

To: The Canadian Nuclear Safety Commission (CNSC)

From: Gordon Edwards, Ph.D., President, [ccnr@web.ca]  
The Canadian Coalition for Nuclear Responsibility (CCNR)

Re: CNSC Technical Assessment Report:  
“NAC-LWT Package Design for Transport  
of Highly Enriched Uranyl Nitrate Liquid”

Date: June 4 2015

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1. The Canadian Coalition for Nuclear Responsibility (CCNR) applauds the Canadian Nuclear Safety Commission (CNSC) for inviting public comments on the Technical Assessment Report (henceforth called the Report) dealing with some technical aspects of the package being proposed for the transportation of 23,000 litres of highly radioactive liquid wastes containing an acidic and aqueous solution of fission products, transuranic actinides, and highly enriched uranium (HEU) -- a liquid that is referred to as HEUNL.

2. However, CCNR deeply regrets the CNSC’s failure to schedule public hearings into the unprecedented transport operation itself, given the fact that post-reprocessing liquid high-level wastes have never hitherto been transported over public roads in North America.

CCNR understands that the transportation route and the timing of the shipments are kept secret for security reasons, given the fact that the uranium in question is enriched to more than 90 percent of the explosive U-235 isotope, making it excellent weapons-grade material similar to that used as a nuclear explosive in the Hiroshima bomb.

But the need for security regarding the timing and routing of the shipments does not absolve CNSC from its responsibility to the Canadian public to conduct a credible, open and transparent assessment of the potential risks to human health and to the environment, particularly if there is loss of containment during transportation. In the post-Fukushima era, we must plan for unanticipated events, even if the planners do not regard such events as credible. Such a risk assessment goes far beyond the technical specifications of the packaging; it cries out for public hearings on the entire project.

***Recommendation 1: The CNSC should schedule public hearings not only on the specifics of the packaging but on the rationale and alternatives for the entire transportation project.***

3. Were the CNSC to fulfill its statutory obligations to be a champion of the public interest, by holding public hearings on the transport of these highly radioactive liquid wastes over public roads, then alternatives to the existing proposal could be systematically examined – alternatives that would still achieve the main objective – to remove weapons-grade uranium from the Chalk River site.

One such alternative would be to solidify the waste before shipping it. This would not be an impossible or even an onerous task, since the solidification of the very same kind of highly radioactive liquid waste containing weapons-grade uranium has been going on at Chalk River for the last 10 years or more, in a process called “cementation”

Indeed, prior to the proposal for shipping the liquid waste to the Savannah River Site, Chalk River Laboratories had already committed itself (during its most recent round of relicensing activities) to solidify the contents of the FISST (Fissile Solutions Storage Tank). This is the same material that is proposed to be sent to SRS in liquid form. Why not in solid form instead?

Another alternative would be to downblend the HEUNL liquid so as to dilute the HEU to LEU (low enriched uranium) that is no longer weapons-usable and therefore does not pose a security risk. Canada has already played a significant role in accepting such down-blended HEU from the Russian nuclear weapons program over the last decade. Down-blending eliminates the security risk from a weapons proliferation standpoint. In fact that is exactly what the US authorities are proposing to do once the HEU has been separated from the rest of the radioactive garbage – to downblend the HEU in order to eliminate the proliferation risk posed by this material.

4. The Report makes it clear that the external package referred to as NAC-LWT has been used in the past only to transport solid irradiated nuclear fuel, never liquid high-level nuclear waste such as post-reprocessing liquid material. On page 5 of the Report we read "The NAC-LWT package is a lead-shielded shipping package designed to transport various types of used nuclear fuel. This package is to be modified by adding inner containers to

hold the HEUNL to the existing package." Yet the design details for these inner containers are not described due to proprietary considerations.

Thus the public is being asked to comment on a package designed to carry solid waste, now being modified to transport liquid wastes, without any access to the technical details of that part of the package that has been specifically designed to hold the liquid waste. This ridiculous disconnect could well serve as an episode in a latter-day version of "Alice in Wonderland", where logic is stood on its head.

To an outside observer, it seems clear that this opportunity for public comment is intended only for public relations purposes, so that CNSC can maintain the illusion that it is truly concerned about public input when in fact that input is so limited as to be virtually meaningless in terms of the overall project. The public is being asked to comment on a Technical Assessment Report that is lacking in the essential technical details.

5. At any rate, it appears that the various regulatory requirements (as outlined on page 9 of the Report) for the NAC-LWT -- the external part of the package -- to resist drops, fires, and punctures, were tested and/or verified without the inner liquid containers being included as part of the test.

CCNR is of the opinion that dropping the NAC-LWT *without any liquid contents* from a height of 9 metres onto an unyielding surface, or dropping it 1 metre onto a punch bar, or exposing it to an 800 degree C fire for 30 minutes, seems to provide no scientific justification for approving the modified package for transporting the *liquid* HEUNL.

The CNSC should insist that all these tests be carried out with realistic liquid contents.

***Recommendation 2: The CNSC should require that all these tests be carried out with realistic liquid contents.***

6. In terms of risk assessment, CCNR feels it is misleading to describe the liquid contents of these shipments simply as Highly Enriched Uranyl Nitrate Liquid (HEUNL). As stated on page 8 of the Report, "*HEU comprises less than 1 percent of the total weight percent of the solution*".

Indeed, the health and environmental risks are mainly associated with the non-uranium components of the liquid solution. According to Table 2 (page 9) in the Report, the radioactivity of the selected gamma-emitting isotopes and their daughter products is  $3.4 \times 10^{11}$  becquerels per litre, which is over half a million times greater than the radioactivity of U-235 per litre, and more than 11,000 times more radioactive than all the uranium isotopes combined.

It is perplexing that the Report does not quantify the total radioactivity in proper units – becquerels per litre – of the highly radioactive solution. It only lists a handful of gamma-emitting isotopes and their daughter products, as well as a few alpha-emitting transuranic actinides. The Report fails to include any of the dangerous beta-emitters that are not also gamma-emitters, such as strontium-90, technetium-99, carbon-14, and hydrogen-3 (tritium).

And nowhere in the Report is there any discussion of what emergency cleanup measures would be undertaken in order to identify and retrieve, as quickly as possible, as much as possible of this corrosive radioactive liquid contamination in the event of a significant spill, however unexpected such a spill may be.

Since the transport trucks will be travelling over 2000 kilometres, passing through many small communities, crossing many bodies of water, intersecting many agricultural zones, including vineyards and orchards, the public is entitled to know just how fast and how effective the emergency response is likely to be. Liquid wastes, after all, are much more mobile in the environment than solid wastes -- for which this package was first designed.

***Recommendation 3: CNSC should publish a complete manifest of radionuclides contained in the HEUNL liquid wastes that could pose environmental risks or risks to human health, along with specific details on what measures will be undertaken to identify and retrieve as much as possible of the highly radioactive liquid as quickly as possible in the admittedly unlikely scenario that there is a spill.***

7. The TEPCO Corporation chose to underestimate the height of a tsunami wave that might strike the Fukushima Dai-ichi plant, despite prior knowledge of the possibilities.

We are told that the outer transport cask (NAC-LWT) is designed to withstand a drop of 9 metres (30 feet) onto an unyielding surface. Since these shipments will be travelling about 2000 km or more on public roads, crossing the border from Canada into the USA, they could be crossing over bridges that are, in places, higher than 9 metres above ground level. Under extreme conditions, the package could drop more than 9 metres off such a bridge onto pilings or rocks below.

Is the public to understand that *the transports will not be allowed to cross any bridges where a potential drop of more than 9 metres would be possible*? Unless such a prohibition is to be imposed and rigorously enforced, then CCNR recommends that the package be required to withstand a much larger drop -- one that would match or exceed the largest conceivable drop on any of the bridges or any other sections of the alternate routes under consideration.

***Recommendation 4: CNSC should declare a prohibition against the transport of HEUNL across any bridge that is at any point more than 9 metres high.***

8. The intensity and duration of some of the transport-related fires that are possible, as the Lac Megantic disaster has shown, far exceed the requirements that the package withstand a fire of 800 degrees C for a period of 30 minutes. Given the inherent mobility of the liquid contents, CCNR feels that the fire-resistant standards for the proposed package are simply too lax, and are not fully cognizant of the disastrous experiences of recent years.

***Recommendation 5: CNSC should require that the containers be tested, with liquid contents, and shown to be able to withstand a fire of the intensity and duration of the Lac Megantic fire following that town's unfortunate experience with the transport of hazardous liquids.***

9. The claim that only 0.033 percent of the liquid contents would escape following an accident of maximum severity the CCNR finds to be a ridiculous assertion. The nature of a liquid is that once a leakage pathway has been established, unless there is some kind of "self-sealing" of that

pathway, just about ALL of the liquid will eventually escape depending on how long a time has elapsed.

Given the lessons of Fukushima, that the unthinkable must be considered in accident planning, it is incumbent on the CNSC to consider what emergency action and retrieval efforts would be undertaken to recuperate the entire liquid contents of any one shipment in the event of 1%, 20%, 50%, or even 100% escape of the liquid contents into the environment.

It is disappointing to discover that the Report relegates all details of the calculation leading to the 0.033 percent figure to an appendix – called Appendix A – which is however not included in the version of the Report made available to the public. This is just one more feature of the process that makes it seem a sterile undertaking. At any rate, calculation is no substitute for actual testing, and CCNR asserts that physical testing of this hypothesis should be carried out.

For example, CNSC staff calculated external radiation doses following a leakage of 0.033 percent of the contents given on page 8 of the Report, in two separate categories. These external (gamma) doses would be increased by a factor of 30 if there was a 1 percent leakage, or by a factor of 300 if there were a 10% leakage. That would increase the calculated external exposures in the first category to 24.6 mSv or 246 mSv respectively.

***Quite a difference.***

And of course these calculations omit any internal doses caused by inhalation or ingestion of radioactive vapours or droplets. With 100% leakage, the calculated external dose in the first category would be promptly fatal.

***Recommendation 6: CNSC staff should publish expected gamma exposure levels following hypothetical leakages ranging from 1 percent up to 100 percent, and make these figures available to all first responders along the route, together with a warning not to approach the spill until the level of gamma radiation hazard has been ascertained by competent people.***

10. The CCNR requests that CNSC fulfill its mandate to protect the public through an open, transparent process, by requiring a full public hearing into the entire HEUNL transportation proposal with adequate documentation on

the technical details provided to enable the public to assess the safety claims made by CNSC staff and by the proponents.

In our view, given the fact that irradiated nuclear fuel in solid or liquid form ranks among the deadliest materials on Earth, it is unconscionable that the approval of this project be relegated to a designated officer without the full involvement of the Commissioners, and without benefit of a public hearing.

Existing circumstances demonstrate that the stated objectives of this transport of highly-radioactive post-reprocessing liquid waste is not justified on non-proliferation grounds. Chalk River is currently in the process of importing MORE weapons-grade uranium (93.3 percent enriched) from the USA, and – since that material will never end up in the FISST tank – there are no plans to return this HEU to the USA. In fact, for the last decade – ever since the FISST tank was declared full -- all of the HEU that has been irradiated at Chalk River and then reprocessed to extract Molybdenum-99 for medical use has been stored at Chalk River in a solidified form with no plan to repatriate any of that material.

This being the case, there is absolutely no reason to deny the public the right to public hearings in order to discuss alternative options to the unnecessary transport of liquid high-level liquid radioactive wastes. There is no need to compromise public safety as the CNSC is prepared to do by not solidifying this highly radioactive liquid.

***Conclusion: The CCNR strongly recommends a public hearing to consider alternatives to the proposed transport of 23,000 litres of high-level radioactive liquid waste from Chalk River Laboratories (CRL) to the Savannah River Site (SRS).***