Used Fuel Disposition Campaign

Feature, Event, and Process (FEP) Catalogue for SNF/HLW Disposal in Salt

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Generic Salt FEP Catalogue

- **U.S.-German collaboration to produce a common FEP list**
  - Identify relevant features, events, and processes (FEPs) for disposal of heat-generating waste (SNF and HLW) in salt
    - *Applicable to all potential salt concepts and sites (bedded and domal)*
  - Develop FEP matrix as an organizational structure for the salt FEPs
- **NEA Salt Club**
  - FEP Catalogue for use by all Salt Club members
    - *Countries with potential interest in salt*
  - Consistency with new NEA FEP database
- **UFD**
  - Provides basis for generic FEPs for deep borehole disposal and DOE-Managed HLW/SNF repository concepts

Used Fuel Disposition

FEP Matrix Approach

Characteristics, Processes, and Events / Features and Components	(CP) Characteristics	Processes										Events					
		(TM) Mechanical and Thermal-Mechanical	(TH) Hydrologic and Thermal-Hydrologic	(TC) Chemical and Thermal-Chemical	(TB) Biological and Thermal-Biological	(TT) Transport and Thermal-Transport	(TR) Thermal	(RA) Radiological	(LG) Long-Term Geologic	(CL) Climatic	(HP) Human Activities (long timescale)	(OP) Other	(NC) Nuclear Criticality	(EF) Early Failure	(SM) Seismic	(IG) Igneous	(HE) Human Activities (short timescale)	(OE) Other
Waste and Engineered Barriers Region																		
(WF) Waste Form and Cladding																		
• Commercial SNF & Cladding																		
• Commercial HLW Glass																		
• Naval SNF & Cladding																		
• Defense SNF & Cladding																		
• Defense HLW																		
• Other																		
(WP) Waste Package and Internals																		
• Commercial SNF																		
• Commercial HLW																		
• Naval SNF																		
• Defense SNF																		
• Defense HLW																		
• Other Packages																		
(BB) Buffer/Backfill																		
• Waste Package Buffer																		
• Tunnel/Drift/Room Backfill																		
(MW) Emplacement Tunnels/ Drifts and Mine Workings																		
• Open Excavations																		
• Drift Support																		
• Liners																		
• Other																		
(SP) Seals/Plugs																		
• Drift/Panel Seals/Closures																		
• Shaft Seals																		
• Plugged Boreholes																		
Geosphere and Natural Barriers Region																		
(HR) Host Rock (Repos. Horizon)																		
• Bedded or Domal Salt																		
• Disturbed Rock Zone																		
• Interbeds and Seams																		
(OU) Other Geologic Units																		
• Aquifer(s)																		
• Unsaturated Zone																		
• Pressurized Brine Reservoir(s)																		
Surface Region																		
(BP) Biosphere																		
• Natural Surface and Near-Surface Environment																		
• Flora and Fauna																		
• Humans																		
• Food and Drinking Water																		
• Dwellings and Man-Made Surface Features/Materials																		
System Region																		
(RS) Repository System																		
• Assessment Basis																		
• Pre-closure and Operational																		
• Other Global																		

- **Two-dimensional organization structure**
  - Matrix rows = Features and Components
  - Matrix columns = Processes and Events
- **Matrix Cell contains**
  - all FEPs related to the "Process/Event" acting upon or within the "Feature"
- **FEP Identification**
  - Matrix-based alpha-numeric
  - Can still be mapped to the NEA Database for traceability

Partial FEP Matrix with FEPs

Features and Components / Characteristics, Processes, and Events	Characteristics	Processes										Events					
		Mechanical and Thermal-Mechanical	Hydrological and Thermal-Hydrologic	Chemical and Thermal-Chemical	Biological and Thermal-Biological	Transport and Thermal-Transport	Thermal	Radiological	Long-Term Geologic	Climatic	Human Activities (Long Timescale)	Other	Nuclear Criticality	Early Failure	Seismic	Igneous	Human Activities (Short Timescale)	Other
Geosphere Features																		
Host Rock	HR.00.CP.01		HR.00.TH.01	HR.00.TC.01	HR.00.TB.01 HR.02.TB.02				HR.00.LG.01 HR.00.LG.02 HR.00.LG.03 HR.00.LG.04 HR.00.LG.05 HR.00.LG.06	HR.00.CL.01 HR.00.CL.02			HR.00.NC.01		HR.00.SM.01	HR.00.IG.01	HR.00.HE.01	
• Disturbed Rock Zone (DRZ)	HR.01.CP.01	HR.01.TM.01 HR.01.TM.02	HR.01.TH.01 HR.01.TH.02 HR.01.TH.03	HR.01.TC.01 HR.01.TC.02		HR.01.TT.01 HR.01.TT.02 HR.01.TT.03 HR.01.TT.04 HR.01.TT.05 HR.01.TT.06 HR.01.TT.07 HR.01.TT.08												
• Emplacement Unit(s)	HR.02.CP.01	HR.02.TM.01	HR.02.TH.01 HR.02.TH.02 HR.02.TH.03 HR.02.TH.04	HR.02.TC.01 HR.02.TC.02		HR.02.TT.01 HR.02.TT.02 HR.02.TT.03 HR.02.TT.04 HR.02.TT.05 HR.02.TT.06 HR.02.TT.07 HR.02.TT.08												
• Other Host Rock Units	HR.03.CP.01			HR.03.TC.01 HR.03.TC.02		HR.03.TT.01 HR.03.TT.02												
Other Geologic Units	OU.00.CP.01		OU.00.TH.01	OU.00.TC.01					OU.00.LG.01 OU.00.LG.02 OU.00.LG.03 OU.00.LG.04 OU.00.LG.05 OU.00.LG.06		OU.00.HP.01				OU.00.SM.01	OU.00.IG.01	OU.00.HE.01	
• Overlying / Adjacent Units (including Caprock, Aquifers)	OU.01.CP.01	OU.01.TM.01	OU.01.TH.01 OU.01.TH.02 OU.01.TH.03 OU.01.TH.04 OU.01.TH.05	OU.01.TC.01 OU.01.TC.02	OU.01.TB.01 OU.01.TB.02	OU.01.TT.01 OU.01.TT.02 OU.01.TT.03 OU.01.TT.04 OU.01.TT.05 OU.01.TT.06 OU.01.TT.07 OU.01.TT.08				OU.01.CL.01 OU.01.CL.02								
• Underlying Units	OU.02.CP.01	OU.02.TM.01	OU.02.TH.01 OU.02.TH.02 OU.02.TH.03	OU.02.TC.01 OU.02.TC.02	OU.02.TB.01 OU.02.TB.02					OU.02.CL.01								

Salt FEP Work for Current NEA Salt Club Mandate Period (2014 - 2016)

- **Generic Salt FEPs Catalogue, Volume II, Revision 0**
  - June 2015 Progress Report (UFD and WIPP)
- **Developing complete list of Matrix-based FEPs**
  - February 2016: identified ~ 350 matrix-based FEPs at SNL-GRS working meeting in Washington DC
  - Spring-Summer 2016: ~ review and refine matrix-FEPs
  - September 2016: SNL-GRS working meeting in Washington DC to finalize refinements
    - *in conjunction with the NEA Salt Club and US-German Salt Workshop*
- **Ongoing testing/review of NEA FEP Database Version 0.3**
- **2016 Documentation**
  - TBD