From: Deep Geologic Repository Project/ Projet de stockage de déchets radioactifs[CEAA\ACEE]
Sent: June 21, 2017 12:11 PM
To: <contact information removed>
Cc: Deep Geologic Repository Project/ Projet de stockage de déchets radioactifs[CEAA\ACEE]
Subject: RE: ATTN: Project DGR at Bruce

Dear Mr. Neal Reid,

Thank you for your correspondence of June 5, 2017 and the attached information about nuclear waste vitrification.

In completing its review, the Joint Review Panel was satisfied with the information presented by the proponent to fulfill the requirements of the EIS Guidelines with respect to the purpose of and the need for the project, alternatives to the project and alternate means of carrying out the project. The Joint Review Panel also accepted the proponent's selection of the Deep Geological Repository as the preferred alternative for the management of its low and intermediate level waste. The Joint Review Panel Environmental Impact Assessment Report can be found on the Canadian Environmental Assessment Agency's Registry as record #2206. Based on the work conducted by the Joint Review Panel and its recommendations, the Agency would not require further investigation on this topic as part of the environmental assessment.

The information you have provided to us on vitrification has been forwarded to the Canadian Nuclear Safety Commission for their information as they are the department responsible for regulating the use of nuclear energy and materials as well as for the licensing process should the DGR project proceed. You may also contact the proponent directly at *dgrinfo@opg.com* with your questions or comments, as they may be able to discuss with you, in greater detail, their views on vitrification as an option for managing nuclear waste.

Sincerely,

Deep Geologic Repository Project
Canadian Environmental Assessment Agency / Government of Canada
160 Elgin Street, 22nd Floor/ Ottawa/ ON
CEAA.DGRProject-Projet.DGR.ACEE@ceaa-acee.gc.ca

From: Neal Reid <contact information removed>
Sent: June 5, 2017 1:03 PM
To: Information (CEAA/ACEE)
Subject: ATTN: Project DGR at Bruce

To: (by regular mail and by e-mail) June 5, 2017

Canadian Environmental Assessment Agency

22nd Floor, 160 Elgin Street
Ottawa, Ontario K1A 0H3
&
info@ceaa-acee.gc.ca

Re: Nuclear Waste Disposal at the Bruce Nuclear Site

I am writing to inform you of a method of encapsulating nuclear waste for storage called **vitrification**, *which, surprisingly, no one seems to know anything about*. It has never been mentioned in the media as far as I can tell, and it is not found on the OPG website having to do with the Deep Geological Repository (DGR): http://opgdgr.com/ .

There are actually two issues: where the waste is to be placed (OPG's principle focus), and how the waste is to be encapsulated before it is put in place (barely mentioned by OPG). The problem is that "…if the waste is buried in the wrong place, or in the wrong way, it could ruin our water, render the landscape useless for agriculture, or, in a darker scenario, render it useless for habitation."
https://www.theglobeandmail.com/report-on-business/rob-magazine/inside-the-race-for-canadas-nuclear-waste/article23178848/

Vitrification is the transformation of a substance into a glass. In essence, nuclear waste is thoroughly mixed into a soup of molten glass, in which the waste is trapped when the glass cools and solidifies. Glass "is able to incorporate a wide range of elements over wide composition ranges" and it is "relatively insensitive to the effects of radiation and radioactive decay". Furthermore, glass does not degrade in the environment the way metals do. Basically, you can lock up the waste in a big hunk of glass (the right way) and throw away the key. And yes, then bury it in some suitable geological formation, inaccessible to human contact (the right place). Vitrification "has become the international method of choice for the treatment of the most dangerous radioactive waste."
(See article from Physics Today, February 2015 - a publication of the American Institutes of Physics, **copy attached**). (See also *PS. below.)

The Physics Today article, goes on to describe a new nuclear waste treatment facility, being constructed in Hanford, Washington, USA, on the Columbia River. On their website http://www.hanford.gov/page.cfm/wtp we read:

> "The plant will use vitrification technology, which involves blending the waste with glass-forming materials and heating it to 2,100 degrees Fahrenheit (1,149 degrees Celsius). This mixture is poured into stainless steel canisters to cool and solidify. In this glass form, the waste is stable and impervious to the environment, and its radioactivity will safely dissipate over hundreds to thousands of years."

Note: Glass performs the principle containment function, not the steel canisters. It is hard to believe that nuclear waste can be stored for millennia in steel, copper and clay containers, as is the current OPG plan, especially when they acknowledge that the water in the DGR has

"extremely high salinity" (see *PS. below). It is not surprising that this has generated considerable opposition in communities around the Great Lakes.

There are unquestionably technical and engineering hurdles, but serious consequences if the job is not done right. Maybe OPG has considered the vitrification process as an option, but has dismissed it. If so, I would like to know why. It also may be that OPG is not aware of the vitrification option (their website never mentions it), in which case I have to question their "science" and the credibility of their entire plan.

May I ask that you please reply.

Respectfully,

Neal Reid, (Math and computer science teacher (retired), & Ph.D. in nuclear physics.)
Oakville, ON

*PS. "Glass may seem to be a strange choice as a material in which to immobilize radioactive waste, but several features make it very well suited for that role. Glass is an amorphous material [meaning that the atoms in it are all randomly jumbled] and is able to incorporate a wide range of elements over wide composition ranges. Its amorphous nature also makes glass relatively insensitive to the effects of radiation and radioactive decay, which can include significant atomic displacements in the structure. In addition, the basic glass-making process is relatively simple and robust, so it is well suited to use in a radioactive environment." (Physics Today article)

*PS. "The combination of moisture, oxygen and salt, especially sodium chloride, is more damaging to metal than just rust. This combination corrodes, or eats away at, the metal, weakening it and causing it to fall apart. Salt water corrodes metal five times faster than fresh water does…". http://sciencing.com/effects-saltwater-metals-8632636.html