

SALT R&D PRIORITIES DISCUSSION

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SFWD

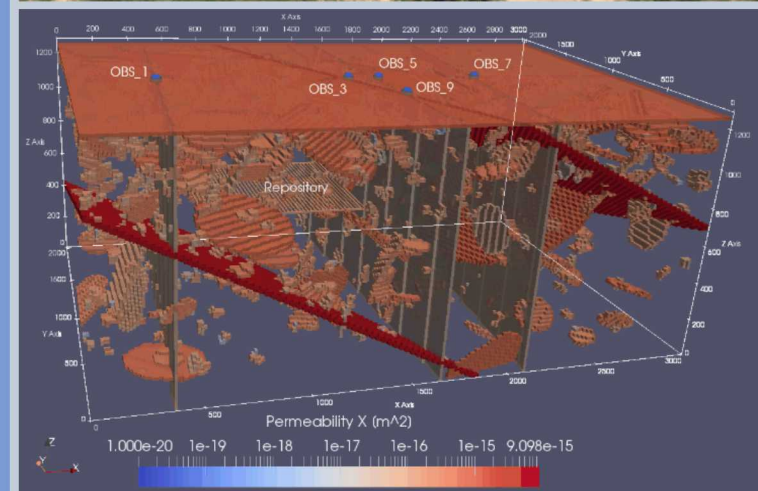
SPENT FUEL & WASTE DISPOSITION

Annual Working Group Meeting

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HIGH IMPACT PRIORITIES IN 2019 DISPOSAL R&D ROADMAP UPDATE

High Priority R&D Activities	
A-08	Evaluation of ordinary Portland cement (OPC)
C-15	Design improved backfill and seal materials
C-16	Development of new waste package concepts and models for evaluation of waste package performance for long-term disposal
D-01	Probabilistic post-closure DPC criticality consequence analyses Task 1 - Scoping Phase Task 2 - Preliminary Analysis Phase Task 3 - Development Phase
D-03	DPC filler and neutron absorber degradation testing and analysis
D-04	Coupled multi-physics simulation of DPC postclosure (chemical, mechanical, thermal-hydraulic) including processes external to the waste package.
D-05	Source term development with and without criticality
E-09	Cement plug/liner degradation
E-11	EBS High Temp experimental data collection- To evaluate high temperature mineralogy /geochemistry changes.
E-14	In-Package Chemistry
E-17	Buffer Material by Design
I-04	Experiment of bentonite EBS under high temperature, HotBENT
I-06	Mont Terri FS Fault Slip Experiment
I-08	DECOVALEX-2019 Task A: Advective gas flow in bentonite
I-12	TH and THM Processes in Salt: German-US Collaborations (WEIMOS)
I-13	TH and THM Processes in Salt: German-US Collaborations (BENVASIM)
I-16	New Activity: DECOVALEX Task on Salt Heater Test and Coupled Modeling
I-18	New Activity: Other potential DECOVALEX Tasks of Interest: Large-Scale Gas Transport
P-12	WP Degradation Model Framework
S-01	Salt Coupled THM processes, hydraulic properties from mechanical behavior (geomechanical)
S-03	Coupled THC advection and diffusion processes in Salt, multi-phase flow processes and material properties in Salt
S-04	Coupled THC processes in Salt, Dissolution and precipitation of salt near heat sources (heat pipes)
S-05	Borehole-based Field Testing in Salt

Medium-High Priority R&D Activities	
A-04	Argillite Coupled THM processes modeling including host rock, EBS, and EDZ (TOUGH-FLAC)
C-01	Discrete Fracture Network (DFN) Model
C-06	Buffer Erosion (is this a gap in our program?) is it too site specific for generic R&D
C-08	Interaction of Buffer w/ Crystalline Rock
C-11	Investigation of fluid flow and transport in low permeability media (clay materials).
C-13	Evaluation and upscaling of the effects of spatial heterogeneity on radionuclide transport
C-14	Radionuclide sorption and incorporation by natural and engineered materials: Beyond a simple Kd approach
C-17	Model DFN evolution due to changes in stress field
E-02	SNF Degradation testing activities
E-03	THC processes in EBS
E-04	Waste Package Degradation Model (mechanistic)
E-06	Waste Package Degradation Testing
E-10	High-Temperature Behavior
E-20	Colloid source terms
I-02	FEBEX-DP Modeling: Dismantling phase of the long-term FEBEX heater test - Modeling
I-03	FEBEX-DP Experimental Work: Dismantling phase of the long-term FEBEX heater test
I-07	DECOVALEX-2019 Task E: Upscaling of modeling results from small scale to one-to-one scale based in heater test data in Callovo-Oxfordian claystone (COx) at MHM underground research laboratory in France.
I-09	DECOVALEX-2019 Task C: GREET (Groundwater REcovery Experiment in Tunnel) at Mizunami URL, Japan
I-14	TH and THM Processes in Reconsolidating Salt: German-US Collaborations (KOMPASS)
I-21	New Activity: SKB Task 10 Validation of DFN Modeling
O-02	GDSA Geologic Modeling
O-03	Web Visualization of Geologic Conceptual Framework for GDSA Geologic Modeling
P-01	CSNF repository argillite reference case
P-02	CSNF repository crystalline reference case
P-04	CSNF repository unsaturated zone (alluvium) reference case
P-11	Pitzer model
P-13	Full Representation of Chemical processes in PA
P-14	Generic Capability Development for PFLOTTRAN
P-17	Multi-Component Gas Transport
S-02	Salt Coupled THM processes, creep closure of excavations
S-07	Brine Origin, Chemistry, and Composition in Salt (in support of field test S-5)
S-08	Evolution of run-of-mine salt backfill
S-11	THMC effects of anhydrites, clays, and other non-salt components

HIGH IMPACT PRIORITIES IN 2019 DISPOSAL R&D ROADMAP UPDATE

High Impact R&D Topics	High-Priority R&D Activities	Medium-High-Priority R&D Activities
High Temperature Impacts	D-1, D-4, I-4, I-6, I-16, E-11, S-5	I-2, I-3, I-7, E-10
Buffer and Seal Studies	I-4, E-9, E-17, A-8, C-15	I-2, I-3, I-7, A-4, C-6, C-8, C-11
Coupled Processes (Salt)	S-1, S-3, S-4, I-12, I-13	I-14, S-2, S-7, S-8, S-11
Gas Flow in the EBS	I-6, I-8, I-18	I-9, P-17
Criticality	D-1, D-3, D-4, D-5	
Waste Package Degradation	C-16, P-12	E-4, E-6
In-Package Chemistry	E-14	E-2, E-20
Generic PA Models		P-1, P-2, P-4, P-11, P-13, P-14
Radionuclide Transport		C-11, C-13, C-14
DFN Issues		I-21, C-1, C-17
GDSA Geologic Modeling		O-2, O-3
THC Processes in EBS		E-3

Maroon color denotes salt-related activities.

DISCUSSION RE: R&D PRIORITIES

■ Discussion (20 minutes):

For each High or Medium-High R&D Activity:

- Do we agree with the “R&D Needed” text in our database? If not, how should we change it?
- How can we translate the Activity into an input to GDSA? If we cannot, then which component of the safety case does the activity support?
- Are the Activity and the GDSA reference case consistent with each other? If not, how can we make them consistent?
- Tentatively schedule sit-down meeting among the project staff who need to integrate on a particular Activity and identify the primary topics for discussion

considerations
f. Integration with storage facilities

facility
e. Waste acceptance criteria
f. Impact of pre-closure activities on post-closure

basis
c. Barrier/basin technical basis
d. Shafts/seals technical basis
e. UQ (aleatory, epistemic)

basis
c. Aquifer/other geologic units technical basis
d. UQ (aleatory, epistemic)

– Surface environment
– Flora & fauna
– Human behavior

4. Disposal System Safety Evaluation

4.1 Pre-closure Safety Analysis

- a. Surface facilities and packaging
- b. Mining and drilling
- c. Underground transfer and handling
- d. Emplacement operations
- e. Design basis events & probabilities
- f. Pre-closure model/software validation
- g. Criticality analyses
- h. Dose/consequence analyses

4.2 Post-closure Safety Assessment

- a. FEPs analysis/screening
- b. Scenario construction/screening
- c. PA model/software validation
- d. Barrier/safety function analyses and subsystem analyses
- e. PA and Process Model Analyses/Results
- f. Uncertainty characterization and analysis
- g. Sensitivity analyses

4.3 Confidence Enhancement

- a. R&D prioritization
- b. Natural/anthropogenic analogues
- c. URL & large-scale demonstrations
- d. Monitoring and performance confirmation
- e. International consensus & peer review
- f. Verification, validation, transparency
- g. Qualitative and robustness arguments

5. Synthesis & Conclusions

- a. Key findings and statement(s) of confidence
- b. Discussion/disposition of remaining uncertainties
- c. Path forward