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Intermediate-Level Waste Disposal from Small Modular Nuclear Reactors in Saskatchewan

The Government of Saskatchewan is investigating in potential deployment of small modular nuclear reactors (SMNRs) to provide the province a base-load electrical power and to replace coal-fired plants. Like in all nuclear energy applications, SMNRs will generate low, intermediate and high-level nuclear waste that needs to be carefully managed based on the type of nuclear waste and properly disposed of.

The prevalent view among the international scientific community is that deep geologic repositories (DGRs) are the safest option for long-term disposal of nuclear waste. In Canada, the Nuclear Waste Management Organization, responsible for nuclear waste management, has indicated a preference for a mined repository for disposal of high and intermediate-level waste, based on the internationally recognized best practices (NWMO, 2024). Certain characteristics of geologic environments such as low seismic hazard, low permeability and low porosity, are essential for selecting an appropriate DGR site.

Saskatchewan has a low seismic hazard rating and rock types that could potentially be suitable for DGR. In this presentation, I begin with an overview of types of nuclear waste. I will discuss engineered barriers used for radiation protection for intermediate-level waste before its disposal. Then, I discuss the role of geological and hydrogeological engineering in relation to isolation of radionuclides from the biosphere. Finally, I discuss the geologic formation in Saskatchewan that could be potential for DGR.