Nuclear Energy University Programs
Fiscal Year 2020
Annual Planning Webinar

Spent Fuel and Waste Disposition
FC - 4.1 Disposal
FC - 4.2 Storage & Transportation

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Spent Fuel and Waste Disposition
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U.S. Department of Energy

August 7, 2020
DOE Office of Nuclear Energy Mission

- Advance nuclear power as a resource capable of meeting the nation's energy, environmental, and national security needs by resolving technical, cost, safety, proliferation resistance, and security barriers through research, development, and demonstration as appropriate.

Spent Fuel and Waste Disposition Mission

- Identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of spent nuclear fuel and wastes generated by existing and future nuclear fuel cycles.
The **Grand Challenge** for the Spent Fuel and Waste Campaign is to provide a sound technical basis for the safety and security of long-term storage, transportation, and disposal of used nuclear fuel and wastes from the nuclear energy enterprise.

- Importance: Supports the establishment of SNF management and disposition pathways
Used Fuel Disposition
Research Needs

- **Disposal**
  - Provide a sound technical basis for assurance that the US has multiple viable disposal options 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 site-specific complexity
  - Develop the science and engineering tools required to address the needs above

- **Storage/Transportation**
  
  Develop the technical bases:
  - To demonstrate used fuel integrity for extended storage periods
  - For fuel retrievability and transportation after extended storage
  - For transportation of high burnup fuel
NEUP R&D Work Scope Description: Used Fuel Disposition FC-4.1: Disposal

Candidate Geologies
- clay/shale
- salt
- crystalline rock
- tuff

Barriers for Waste Isolation
- Unsaturated Zone
- Waste Form
  - Glass or hard ceramic
- Engineered Barrier System
I. Fuel
   I. Fuel/Pellet
   II. Cladding
   III. Assembly hardware

II. Cask
   I. Internals (baskets, neutron poisons)
   II. Container (canister, welds, seals, bolts)
   III. Overpack/Storage module

III. ISFSI
   I. Pad
   II. Rebar
   III. Physical Protection

IV. Monitoring Systems
   I. Remote inspection
   II. In-package sensors
   III. Security
Two Program Supporting R&D proposals are being solicited in the Used Fuel Disposition Area, FC-4.1 Disposal and FC-4.2 Storage & Transportation (University-led up to $800,000 for 3 years)
**FC-4.1 Disposal**

Develop new technologies, models, and validation techniques to support the permanent disposal of spent nuclear fuel and high-level radioactive waste for a variety of generic mined repository concepts in various rock media, including:

- waste package failure modes and material degradation processes
- new techniques for in-situ field characterization of hydrologic, mechanical, and chemical properties
- alleviating post-closure criticality concerns
- novel buffer materials, engineered/natural system component properties and failure modes

**FC-4.2 Storage and Transportation**

- Develop novel technologies for mitigating chlorine induced stress corrosion pitting and cracking to improve the reliability of long term storage and maintenance of SNF Storage Canisters