Date: December 15th 2017

From: Michael Stephens

To: Candida Cianci, Environmental Assessment Specialist
Canadian Nuclear Safety Commission

By email: cnsc.ea-ee.ccsn@canada.ca

Subject line: Comments from Michael Stephens on the draft EIS for the In Situ Decommissioning of the WR-1 reactor (CEAA Registry project #80124)

CEAA Reference number: 80124

Comments:

For the attention of Candida Cianci

Dear Ms. Cianci - Please find attached my comments on the proposed In Situ Decommissioning of the WR-1 reactor (CEAA Registry project #80124).

Michael Stephens

Comments on the Environmental Impact Statement for the in Situ Decommissioning of the

WR-1 Reactor at the Whiteshell Laboratories Site

(CEAA Reference number 80124)

Submitted by Dr. Michael Stephens, concerned former Pinawa resident and former AECL employee at Whiteshell Laboratories

December 15, 2017

These comments expand on my comments on the Project Description for this project (document #7 for this project in the CEAA Registry, and included here as an Appendix for convenience)**.** I have put the portions of text I have extracted from the EIS in *italics*.

Summary

The EIS does not respond to public comments on the Project Description and continues to make unsubstantiated, debatable claims about the merits of the In Situ Decommissioning (ISD) to decommissioning the WR-1 building. The Proponent continues its one-way Decide-Announce-Defend strategy of communications with the public. Implementing the ISD approach would unnecessarily leave avoidable long-term hazards to the public and the environment at the site.

Detailed Comments

- Section 1.0 Introduction – The Proponent makes the following claim about In Situ Decommissioning (ISD) on page 1-1:

> *ISD is a proven nuclear decommissioning approach that increases worker safety, promotes protection of the environment and the public, reduces interim storage and multiple handling, enables permanent liability reduction, and utilizes less resources.*

This statement is replete with distortions and misleading statements. I think it would be more accurate to say:

> ISD is an unproven, and not internationally accepted approach to nuclear decommissioning for reactors reaching the end of their planned operating life. ISD proposes a quick and relatively cheap short-term solution when the proponent is in complete control of the site - by sacrificing achievable long-term protection of the public and the environment long after control of the site has been relinquished. It also further defers indefinitely the development of the disposal repositories that Canada needs to deal definitively with the country's existing low-level and intermediate-level radioactive wastes, leaving a liability for future generations.

- Section 1.1 Project Context – On page 1-7 the Proponent says:

> *AECL's mandate is to manage its radioactive waste and decommissioning liabilities in a safe and environmentally responsible manner. AECL has asked CNL to perform the work, and in keeping with international best practices (IAEA 2004, 2006), the decommissioning timeframe has been accelerated with the goal of completing the decommissioning of the WL site by 2024.*

Safe, responsible management of radioactive waste and decommissioning liabilities on AECL's sites is only part of its mandate. AECL is also responsible for managing the government's interests in the application of nuclear science and technology to national purposes, and for maintaining Canada's nuclear obligations to the international community. While it is international best practice to decommission facilities as soon as is reasonably feasible (so that the current generation minimizes the risk and cost to future generations) it is NOT best international practice to rush the task so much that it leaves a long-term risk and shadow on the future uses of the site that could be avoided.

- Section 1.2 Project Overview – On page 1-10 the Proponent says:

> *WR-1 is well suited for this [ISD] decommissioning approach because the small reactor core contains the vast majority of remaining activity and it can be isolated below-grade in a permanent safe way that provides protection of the environment and people. On the contrary, total dismantling of the below-grade reactor systems exposes workers to many radiological and standard industrial hazards that are avoided through the ISD approach.*

The fact that "the small reactor core contains the vast majority of remaining activity" means that removing the core (including the calandria tubes and fuel channels) for eventual disposal in a repository designed for the purpose will greatly enhance the long-term safety of the WL site after human control is relinquished. Workers will not be exposed to unacceptable radiological and industrial hazards when removing the core and associated systems. Such work is standard practice in the nuclear industry and CNL has in place long-standing worker protection programs that are suitable for just this purpose. If the reactor remains in place and future remedial action or removal is required, then the contaminated structure filled with grout will be difficult and very expensive to deal with. Thus ISD will thus increase - not reduce - the associated liability because the avoidable risk of possible expensive future remediation will inevitably remain.

- Section 2.5 – Alternative Means for Carrying Out the Project

The nominal purpose of the project is to decommission the WR-1 building. ISD does not achieve that goal. It simply converts a structure that is currently maintained in a safe, sustainable storage state into a near-surface waste repository of intermediate-level waste in a structure that was not designed for the purpose, and in a location that was not chosen for its suitability for disposal.

- Section 2.5.2.1 – Public Safety – On page 2-14, the Proponent says:

> *Overall, complete removal of the facility is considered the safest long term option with respect to the public near the WL site, compared to an ISD alternatives (sic).*

- Section 2.5.2.2 – Environmental – On page 2-14, the Proponent says:

> *Compared to an ISD alternative, complete removal also eliminates the potential risk associated with groundwater leaching through the WR-1 ISD structure that could migrate to surface water and then adversely affect human health and the ecological the (sic) health of terrestrial and aquatic systems.*

On page 2-15, the Proponent says:

From a social perspective, the complete removal of the facility could improve the perceived suitability of the site for future business ventures because long-lived radioactive material will no longer be present in the former WR-1 Building footprint. In addition, complete removal may allow this portion of the site to be released for unrestricted use.

These three long-term outcomes favouring complete removal of the facility should be heavily weighted in deciding the choice of alternative.

Section 2.5.4.1.2 – Public Safety – On page 2-21 the Proponent says:

Alternative 3 [i.e., ISD] represents the highest risk to the public near the WL site during the post-closure phase because most radioactive materials will still be present onsite, unlike the other alternatives where the radioactive materials are either completely or partially removed and relocated to another site for storage.

- Section – 2.6 – Summary – On page 2-27, the Proponent says:

As described in Section 2.5.1, the alternatives are evaluated using a reason narrative approach.

The rankings listed in Table 2.7-1 were carried out by considering whether each alternative had a high, moderate, or low likelihood of success. The "narrative approach" used was unquantified, highly subjective, and clearly biased towards ISD.

First, the criteria were given equal weighting - unjustifiably. Worker safety can be controlled with all the alternative means, but the residual level of risk to the public left by the different alternatives should be given greater weight in the ranking because the situation is then no longer under the control of the Proponent.

Second, under "Social" criteria, no mention is made of the greater number of short-term local jobs that will be created by full decommissioning rather than ISD. Surely the local population had a view on that benefit and I suspect it would give an even greater favourable ranking to the complete decommissioning options. Why are short-term jobs not mentioned?

Third, also under "Social", Alternative #3, the ISD option, is credited with the presence of a Community Regeneration Partnership to support future economic and community development. Details are given in Section 5.2.1.3. Why is that program not mentioned and credited to Alternatives #1 and #2 as well? It would be just as important to and welcomed by the local population.

Fourth, under "Technical Feasibility", the "Proven Approach and/or Technology" criterion says:

The technologies are proven and have been successfully deploy (sic) at other sites for all alternatives.

That is certainly not true for ISD. It may have been deployed at several US sites, but it cannot be said to be <u>proven</u> as yet (and it cannot be described as being proven - or not - until far into the future)

- Section 3.5.1.2 – Grouting of Below Grade Structures and Systems – Complete internal grouting of the WR-1 building below grade is a key element of the ISD proposal. Three short paragraphs with no references are totally inadequate to provide evidence that grouting will be complete, not expand and crack the structure or shrink and leave gaps, or crack after curing.

- Sections 4.1.1 and 5.1.1 – Corporate Social Responsibility – The description of the ongoing Public Information Program demonstrates that the Proponent persists in one-way communication towards the public. There is no hint of any incorporation of the public's views into anything the Proponent does (other than how it tells the public what it is going to do).

- Section 5.3.2.1 – Public Open Houses – Table 5.3.2.2 summarizes issues raised at Round 1 Open Houses, but provides no indication of what the Proponent said or will do to respond to those "key interests and concerns". This is again an indication of one-way communication with no consequence to the project.

- Section 6.9.4.2.6.1 – Community Goals and Plans – On page 6-426, the discussion of the Whiteshell Laboratories Community Regeneration Partnership mentions:

  > *There is still uncertainty regarding the future uses of the WL site once CNL transfers control to AECL for Institutional Control.*

I believe that is the first mention in the EIS that CNL will turn over the WL site to AECL for institutional control during the post-closure phase of the project. (Institutional control is part of the project, as per page 3-3). There is no mention of how AECL plans to implement institutional control. Why, then, is AECL not a co-Proponent of the project, and why is there no detailed description of what institutional control will consist of and how it will be financed?

Section 10.5.1 – Comparison with Unconditional Clearance Levels – This section reports on an assessment of the release of contaminants from the grouted WR-1 structure over the very long term and compares the residual radioactivity to unconditional clearance levels. A key assumption is made that the remaining radioactivity is evenly mixed throughout the entire 880 Mg of non-radioactive corroded WR-1 components. That is an unwarranted assumption, and the consequent assumed extreme dilution of the radioactivity over such a large mass of material leads to only a low fraction of the unconditional release levels for the various nuclides. However, if one alternatively assumes that the reactor core materials do not degrade to that degree and dilute the contamination in the mass evenly to that degree, the remaining level of radioactivity could be harmful to a human who comes upon a remaining mass of uncorroded contaminated metal from the reactor core.

Conclusion

The EIS does not respond to public comments on the Project Description and continues to make unsubstantiated, debatable claims about the merits of the In Situ Decommissioning (ISD) to decommissioning the WR-1 Building. The Proponent continues its one-way Decide-Announce-Defend strategy of communications with the public. Implementing the ISD approach would unnecessarily leave avoidable long-term hazards to the public and the environment at the site.

Appendix

Comments on the Project Description for the in Situ Decommissioning of the WR-1 Reactor at the Whiteshell Laboratories Site

(CEAA Reference number 80124)

Submitted by Dr. Michael Stephens, concerned former Pinawa resident and former AECL employee at Whiteshell Laboratories

June 29, 2016

General Comments

It is surprising that the proponent is proposing to entomb the WR-1 reactor, which was successfully operated throughout its operating lifetime and underwent a planned permanent shutdown in 1985. Entombment is not an accepted practice in the world's nuclear community in such a situation. Part 6 of the IAEA General Safety Requirements, Decommissioning of Facilities (GSR Part 6, July 2014, pp 2-3, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1652web-83896570.pdf) states that (Note: my highlighting):

> *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).*

If, counter to this clearly stated position of the world's nuclear community, the proponent is permitted to implement this project, then the following comments apply.

The project involves more than completing the decommissioning of a reactor that is now maintained in a safe state, and leaving a site that can be immediately released from regulatory control. "In Situ Decommissioning" is simply another term for "entombment". As acknowledged by the proponent this is therefore also a disposal project. It entails the creation of a near-surface radioactive waste disposal repository. The accompanying requirements for ensuring the long-term safety of humans and the environment must also be satisfied before the project is allowed to be implemented.

To my knowledge, despite contacting "public stakeholder groups" about the project the proponent has not proactively sought two-way direct interactions with members of the public. The proponent should begin such activities as soon as possible to avoid the appearance of having adopted a "Decide-Announce-Defend" approach to public engagement.

How the project will contribute to, "ensuring the prompt reduction of Canada's long-term nuclear legacy liabilities," is not clear. The project could increase the liabilities.

Detailed Comments

Section 2.1.1 – The proponent describes the project as changing the currently approved decommissioning approach – complete removal of the WR-1 reactor, leaving only the below grade concrete structure largely in place – to "in Situ Decommissioning" of the reactor. Contaminated materials in the below grade reactor systems would also be left permanently grouted in place, leaving a "permanent, passive decommissioning end state". Therefore the project creates a near-surface radioactive waste disposal repository at a location that was not selected for that purpose. The potential long-term impacts on human health and the environment must be assessed and shown to be acceptable before the project proceeds.

Section 2.3 – It is indicated that between 2015 June and 2016 April, communication activities by CNL have informed several "public stakeholder groups" of this project. However there is no indication of direct communications with individual members of the public. Was there any proactive substantive notification and information provided by the proponent, and an invitation to comment on the proposed approach, the alternatives to it, and the rationale for adopting the proposed new approach? What was the public reaction to it? The project was briefly outlined in the latest issue of CNL's *Contact* public update (which is dated June 2016, and which was received in residents' postboxes in Deep River, Ontario on June 24). There is no mention of any Open Houses, Public Information Sessions or other contacts with the public in the towns near the Whiteshell Laboratories (i.e., Lac Du Bonnet, Pinawa, and Seven Sisters).

Section 2.3.1 – CNL's public information program is described as having the overriding objective, "to build public awareness, understanding, and a supportive appreciation of the Laboratories' value and relevance to Canadians". There is no indication that CNL seeks to listen to the public and consider accommodating its concerns and preferences in its program. Well-informed local members of the public might lend their support to CNL proposals if their views were sought and responded to before key decisions are made. The vital importance of direct early two-way engagement with the public was a lesson learned the hard way by the United States Department of Energy at similar sites in the US.

Section 3.1.1 – The proponent mentions that four decommissioning options other than entombment have also been considered. All of those options consist of removing more or less of the contaminated reactor and its supporting systems.

The claimed advantages for leaving everything in place involve reducing the risk to workers of doing anything beyond keeping the reactor in its current site, and being technically easier, quicker and cheaper. However the more contaminated material that is left in place, the greater will be the long-term residual hazard associated with the resulting waste repository. Total residual radioactivity in the reactor has no doubt decreased significantly since the permanent shutdown because of the decay of the short-lived nuclides. The long-lived nuclides also present may not dominate the current total radioactivity now, but they eventually will in the long term.

There is another option: the status quo. The risk to workers of removing the reactor in the future could be decreased significantly more by simply keeping the reactor in its current Storage With Surveillance condition until a repository is available to receive the waste from removing the reactor. An appropriate repository should surely not take many decades to put into place – and likely can be done in a much shorter period than the reactor site has to be protected if the long-lived nuclides are left near the surface.

The fact that disposal options for nuclear waste within Canada are currently not available is not a valid reason to advance decommissioning. It is an argument for building appropriate repositories for the different classes of waste, rather than risk creating another problem. AECL has been a world leader in developing waste disposal technology for decades, but has not built or gained access to actual repositories for its wastes. Putting long-lived waste into an unsuitable near-surface condition could leave it in a difficult-to-retrieve state for eventual retrieval and proper disposition when an appropriate repository is available.

The problem in leaving long-lived waste in a near-surface entombed reactor is summarized in a 2007 IAEA document (Safety Report Series #50) which states, amongst many pertinent aspects, (Note: my highlighting):

> *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*
>
> *3.2.3. Entombment*
>
> *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.*

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.

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 [4], 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.

3.9. SOCIAL AND ECONOMIC IMPACTS

. . . . . .

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.

. . . . . .

Section 3.1.2 – The stated objective of the project is to ensure "the prompt reduction of Canada's long-term nuclear legacy liabilities". If the entombed reactor is not licensable as a near-surface disposal facility because of the long-lived nuclides, then this project does not reduce the long-term liabilities - it increases them because it will be more difficult and expensive to retrieve them for disposal later.

The proponent's suggestion that projected doses to members of the public from the entombed reactor be less than 0.25 mSv per year explicitly excludes any does from human intrusion. Human intrusion will be a much more credible scenario if masses of metallic wastes containing long-lived nuclides are left near the surface than if they are placed in a deep bedrock repository.

There is no discussion of how long institutional control by AECL could be necessary, nor of the short-term and total cost implications of carrying out this project, including the institutional control (rather than, for example, simply maintaining the status quo until AECL has access to a geological repository for its long-lived wastes). Storage With Surveillance for another 50 years will lead to a further great decrease in the inventories of the short-lived radionuclides. What is expected to happen after period of institutional control? Can the proponent show that the ensuing impact on human health and the environment is not of concern?

Section 3.3.2.1 – It is stated that over 99% of the (current) radiological inventory in the reactor is situated in the reactor vessel. The information provided about the specific nuclides present is very incomplete. Since known contaminants are associated with irradiated reactor fuels, corrosion/ activation and fission products, longer-lived nuclides are certainly present. They may not dominate the total radionuclide inventory now, but will dominate in the longer term. What are the inventories of the long-lived radionuclides?

Section 3.3.2.2 – Hazardous materials in the reactor include asbestos, residual organic coolant, lead, PCBs, and mercury. What are the estimated quantities of these substances? Is it proposed to leave all of those materials that are in the below grade structures in place?

Section 3.5.2 – What assurance will there be that the grout seals to the walls of the subgrade structures, that it won't expand and crack the structure, or shrink and leave fissures, or crack after curing?

Section 3.5.4 - It is indicated that an "engineered barrier" will be installed over an "engineered cap" to create an "engineered cover", but no details are given. What will the barrier consist of? How will its performance be assured? Section 3.5.6 suggests that it may be subject to "subsidence, erosion and animal or other (=human?) intrusion".

Section 3.7 – Table 1 refers to the last phase of the project comprising institutional control activities starting in 2024 and continuing for an undetermined length of time. Some acceptable minimum time should be discussed with the public and agreed upon (as well as where the necessary resources will come from and how they will be funded) before this project is allowed to proceed.

Section 5.3 – Will a CNSC licence to "abandon" the small WR-1 site be necessary and sought at some point?

Section 6.1.3 – Abandoned farm fields on the Whiteshell Laboratories site are mentioned. Farming in the area might restart in the future, so this possibility should be included in the long-term safety assessment of the entombed reactor.

Section 6.2.1 – It is indicated that, "There is the potential for radionuclide releases to groundwater from the in Situ Decommissioned reactor and radionuclide migration to the Winnipeg River". This in itself is sufficient reason to conduct an assessment of the long-term safety of the site to both the environment and humans who may be located along the migration path.