)

**(6) Section 3.1.2 – Project Objectives**

I note that the list provided in this section are project outcomes, and cannot be considered project objectives. Project objectives come from a problem definition.

Please revise the list to address the actual objectives of the project. In other words, please answer the question, what is the problem this project will be designed to solve? (See also Comment 1 above “What is the problem?”)

**(7) Section 3.1.2 – Project Objectives (Last Paragraph)**

*The WR-1 Reactor site will be returned to AECL for Institutional Control. The duration of the Institutional Control period will be determined through the Environmental Assessment.*

Actually this is not quite true. The institutional control period will be determined by the safety analysis conducted in accordance with the CNSC Regulatory Guide, G-320, *Assessing the Long Term Safety of Radioactive Waste Management*.

Please revise.

**(8) Section 3.2 Provisions in the Schedule to the Regulations Designating Physical Activities**

Please see Comment 8 above, “Does the Canadian Environmental Assessment Act (2012) apply to this undertaking?” I question as to whether the regulations cited in this section actually apply to this undertaking.

**(9) Section 3.3.2.1 Radiological Hazards**

The following is a table that provides half-life of each of the nuclides identified in this section. It is sorted by half-life. Also included is the percent of total activity from the text. A cursory look at this table would suggest that within a few hundred years, the activity from these short lived nuclides would present no safety issues.

Nuclide	Half-life	%Total Activity
<sup>65</sup> Zn	244 d	
<sup>57</sup> Co	271 d	
<sup>144</sup> Ce	284 d	
<sup>54</sup> Mn	312 d	
<sup>134</sup> Cs	2.1 y	
<sup>a55</sup> Fe	2.7 y	3.6%
<sup>60</sup> Co	5.3 y	17%
<sup>3</sup> H	12.3 y	
<sup>90</sup> Sr	29 y	
<sup>137</sup> Cs	30 y	
<sup>63</sup> Ni	96 y	79%
<sup>106</sup> Ru	368 y	
<sup>241</sup> Am	432 y	
<sup>14</sup> C	5700 y	<0.5%

It is unlikely this listing is exhaustive since there are no long lived nuclides included. Therefore, a prediction as to when the entombed site will reach the clearance criteria for abandonment cannot be done.

The proponent will have to develop a more exhaustive listing of nuclides in order to comply with the CNSC guidance document, G-320.

**(10) Section 3.3.2.2 Non Radiological Hazards**

I note that the primary heat transport system contains residual organic coolant. Will this residual coolant be removed from the system before entombment? If not, what are the implications for the entombment process? If it is removed, how will these wastes be managed?

**(11) Section 3.7 - Project Phases and Schedule (Table 1)**

This table is incomplete since there is no estimate of the institutional control period. As such it is misleading.

Please provide an estimate of what is meant by “TBD”.

**(12) Section 6.2.1 - Fish and Fish Habitat (Second Paragraph)**

*“There is the potential for radionuclide releases to groundwater from the In Situ Decommissioned reactor and radionuclide migration to the Winnipeg River.”*

This statement appears to indicate that there is no advantage to the environment from implementing this project. In fact there is a potential disadvantage since the lifetime for entombed reactor is forever.

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If the reactor was removed (as originally envisioned), there could be no radionuclide releases to groundwater thus to the Winnipeg River.

Please clarify.