Challenges and Perspectives of Deep Geological Repositories for Nuclear Energy

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Abstract

Sustainable development and environmental preservation are unattainable without addressing climate change and its severe impacts. A key component of this effort is the adoption of clean energy technologies, such as nuclear, wind, and solar energy, which are essential to achieving net zero greenhouse gas (GHG) emissions by 2050. Nuclear energy, in particular, is crucial for reaching this goal both in Canada and globally. Currently, nuclear power supplies approximately 10% of the world's electricity, 15% of Canada's, and 60% of Ontario's needs. Despite its benefits, nuclear energy generation results in the production of hazardous nuclear waste. The sustainable and safe management of this waste is paramount, and several countries around the world are investigating the use of deep geological repositories, which involve the disposal of nuclear waste in deep rock formations, as sustainable solutions for nuclear waste. This lecture will address the significant geotechnical engineering challenges associated with the design and implementation of deep geological repositories for nuclear waste. It will present the latest research advancements aimed at overcoming these technical obstacles and explore the future prospects of deep geological repositories as a sustainable solution for nuclear waste management.