**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:**  **Changes in the Performance Assessment at WIPP over Time** | |
| **Abstract (300-500 words):**  The Waste Isolation Pilot Plant (WIPP) in southeast New Mexico, United States, has been accepting defense transuranic waste for permanent disposal since 1999. Prior to the first compliance certification application (CCA) for licensing by the US Environmental Protection Agency (EPA), the US Department of Energy (DOE) used a performance assessment (PA) to demonstrate compliance with EPA’s long-term radioactive waste disposal standards. As required by regulation, the DOE WIPP PA calculates potential releases that could occur, including after a future inadvertent intrusion via oil or gas drilling. Such drilling could lead to the release of actinide-contaminated pressurized brine. Per the WIPP Land Withdrawal Act (LWA), DOE submits a recertification application every five years and updates the PA to reflect changes in knowledge about the system. For this Symposium presentation, we will discuss how the PA has changed over time to address changes in our understanding of the disposal system and their impact to releases and subsequent compliance.  In the pre-certification period in the 1990s, PA calculations identified that low brine pH could lead to high radionuclide releases. As a result, DOE investigated materials to buffer the system and settled on magnesium oxide (MgO). The MgO would remove CO2 from the system through a series of hydration reactions with brine, decreasing repository pressures and buffering brine to a pH where actinides are the least soluble (8<pH<10). EPA’s regulation requires an engineered barrier in addition to the natural barriers and MgO is an acceptable engineered barrier as it ensures a favorable repository chemistry.  In the early 2000s DOE’s plan to supercompact some wastes with cellulosic, plastic, or rubber (CPR) materials raised questions: would the rigidity of the compacted drums challenge the function of the salt to creep close around the waste, and how would the large amounts of CPR contribute to increased microbial gas generation? Through separate process modelling of the rock mechanics and a full PA of the material, DOE determined that the material was acceptable, but EPA required a condition to make sure there was enough MgO available to react with microbially generated CO2 with a safety factor.  Separately and later, DOE continued to collect data on microbial gas generation and determined that the original rate overestimated longer-term microbial gas generation. Because of the availability of additional data, DOE requested, and EPA approved, a reduction in the microbial gas generation rate used in the original certification (the Compliance Certification Application). This acted to reduce releases from CPR. A lesson learned is that it can be important to keep certain experiments going for long periods as the long-term experiments indicated that the short-term experiments did not fully reflect the longer-term gas generation rate.  In February 2014, a radiological incident at WIPP resulted in underground contamination and kept workers from conducting ground control for about 6 months. This resulted in the abandonment of one waste panel and the omission of panel closures for several other panels. For the following recertification, DOE made bounding assumptions in the PA to deal with uncertainty in the future repository design. DOE is planning to add two new waste panels to replace lost space and this requires changes to the modelling of the system.  EPA regulations allow for DOE to request changes to the disposal system through a planned change request process. The use of supercompacted waste discussed above was an example of a change made through the planned change process that had the potential to affect releases calculated in the PA. More minor technical changes are made by the DOE and reviewed by the EPA in the 5-year recertification process. The addition of the two new panels as a result of the 2014 radiological incident is being addressed via the planned change request process. Because of the high interest in the addition of two new panels and the potential magnitude of the change to the design, however, EPA is asking for public comments on DOE’s planned change request. EPA needs to decide whether the addition of two new panels is a “significant departure” from previous (re)certifications. If the EPA determines the addition of two new panels is a significant departure, then the decision process will need to follow the federal rulemaking process; otherwise, the EPA is still committed to a process that has public involvement.  These examples illustrate WIPP PA evolution over time. The PA has been used to understand the impacts of repository behaviour such as brine pH, salt creep, microbial activity, waste shear strength, and repository design on releases and has been updated based on our evolving understanding of real-world data and operational changes to the disposal system. | |