

August 14, 2017

From: Michael Stephens

To: Nicole Frigault, Environmental Assessment Specialist
Canadian Nuclear Safety Commission

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

Comments from Dr M.E. Stephens on the draft Environmental Impact Statement for the Near Surface Disposal Facility at the Chalk River Laboratories (Reference Number 80122)

CEAA Reference number: 80122

For the attention of Nicole Frigault

Dear Ms Frigault:

Please find attached my comments on the draft Environmental Impact Statement for the Near Surface Disposal Facility at the Chalk River Laboratories. Please add them to the Comments Received/Responses on the Near Surface Disposal Facility (your Reference Number 80122).

Best regards,
Dr. Michael E. Stephens

**Comments on the Draft Environmental Impact Statement
for the Proposed Near Surface Disposal Facility at Chalk River Laboratories
232-509220-REPT-004, Revision 0, 2017 March 17 (CEA Registry Number 80122)**

Dr M.E. Stephens

I appreciate the opportunity to comment on the Draft Environmental Impact Statement (EIS) for the proposed Near Surface Disposal Facility (NSDF) at the Chalk River Laboratories (CRL).

I am commenting as a resident of Deep River, as a Canadian taxpayer, and from my 25 years' working experience in radioactive waste management and decommissioning of nuclear facilities, including as former Manager for Strategic Planning for the Canadian Nuclear Legacy Liabilities Program. My comments below expand on and follow up my comments of June 12, 2016 on the original Project Description (document #5 in the Comments Received/ Responses on the project in the CEA Registry). I refer to several foreign waste management facilities. Information on them is easily found on the internet.

Comments as a Resident of Deep River

An important lesson appears to have been forgotten from the ill-fated Canadian Nuclear Fuel Waste Management Program: social licence (or public endorsement) for a project cannot be assumed and must be earned. The Nuclear Waste Management Organization (NWMO) has taken that lesson to heart in its work to implement a solution to dealing with Canada's nuclear fuel waste.

In contrast, the NSDF Proponent continues to use a one-way Decide-Announce-Defend (DAD) strategy rather than two-way public engagement. To my knowledge the public was not involved before the NSDF concept was selected and developed. Many public *information* sessions have since been held to defend the project, but public views have not led to any modifications of the project. If the public had been asked early in the process, they might have indicated a clear preference that other approaches to dealing with much of the waste be adopted. For example, "clearance" efforts (to confirm some of the waste can actually be handled as not radioactive) would both create local job opportunities and greatly reduce the volume of waste to be emplaced in better quality - albeit more expensive - radioactive waste repositories.

Local residents have refrained from systematic a "Not-In-My-Back-Yard" (NIMBY) attitude towards local disposal of radioactive waste. Deep River townfolk have already expressly shown their readiness to host an acceptable radioactive waste repository. In 1995 Deep River residents voted in favour of an agreement-in-principle that would have had the town host a geological repository to receive the wastes being cleaned up around Port Hope. The federal government decided not to pursue that approach, and those wastes are now being emplaced in two "long-term waste management" (that is, surface storage) mounds at Port Hope and Port Granby that have not been qualified for disposal.

The Town of Deep River was created to house staff of the Chalk River Laboratories. The 1995 agreement-in-principle mentioned above included provisions that would directly benefit the town in the form of continuing employment opportunities and funding to enable the town to diversify the local economy away from heavy dependence on the laboratories. As CNL continues decommissioning at CRL to "right-size" and "revitalize" the laboratories, the grant-in-lieu to the town can be expected to decrease. That is because it is tied to the size of the facilities at the laboratories, which will decrease (D.

Thompson, document #95, page 5). To my knowledge there is no agreement under discussion with Deep River to compensate it for that loss, or to yield any other benefit to the town for accepting what could be the first radioactive disposal facility in Canada.

Comments as a Canadian Taxpayer

The project ignores the approved Comprehensive Preliminary Decommissioning Plan for CRL that was developed with great care over many years (Concerned Citizens of Renfrew County and Area, document #88, page 1). The project is driven instead by the objective of greatly accelerating decommissioning activities at the AECL sites. Future expensive intervention may well be required if and when the NSDF containment fails, so the project will therefore not reliably reduce the Canadian Government's - really, my, and my descendants'- liability.

Disposal is forever. AECL and the Federal Government should therefore be co-Proponents of the project. They own all the sites in question and will be responsible for paying to remedy any problems that arise long after the current GoCo Contractor, Canadian National Energy Alliance (CNEA), has been paid for its efforts and left the scene. Canadian Nuclear Laboratories (CNL) is simply the implementing entity that has no assets of its own; it will just "belong" to a series of Contractors, the first one being the CNEA.

A key tenet of radioactive waste management is that the current generation of humans should deal definitively with the wastes it generates. That will not be possible with the NSDF project even if it works as intended because of the associated lengthy required period of institutional control. Relying on institutional control of a facility for centuries is highly problematic. I understand that indigenous precepts call on people to consider the effects of their activities for seven generations in the future. For the NSDF, seven generations would only be the start of the time of concern.

Institutional control could easily falter or fail if society faces greater challenges that take precedence. Who can say whether society, and its capabilities, resources and priorities will be stable? Who knows if Canada will or any successor governmental entity will exist? Humanity may well be struggling for basic survival in the face of accelerating climate change in the year 2100, let alone at the end of the proposed institutional control period in 2400. A worldwide pandemic could relegate dealing with failure of the NSDF site to an afterthought. More reliable disposal facilities for the proposed long-lived waste contents of the NSDF are required – and are available.

Comments as a radioactive waste management professional

"If saying it would only make it so."

(Wistful response of Governor Tarkin to assurances that the untested Death Star will actually work,
in *Rogue One: A Star Wars Story*)

The Proponent has repeatedly said that the mound concept is safe and is based on proven technologies. However there are no examples of disposal repositories that have been successfully built, operated, closed, and then kept under institutional control for 300 years.

Confidence in the safety of a waste disposal repository is based on multiple lines of argument and the use of multiple defensive layers and barriers in the design of the entire facility within its surroundings. One layer of defence can compensate for less than ideal aspects of other layers. For instance poorly characterized waste can be re-characterized, wastes can be treated to stabilize and immobilize them,

waste packaging can be added or reinforced, the facility can be emplaced in a more certain geology, and more robust engineered barriers can be added.

The wastes from the AECL sites will be much more variable than the wastes from nuclear power plants (e.g., those from the OPG reactors proposed for the Deep Geological Repository) due to the wide range and variable nature of activities at the nuclear research sites. Some information on early CRL wastes was lost in a building fire.

The information on the characteristics of much of the waste inventory appears to be weak (G. Csullog, document #39). As indicated in the Performance Assessment for NSDF to Support the EIS (CNL document 232-508760-SAB-001 R0, section 4.2, page 4-4), *“Due to the differences in record keeping methods from present day and 60 years ago, there are some uncertainties in the waste characterization, particularly for some of the older waste streams. Any waste destined for disposal will require further characterization and assessment prior to acceptance at the NSDF.”* Further, weak information is provided on how waste inventory information will be confirmed. These are key “incidental” aspects of the NSDF project and how they will be carried out are insufficiently described.

Much of the waste will be untreated. Over 80% of the wastes will be bulk unpackaged wastes (EIS, section 3.2.1.2, page 3-8). After being dumped onto the NSDF mound, they will be bulldozed and compacted (that is, crushed) (EIS, section 3.6.1.2.4, page 3-41). No temporary weather shelter will be used to protect the wastes from precipitation until they are adequately covered. The wastes will also contain a significant amount of organic material (vegetation and other) which will eventually degrade and slump, which may lead to failure of the cover. The position of particular wastes in the facility will be uncertain, so it would be difficult and expensive, if not impossible, to locate and retrieve them if wastes must be selectively removed for further treatment.

The Proponent modified the original Project Description to add Intermediate-Level Waste (ILW) to the possible classes of waste to be emplaced in the facility. A basic tenet of waste management is to segregate different classes of waste for disposal in separate facilities that are suited to coping with the characteristics of each class of waste. Emplacing several types of waste in a single disposal facility means that any part of the entire contents may have the characteristics of the class of waste with the most challenging and demanding management requirements - in this case ILW, possibly mixed with hazardous wastes. The NSDF project then adopts the weakest approach to containment – essentially a municipal landfill – but proposes no compensatory measures.

Calling the NSDF a “near surface” facility is a misnomer – it is an exposed above-ground mound. The closed NSDF will resemble a smaller version of the Carp landfill mound that is visible on the horizon when travelling west from Ottawa on Highway 417 near the Canadian Tire Centre.

A landfill is an inappropriate type of repository to use, given the classes of radioactive wastes it is proposed to put in it, the weak information on inventory, and the high precipitation of the local climate. Chalk River Laboratories is not located in a dry climate like the parched deserts in the southwestern United States. The likely fate of the facility more resembles that of the French “Centre de la Manche” facility. The French national waste management agency has been struggling for decades to deal with cover failure issues in a humid climate. The agency has since changed its approach to disposing of Low-Level Waste (LLW) to the concrete vaults now in use at the Centre de l’Aube facility.

The NSDF cover will eventually fail and leak and, as discussed in the EIS, may lead to the creation of a “bathtub” in which the wastes will macerate and generate leachate. Relying on having active water treatment available for centuries to recover from cover failure is risky. Water treatment facilities at the new Port Hope and Port Granby storage facilities have already been overwhelmed and released untreated water due to heavy precipitation this spring.

If the NSDF actually does remain essentially intact for thousands of years, but knowledge of its nature is lost, humans may inadvertently occupy the site and receive a dose that would not be acceptable today (EIS, section 6.4.4.4, page 6-12). As well, after the kilometers-thick ice cover of the next glacial period comes to an end, the area will again be habitable by humans (if we survive!). However the facility will likely have been deeply eroded and the still-radioactive contents will be dispersed unpredictably (EIS, section 9.5, page 9-13).

In short, the facility uses inappropriate technology for long-lived wastes. As described by Dr J.R. Walker (document #40) the facility is also problematically located, and with the assumed inventory does not meet the regulatory limit on dose to the public (EIS Table 6.4.4-5, page 6-15). The Performance Assessment for NSDF to Support the EIS (CNL document 232-508760-SAB-001 R0, section 8.3.3.1, page 8-45) says, “A 20-cm diameter well is drilled through the waste and is used for irrigation of crops and drinking water. **The well is located immediately downstream from the ECM [NSDF] with radionuclide concentrations in water equal to the maximum concentrations in the leachate generated at the time of intrusion.**” In the long term, the well water isn’t being contaminated because the well was drilled through the waste. The well is located immediately downstream from the ECM. The peak dose of 5 mSv at ~67,000 years is dominated by human ingestion of food and water that have been contaminated by waterborne emissions into the aquifer that are picked up by the *off-facility* well (Performance Assessment, page 8-47). The contamination of the aquifer comes from leachate generated in the NSDF after its containment has failed due to natural weathering and erosion processes. This is thus in the “natural evolution” scenario, not an intrusion scenario.

If the NSDF project is pursued as proposed, the facility will likely be the first radioactive waste disposal facility in Canada. The Port Hope and Port Granby facilities are not disposal facilities and cannot be presented as such. They are “long-term management” facilities, that is, storage facilities that will require either open-ended active management, qualification as disposal facilities, or removal of the contents for continuing management elsewhere. All the existing waste management facilities at CRL are also storage facilities, including the valley-full of Port Hope Waste (Waste Management Area F), the Bulk Storage Facility, and the LLW waste in Waste Management Area C and its Extension. None of those has been qualified as a disposal facility.

“Alternative means” are available for achieving the objectives of the NSDF, and the EIS discusses two of them: Geologic Waste Management Facility (EIS, section 2.5.2.2, page 2-19) and Above-ground Concrete Vaults (EIS, section 2.5.3.2, page 2-29). Repositories for the different classes of waste proposed for the NSDF have been operating abroad for decades. Examples include:

- a landfill with an interim weather shield for Very-Low-Level Waste (VLLW) at Morvilliers in France,
- near-surface concrete vaults for LLW at the Centre de l’Aube in France and El Cabril in Spain, and

- bedrock caverns for LLW and vaults for ILW at Forsmark in Sweden, and at Olkiluoto and Loviisa in Finland.

I have visited most of these facilities and to date they are fully expected to fulfill their purpose.

AECL has worked on surface vault and geological repository concepts for LLW and ILW but has not implemented them. However, *“The feasibility of locating a disposal facility [for ILW] at CRL has previously been assessed. The outcome determined that CRL was feasible to host such a facility. Further options and locations still need to be identified and assessed”* (CBL Integrated Waste Strategy Summary, CW-508600-PLA-006 R0. section 6.1.2.3, page 6-3). Get on with it!

The overall goal of the NSDF is to provide disposal capacity for the wastes that will be generated by the ambitious program to decommission quickly many different facilities and execute numerous clean-ups at the AECL sites. (The NSDF isn't required for the new facilities to be built soon in the CRL Supervised Area.) How much of the waste material will not meet the NSDF Waste Acceptance Criteria? It could be voluminous. What will be done with it? In particular, how much ILW will be generated by the proposed decommissioning of the NRX and NRU reactors, their fuel storage and handling bays, the hot cells, the waste storage facilities, and the above-ground plutonium extraction vault in Building 220 dating from the cold war era? These wastes contain substantial quantities of long-lived radioactive contaminants and can't be disposed of either in the NSDF or in place. How all classes of decommissioning waste will be dealt with is thus “incidental” to the NSDF project given its raison d'être. They must also be known - and credible.

Summary

The municipality of Deep River has never accepted, nor been asked to accept, a radioactive waste disposal facility without compensating benefits. To my knowledge, no agreement is currently under discussion with the town for the NSDF facility. That must change.

AECL and the federal government should be co-proponents of the project. They own all the sites in question and Canadian taxpayers will be responsible for paying to remedy any problems that arise long after the current GoCo Contractor has been paid for its efforts and left the scene.

The concept of the NSDF project deviates significantly from internationally-accepted waste management principles and practices. Before consideration is given to allowing it to be implemented, it should be subjected to a comprehensive technical review by an international group of experts arranged through the International Atomic Energy Agency, and the results should be made public.

Canada prides itself on having an advanced civilian nuclear program. It is disappointing that this proposal was even forwarded for review. From a safety point of view, the proposed NSDF is an inappropriate type of facility for several of the classes of waste it is proposed to put in it. Demonstrated alternative means are available. They will cost more and take longer to implement, but they will be much more certain to meet the objective of protecting public health and the environment. The essence of the risks attached to the NSDF project can be summarized in the phrase:

Bury in haste, repent at leisure.