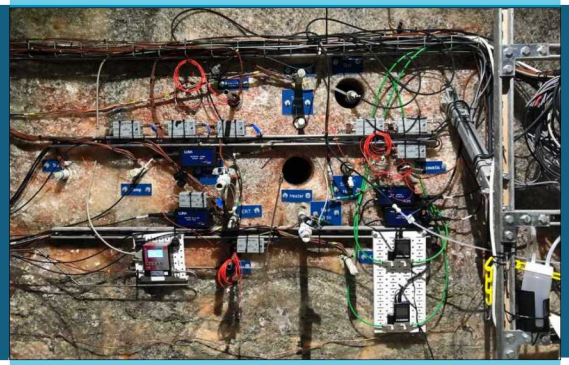
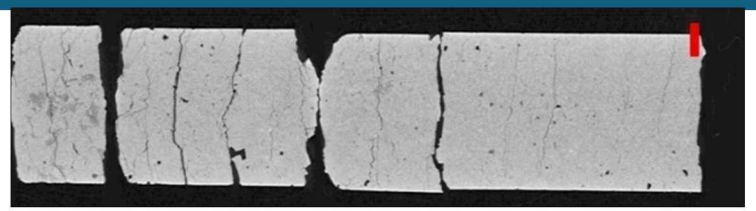
SAND2020-8277PE

Objectives and Regulatory Requirements for Scenario Development: US – WIPP





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WIPP Scenario Development History

- Early scenario development process preceded regulatory guidance
- SAND80-1429 (Cranwell et al., 1982) documented a formal process for developing scenarios and the "Performance Assessment Methodology"
- Scenarios for WIPP PA "refined" from 1989 to 1996 based on input from scientific program, stakeholders, and regulator (EPA).

Regulatory Framework:

- WIPP Land Withdrawal Act (1992, 1996)
  - Transferred ownership of 16 square miles of public land to the U.S. DOE for the WIPP site
  - Identified EPA as the regulator, and required EPA to develop “Criteria for Certification of WIPP”

- 40 Code of Federal Regulations (CFR) Part 191 “Long-term Radioactive Disposal Standards” (1985, 1993)
  - Generally applicable to permanent geologic repositories for the disposal of radioactive waste
    - Not WIPP-specific; included HLW, SNF, & TRU
  - Requires a demonstration of compliance based on a probabilistic assessment of risk (performance assessment [PA])
  - 10,000 year performance period
  - Requires evaluation of disturbed and undisturbed scenarios
    - requires human intrusion via drilling in performance assessments

- 40 CFR Part 194 “WIPP Certification Criteria” (1996)
  - Provides WIPP-specific criteria for certifying compliance with 40 CFR 191
  - Specifies the content of compliance applications
    - provides details on drilling intrusion
    - added mining scenario

Regulatory Framework (continued):

- 40 CFR Part 194.25 “Future States Assumptions”
  - No acceptable methodology can make reliable predictions of the future state of society, science, languages, or other characteristics of *future humankind*.
  - In contrast, established scientific methods can make plausible predictions regarding the future state of geologic, hydrogeologic, and climatic conditions (i.e, the *natural system*).
  - PA must include dynamic analyses of geologic, hydrogeologic, and climatic processes and events that will evolve over the 10,000 years regulatory time period.
    - The rule limits consideration of climatic conditions to the effects of increased and decreased precipitation on the disposal system. This includes predictions of temperature, which affects evapotranspiration, and other factors.
  - All other present day conditions are assumed to exist in their present state for the entire 10,000 years. Therefore, we assume current state of technology for human activities (drilling, mining, etc.)

Regulatory Framework (continued):

- 40 CFR Part 194.32 “Scope of Performance Assessments”
  - PA shall consider natural processes and events, mining, deep drilling, and shallow drilling that may affect the disposal system during the regulatory time frame.
  - Performance assessments need not consider processes and events that have less than one chance in 10,000 of occurring over 10,000 years.
    - Must identify all potential processes, events or sequences and combinations of processes and events that may occur during the regulatory time frame and may affect the disposal system (FEPs);
    - Identify the processes, events or sequences and combinations of processes and events included in performance assessments (scenarios); and
    - Document why any processes, events or sequences and combinations of processes and events identified pursuant to paragraph (e)(1) of this section were not included in performance assessment results provided in any compliance application (document FEP screening and scenario development).

Regulatory Framework (continued):

- 40 CFR Part 194.27 “Peer Review”
  - Requires peer review of *conceptual models*, waste characterization, and engineered barriers
- WIPP PA represents its various performance *scenarios* through 24 peer reviewed conceptual models:

- Disposal system geometry
- Culebra hydrogeology
- Repository fluid flow
- Salado
- Impure halite
- Salado interbeds
- Disturbed rock zone
- Actinide transport in Salado
- Units above the Salado
- Dissolved transport in Culebra
- Colloidal transport in Culebra
- Exploration boreholes
- Cuttings/Cavings
- Spallings
- Direct brine release
- Castile and brine reservoir
- Multiple intrusions
- Climate change
- Creep closure
- Shafts and shaft seals
- Gas generation
- Chemical conditions
- Dissolved actinide source term
- Colloidal actinide source term

Questions?