Crystalline R&D Priorities Discussion

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SFWD

Spent Fuel & Waste Disposition

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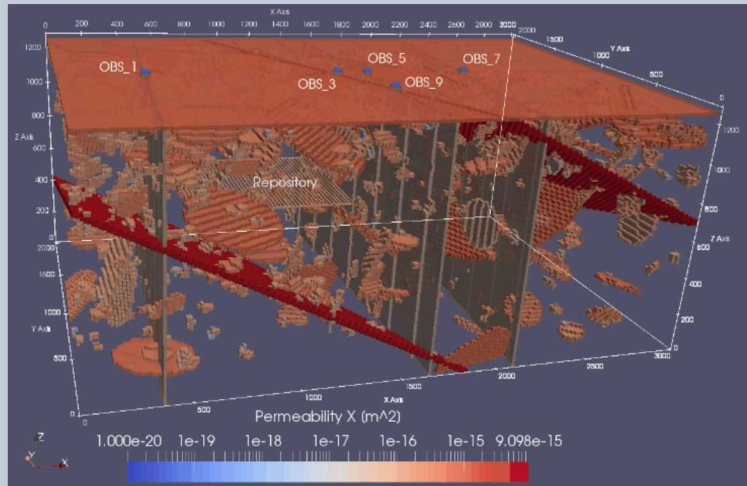

CRYSTALLINE R&D PRIORITIES

- Priority Score Matrix in 2019 Roadmap Update
  - State-of-Art Level (SAL)
  - Importance to Safety Case (ISC)
  - Medium-High

ISC: \ SAL:	1	2	3	4	5
High (5)	L	M	M	**M-H**	**H**
Medium (3)	L	M	M	M	M
Low (1)	L	L	L	L	L

H = High; M-H = Medium-High; M = Medium; L = Low

Crystalline R&D Priorities in 2019 Disposal R&D Roadmap Update

High Priority	
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
E-14	In-Package Chemistry
I-04	Experiment of bentonite EBS under high temperature, HotBENT
I-08	DECOVALEX-2019 Task A: Advective gas flow in bentonite
Medium-High Priority	
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-03	THC processes in EBS
E-04	Waste Package Degradation Model (mechanistic)
E-06	Waste Package Degradation Testing
I-02	FEBEX-DP Modeling: Dismantling phase of the long-term FEBEX heater test - Modeling
I-09	DECOVALEX-2019 Task C: GREET (Groundwater REcovery Experiment in Tunnel) at Mizunami URL, Japan
P-17	Multi-Component Gas Transport

High Impact Priorities in 2019 Disposal R&D Roadmap Update

- High Impact R&D Topics

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, P-15, P-16
Generic PA Models		P-1, P-2, P-4, P-11, P-13, P-14
Radionuclide Transport		C-11, C-13, C-14, P-15, P-16
DFN issues		I-21, C-1, C-17
GDSA Geologic Modeling		O-2, O-3
THC Processes in EBS		E-3

Maroon color denotes crystalline-related activities.

Discussion

- 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
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