SAND2022-2526C

Helsinki ICGR 6th International Conference on Geological Repositories

6th International Conference on Geological Repositories

Helsinki, April 4th-8th 2022

Session 2 : Demonstrating technical reliability for operational and long-term safety (including peer-reviews)

Session 2B : *Panel debate on demonstrating technical reliability*

STEIN Emily

Technical Manager

Geologic Disposal Safety Assessment in a Generic R&D Program

Sandia National Laboratories

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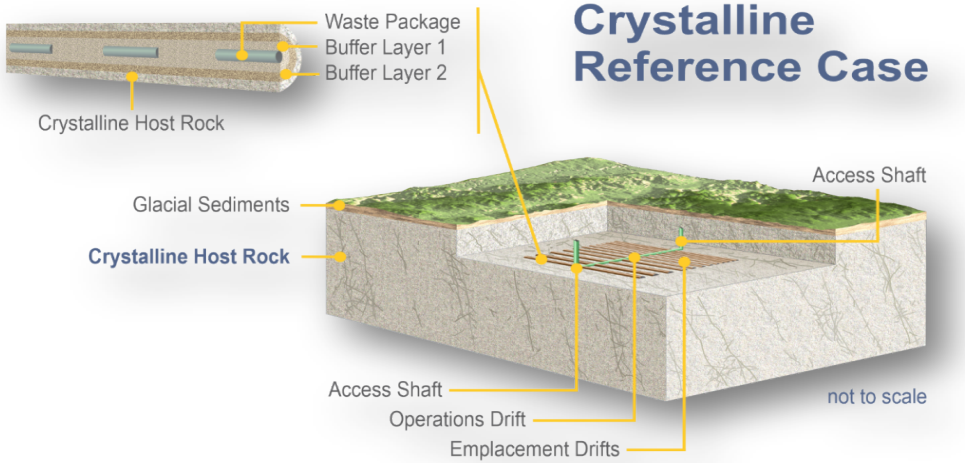
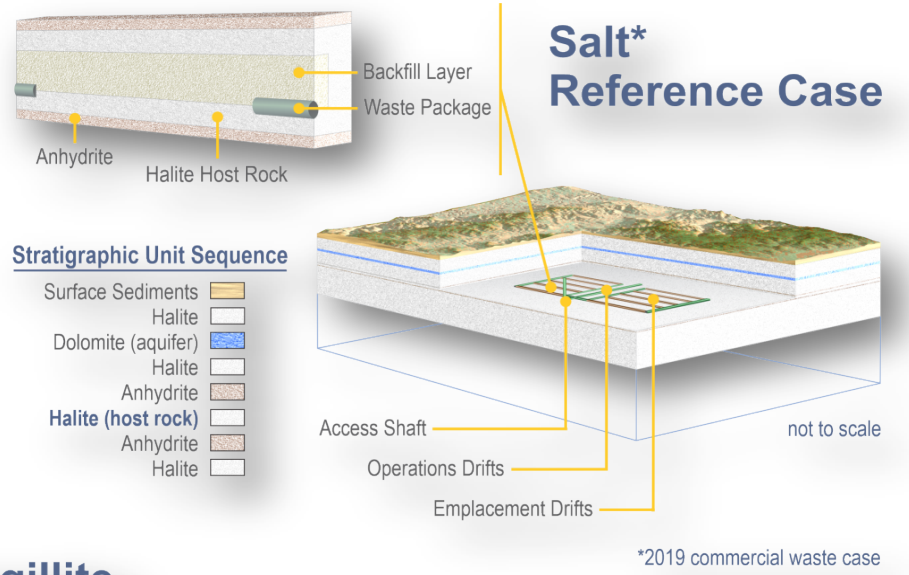
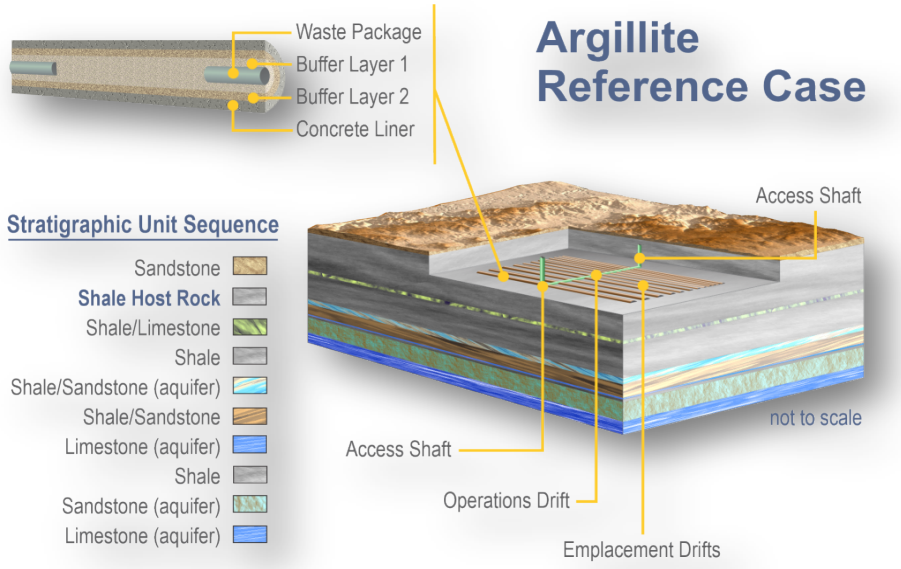
Generic Disposal Research and Development

- Provide a sound technical basis for multiple viable disposal options in the US
- Increase confidence in the robustness of generic disposal concepts
- Develop the science and engineering tools needed to support disposal concept implementation



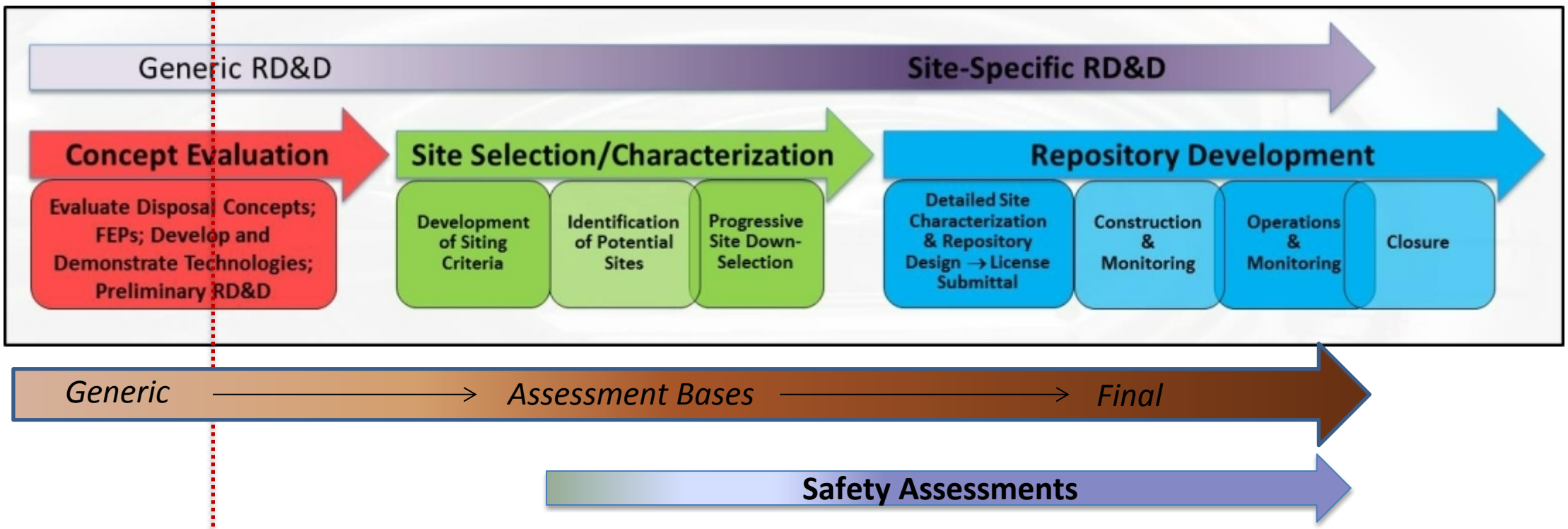




Stages of a Deep Geologic Disposal Program

U.S. Program Currently:

- *Concept Evaluation stage*
- *"Generic" stage*



Geologic Disposal Safety Assessment (GDSA) Framework

Next Gen Workflow

DAKOTA
Explore and predict with confidence.

Input Parameters

- Parameter database

Uncertainty Sampling and Sensitivity Analysis

DAKOTA
Explore and predict with confidence.

Computational Support

Processing

VoroCrust
python
dfnWorks

Visualization

ParaView
Parallel Visualization Application
python

Multi-Physics Simulation and Integration

PFLOTRAN

Source Term and EBS Evolution Model

- Inventory
- Decay, ingrowth
- WF degradation
- WP degradation
- Radionuclide release
- Thermal, mechanical
- Gas generation

FMDM

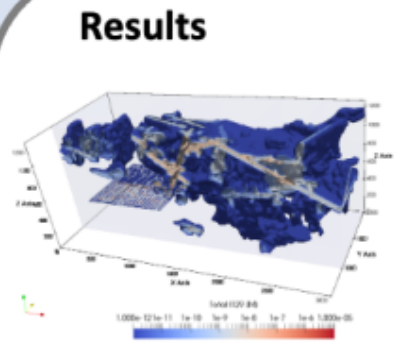
Flow and Transport Model

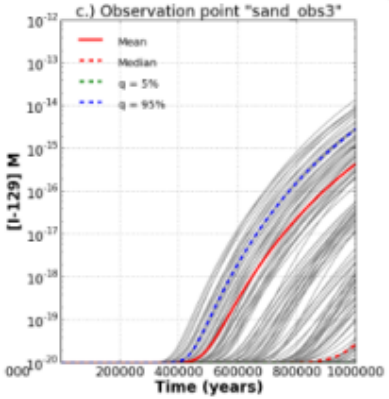
- Advection, diffusion, dispersion
- Discrete fracture networks
- Multiphase flow
- Sorption, solubility, colloids
- Isotope partitioning
- Decay, ingrowth
- Thermal effects
- Chemical reactions

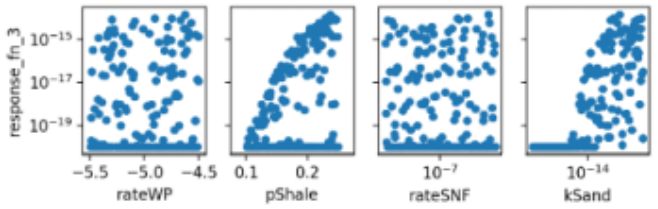
Biosphere Model

- Exposure pathways
- Uptake/ transfer
- Dose calculations

Results







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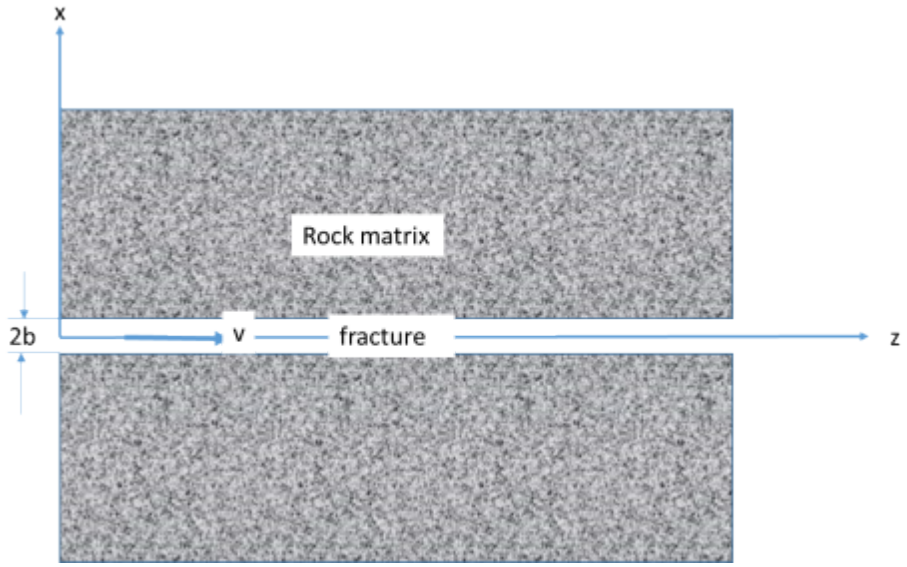
GDSA Framework Development Objectives

- Responsive to advances in
  - Process understanding, computer hardware and software, simulation and analysis methods
- Adaptable to
  - Generic site and design constraints
  - Future programs collecting site- and design-specific technical bases
  - Evolution of the safety assessment strategy
- Transparent
  - Developed and distributed in an open-source environment with public documentation
- Accessible
  - Laptop, workstation, and high-performance computing

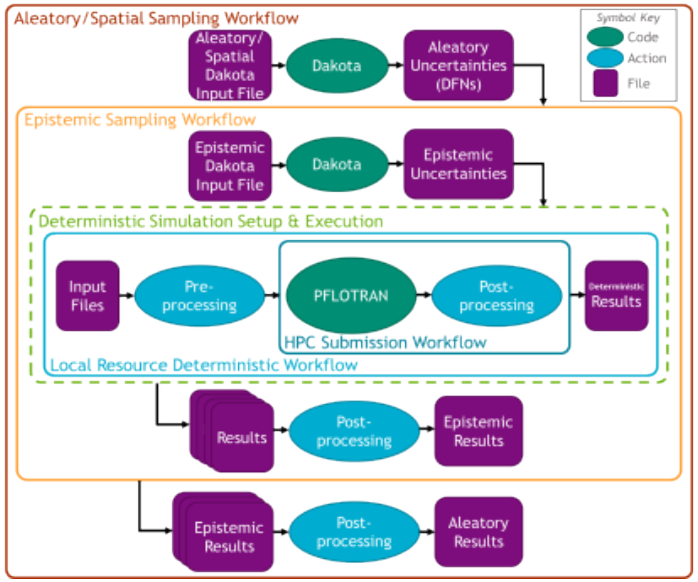
Current Priorities

Simulation capability



Uncertainty and sensitivity analysis methods

Workflow



Repository systems analysis