



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

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# **Nuclear Energy University Programs (NEUP) Natural Barrier Evaluation for Disposal of High-Level Radioactive Waste IRP**

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Research & Development**

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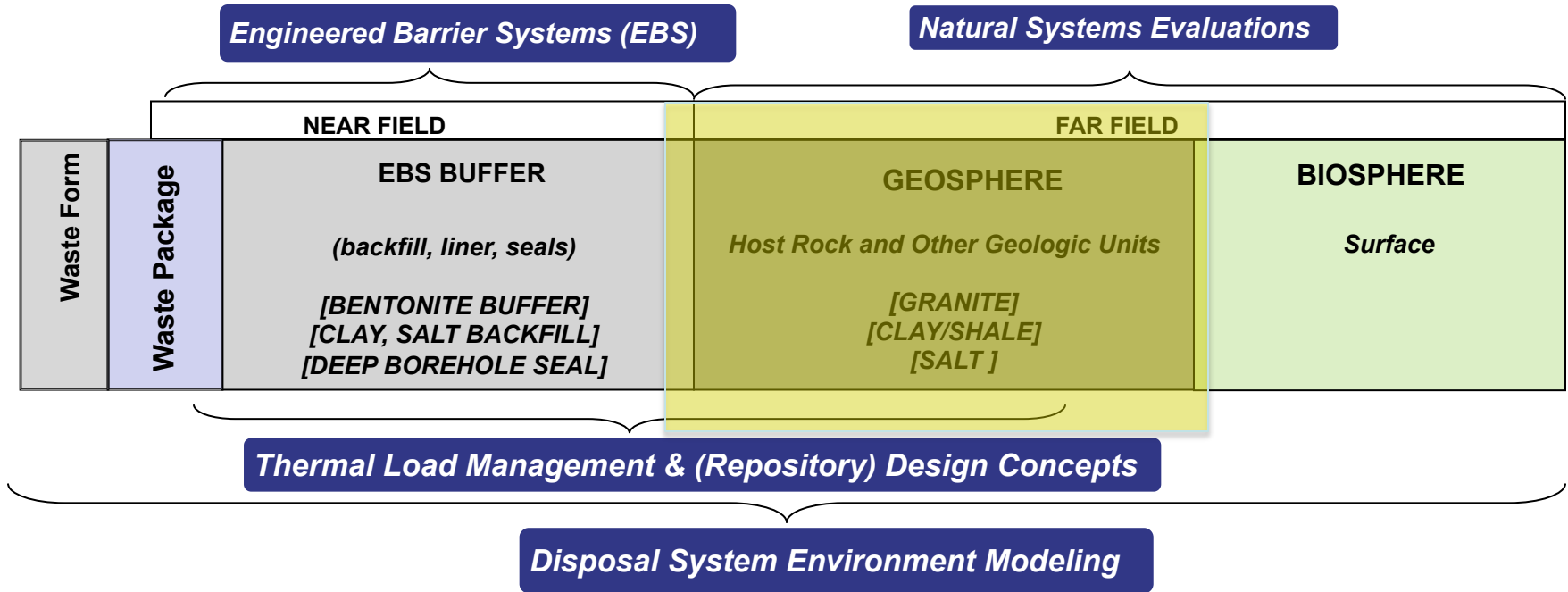
# Used Fuel Disposition Disposal Research Goals

- **Provide a sound technical basis for the assertion that the US has multiple viable disposal options that will be available when national policy is ready**
- **Identify and research generic sources of uncertainty that challenge the viability of disposal concepts**
- **Increase confidence in robustness of generic disposal concepts to reduce the impact of unavoidable site-specific complexity**
- **Develop the science and engineering tools required to address the needs above**

- **Develop basic data, modeling capabilities, and experimental techniques to support deep geologic repository development in multiple geologic media, including, but not limited to, clay/shale formations, bedded and domal salt deposits, low-permeability metamorphic and igneous rocks, and other media as appropriate.**



# UFD Disposal Research Activities



## SUPPORT, ANALYSIS & EXPERIMENTAL

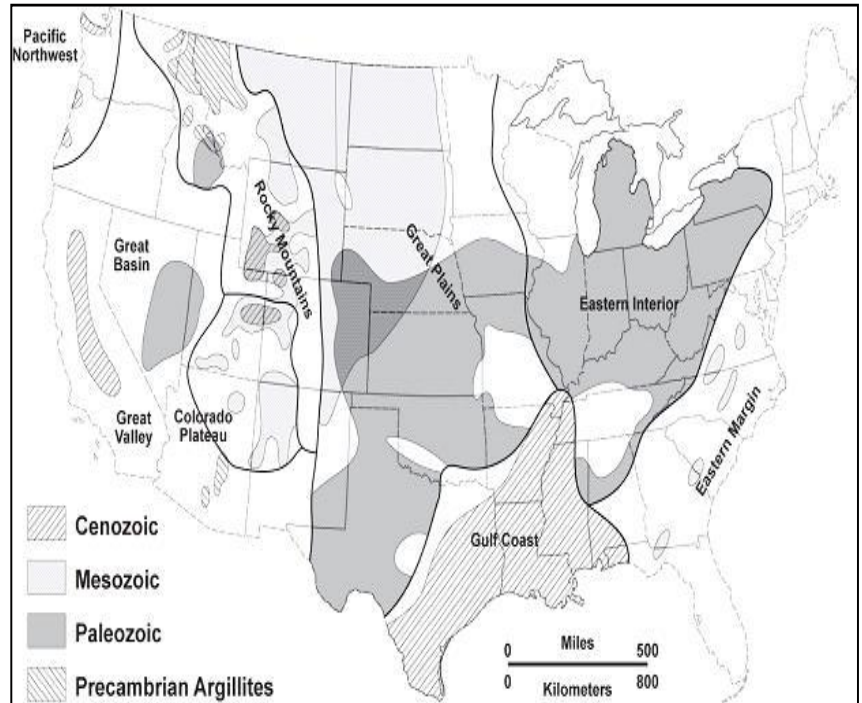
- Regional Geology
- Salt R&D
- Deep Borehole Disposal
- Low Level Waste Disposition Issues
- Inventory Projections
- Nuclear Waste Management Perspectives

- (spatial GIS database development)
- (specific geologic media investigation)
- (specific disposal concept investigations)
- (part of total nuclear waste consideration)
- (LLW/HLW, used fuel, open → closed fuel cycles)
- (regulatory, systems integration, social issues)



## IRP Areas Of Interest for UFD

- Development of detailed data bases documenting spatial distribution of potentially relevant material properties for multiple media, including (but not limited to) mineralogy, thermal properties, mechanical properties, permeability, porosity

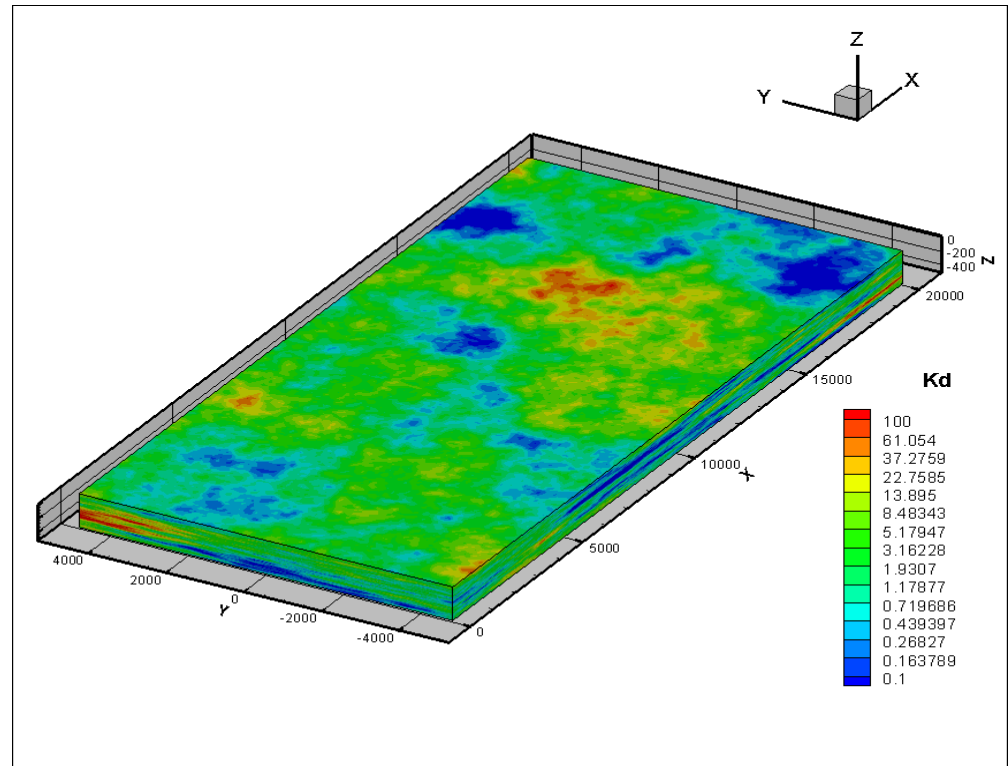


Gonzales S. and Johnson K. S. (1984) *Shale and other argillaceous strata in the United States*. Oak Ridge National Laboratory. ORNL/Sub/84-64794/1.



# IRP Areas Of Interest for UFD

- Testing, both in the laboratory and in boreholes, as appropriate, to acquire new data to supplement data currently available in the scientific literature

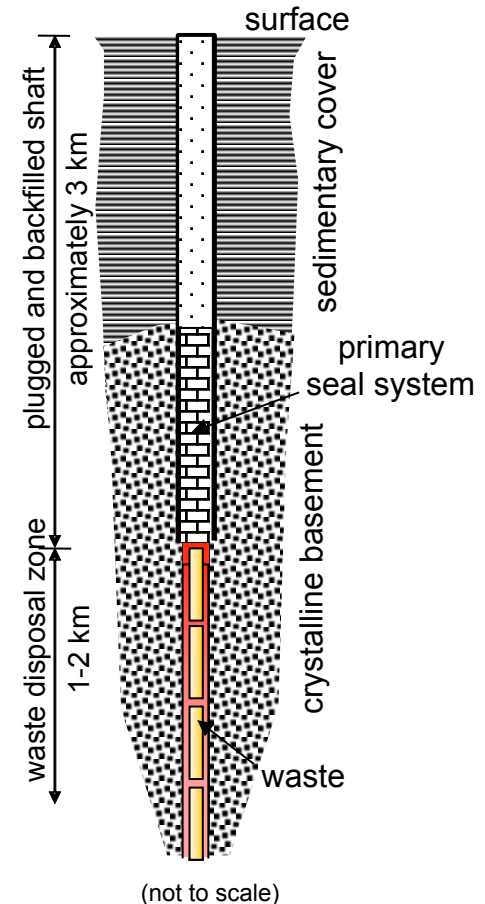


Wang Y., Simpson M., Painter S., Liu H.H., and Kirsting A. (2011)  
*Natural System Evaluation and Tool Development – FY11 Progress Report*. DOE-NE Used Fuel Disposition Campaign. FCRD-USED-2011-0002.



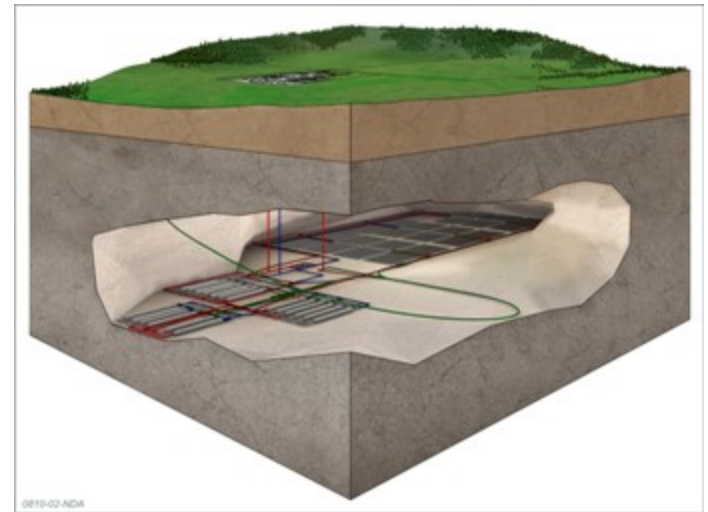
## IRP Areas Of Interest for UFD

- Material properties of crystalline rocks at depths of 3 to 5 km, well below the depth generally proposed for disposal in mined repositories, and where the anticipated means of waste emplacement would be in a borehole





- Improved understanding of hydrologic and radionuclide transport processes in the geosphere of relevant disposal model environments, with emphasis on the models that can better capture the effects of geologic media heterogeneity and the alternative models to the existing equilibrium  $K_d$  approaches for radionuclide transport

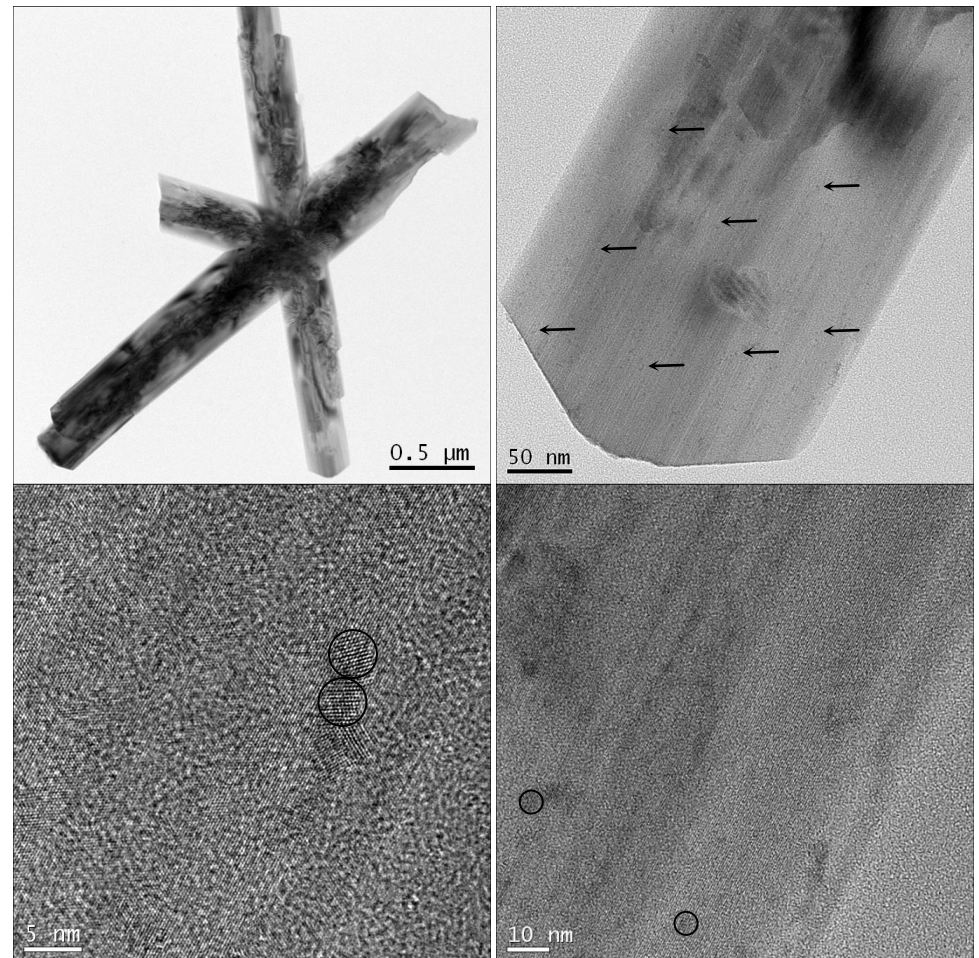






## IRP Areas Of Interest for UFD

- Development of methods to upscale atomistic (or pore-scale) descriptions into continuum-scale models of radionuclide transport in geologic media



Wang Y., Simpson M., Painter S., Liu H.H., and Kisting A. (2011) *Natural System Evaluation and Tool Development – FY11 Progress Report*. DOE-NE Used Fuel Disposition Campaign. FCRD-USED-2011-000223.

## Summary

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- Funding will not be used to support geologic characterization and evaluation of specific candidate disposal sites.
- Funding may be used to acquire new data through drilling or other field activities, but the primary emphasis of IRP must be on information and techniques broadly applicable to a range of generic sites.
- IRP will complement ongoing UFD R&D and will support meeting goals above