**Integration Group for the Safety Case (IGSC) Symposium 2024***MOVING TOWARDS THE CONSTRUCTION OF A SAFE DGR – GETTING REAL*

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| **Abstract Title: Technical and Regulatory Considerations in the Long-term Management of Unconventional and Legacy Radioactive Waste**  **United States of America**  [**david.esh@nrc.gov**](mailto:david.esh@nrc.gov) | |
| Abstract (300-500 words):  Diverse use of radioactive materials for beneficial uses can lead to a range of radioactive waste streams (e.g., depleted uranium, irradiated graphite, activated metals, wastes containing high concentrations of long-lived alpha emitting transuranic radionuclides) that may have considerably different characteristics than the central tendency of all waste streams. Near-surface disposal may not be suitable for all types of wastes. Where and how to dispose of radioactive waste can be a complex decision that is influenced by many factors – factors that can be determined and assessed through the use of the safety case methodology. Restrictions on disposal of some wastes are typically established by law, policy, regulatory analyses, site-specific analyses, or some combination. All types of restrictions can usually be traced back to quantitative or qualitative technical analyses.  Near-surface disposal facilities have a higher likelihood of being impacted by natural and anthropogenic processes and events compared to deep geologic disposal facilities. The magnitude in variation of surface conditions is larger leading to uncertainties in estimated future performance of a disposal facility. For this reason, most programmes have established limits on acceptable concentrations of radioactive waste that may be disposed in a near-surface disposal facility. The appropriateness of generic concentration limits is tied to the representativeness of the analyses used to establish the limits compared to the actual disposal system and conditions. The operational and post-closure safety risks from the disposal of radioactive waste are a function of the radiological composition of the waste but are also a function of many other factors such as the location of the facility, the presence of natural resources, the conditioning of the waste (e.g., dispersibility, leachability), engineered barriers, site stability, environmental conditions, surficial and deep geology, and the interactions of various system components.  The use of regulatory requirements and technical analyses in a complimentary manner can lead to more robust decisions for the disposal of unconventional and legacy radioactive waste. Complimentary regulatory requirements for site selection (characteristics), waste characteristics (conditioning), and site control can be used to mitigate or reduce certain types of uncertainties thus simplifying post-closure safety cases. The post-closure safety analyses can then be used to determine if the waste is suitable for near-surface disposal. The presence of certain radionuclides in high concentrations may not be a sufficient condition to necessitate deep geologic disposal. Examples will be presented for different types of unconventional and legacy wastes. | |