



Nuclear Waste Management During Decommissioning: Principles into Practice Webinar Q&A

These are questions we did not get the opportunity to answer during the webinar. Please note, the answers below are based on our readings and experience and are not legal or medical advice. Mikkel Øberg has kindly added to our answers based on his experience and a European perspective.

- Q: Where does the nuclear waste get transported to if you are the company hauling the waste found in Saskatchewan?
- A: If you are referring to uranium mine and mill waste, the Canadian Nuclear Safety Commission (CNSC) has more information about this topic here: <https://www.cnsccsn.gc.ca/eng/waste/uranium-mines-and-millswaste/>. For other types of waste, see here: <https://www.cnsccsn.gc.ca/eng/waste/waste-nuclear-substance-licence/>. They also have a map of radiological facilities, including long term storage sites here: <https://www.cnsccsn.gc.ca/eng/resources/maps-of-nuclear-facilities/>. Canadian National Laboratories (CNL) has a map of their storage locations on this page: <https://www.cnl.ca/environmental-stewardship/waste-programs/>.
- Q: What is your view on continuous recycling and deep repository final disposal?
- A: The Radiation Safety Institute of Canada does not take stands on issues related to the use of nuclear energy production, including these topics. Rather, we provide science-based information so that people can make their own decisions.
- Q: Why don't we try to recycle nuclear waste?
- A: The reasons behind this are complex. There are business considerations, public concerns, and international non-proliferation treaties that come into play. Canada banned nuclear fuel reprocessing in 1977. There were and continue to be people concerned that the plutonium being produced during recycling could be used for nuclear weapons. All this being said, in January of 2024, Moltex received a Canadian patent for a spent nuclear fuel recycling process.
- Mikkel: There are several positive interesting aspects in recycling regarding nuclear waste, however it will possibly not have a significant impact on final disposal as this is largely based on the types of waste, more so than the specific amount. So far, the technology used to reprocess or recycle especially fuel does not remove the waste type completely from the waste stream, rather it modifies and lowers the total amount.
- Q: Has Denmark ratified the United Nations Declaration of the Rights of Indigenous Peoples Act? (s.29 talks about storage or disposal of hazardous materials)
- A: Yes. According to <https://social.desa.un.org/issues/indigenous-peoples/united-nations-declaration-on-the-rights-of-indigenous-peoples>.

- Q: What about processing facilities that treat NORM and produce TENORM residues? Should the same guidelines for anthropic radionuclides be applied to natural radionuclides?
- A: The International Commission on Radiological Protection is an independent international organization that makes recommendations for a system of radiological protection for governments to adopt in part or as a whole. Canada's regulators regularly refer to ICRP documents. [ICRP 103](#) explains that Naturally Occurring Radioactive Materials (NORM) are what are considered an existing exposure situation. In these situations, rather than having worker dose limits, they suggest using constraints and reference levels are used to protect individuals both workers and the public. They are used as guidance targets, rather than regulated limits which are not to be exceeded, as this isn't practically possible in an existing exposure situation.

The CNSC has a page which explains its control and regulation in Canada: <https://www.cnscccsn.gc.ca/eng/resources/fact-sheets/naturally-occurring-radioactive-material/>. Note there is no distinction between NORM and Technologically Enhanced NORM (TENORM) in the [Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials \(NORM\)](#) or in the CNSC's legislation.

Basically, it depends on how radioactive the natural materials are.

Mikkel: In a European context, there is great difference between countries on how to handle and especially label and regulate NORM-waste. In some countries it is labelled as a resource, as it can be used, in some form, in building projects and dykes, and as such it is only waste of no other use can be found. Some regulate the radiological content separately, while others pool it with other types of environmental contamination of soil.

- Q: To dispose off waste in the concrete container, are there any regulations for strength of concrete? What should be the strength of concrete for LLW and HLW?

- A: This answer would be quite expansive and depends on context. In the CSNC's REGDOC 2.11.1 Vol 1 Section 9, they state:

Where applicable, the licensee shall use engineered waste packages to contain radioactive waste in accordance with applicable regulations for normal operation and in postulated accident conditions. The licensee shall use engineered waste packages for their intended use in the handling, processing, storage, disposal, and, if applicable, the transport of waste.

The licensee shall ensure that waste packages and unpackaged waste accepted for processing, storage and/or disposal conform to the waste acceptance criteria for the licensed facility or activity.

The CNSC's [REGDOCs related to nuclear waste](#), refer out to the N292 series of Canadian Standards Association documents. These documents can be accessed for free by following the directions at <https://www.cnscccsn.gc.ca/eng/acts-and-regulations/regulatory-documents/csa-standards/>.

Mikkel: In most European countries, Denmark included, there isn't a strict regulation on the individual aspects of barriers between radioactive material and the environment. Rather, it is a broad approach, where there are a multitude of pathways all leading to a sufficiently safe and secure solution. This is

most often based not on concrete acceptance parameters, but rather specific safety cases and modelling.

Q: What type of certification do you need to work in nuclear waste disposal and/or nuclear decommissioning?

A: It really depends on what aspect of the work you plan to take on. If you wish to be in charge of the operation, as with our guest, a background in physics/engineering and health/medical physics or comparable will probably be required. If you wish to be hands on doing the radiation measurements, a radiation protection technician diploma would be a consideration. If you are already working in conventional environmental cleanup, you may be able to get a position at a company that does both conventional waste management and nuclear waste management and gain the skills for the nuclear side on the job.

In Canada, there are a variety of levels of education available for those who wish to work in the nuclear industry. See <https://crpa-acrp.ca/resources/radiation-protection-programs-in-canada/> for more information.

Mikkel: It varies somewhat between countries in Europe, but due to the closure of Nuclear Power Plants beginning in the 90's it has become more difficult to sustain the trained work force across the continent. The delay in decommissioning for many major sites further accelerated this development, and as such it is most often based on existing competences in adjacent areas being re-trained and certified after being hired. Some countries have proper certification for specific aspects, most often either nuclear engineering or health physicist, but any experience or education within environmental modelling, physics, chemistry or similar will be a place to start.