

An Alternate Approach  
Towards Addressing the  
Technical Issues for Long-  
Term On-Site Storage of  
Used Nuclear Fuel

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## DOE-NE's UFDC

- Office of Civilian Radioactive Waste has been disbanded
- DOE-NE has established the Used Fuel Disposition Campaign (UFDC)
  - To conduct scientific research and development to enable storage, transportation and disposal of Used Nuclear Fuel (UNF) for current and future nuclear fuel cycles
  - Among the UFDC tasks – to facilitate all options for disposition and to maintain retrievability and normal back-end operations, the program will evaluate the likelihood that UNF remains undamaged after extended storage.
  - This should not preclude options, from a total systems performance perspective which result in an overall benefit to nuclear waste management.

## Where Do We Want to Be?

- Through research and development, the gap analysis to support UNF management should:
  - Provide assurance that systems containing UNF will meet their intended extended storage safety functions and regulatory requirements
    - Thermal performance
    - Radiological protection
    - Confinement
    - Sub-criticality
    - Retrievability for normal and off-normal conditions
  - Provide similar assurance for subsequent transportation
- Transparent and collaborative process with EPRI, Industry and NRC, with opportunity for public comment

## What Deserves Our Consideration? (1)

- Existing NRC regulations and the DOE Standard Contracts address/require the waste form as the fuel assembly
  - Definitions of “INTACT” and “DAMAGED” fuel and how canister designs are affected by the mechanical state of the assembly and cladding
  - Standard Contract requirements specific to fuel assemblies and components which are an integral part of the assembly (BWR channels, PWR inserts, etc.)
- Is it time to consider a new regulatory framework for long-term management of UNF?

## What Deserves Our Consideration? (2)

- Other options we might consider
  - Modify NRC regulations and amend the DOE Standard Contract
    - Welded canister or existing transport casks become the waste form
    - Has the potential to simplify technology development necessary to meet long-term storage and transportation requirements
    - Accelerate the process of moving UNF away from reactor sites
    - Amending Standard Contract is problematic
  - Canning all UNF – provide an additional fission product boundary, removing reliance on fuel cladding
    - Expensive – up to \$1,000,000 per canister
    - Not ALARA considering the number of already loaded systems, which would require repackaging
    - Opportunity for fuel damage moving each assembly several additional times, increased occupational exposure

# Research and Development Required

| <u>Structures, Systems and Components Important to Safety</u> | <u>Existing Regulatory Framework</u> | <u>Canister/Cask Becomes Waste Form</u> |
|---|--------------------------------------|---|
| Cladding  | ✓                                    | Limited                                 |
| Fuel Assembly Hardware  | ✓                                    | Limited                                 |
| Neutron Absorbers   | ✓                                    | Limited                                 |
| Welded Canisters (MPC)  | ✓                                    | ✓                                       |
| Bolted Systems  | ✓                                    | ✓                                       |
| Metal / Concrete Overpacks                                    | ✓                                    | ✓                                       |

## Canister/Cask as a Waste Form (1)

- Technology development begins with assumptions:
  - Since UNF is no longer a waste form, must assume debris configuration inside canister/cask for long-term storage, transportation and disposal (may not be necessary for all UNF)
  - Canister/cask becomes the confinement boundary
  - Criticality control – moderator exclusion, burn-up credit methodology including fission product poisons
  - Canister/cask becomes the retrievable component
- Expand upon EPRI work which has already produced reports addressing:
  - Disposal of intact canisters at Yucca Mountain, and
  - Criticality analysis including burnup credit and fission product poisons

## Canister/Cask as a Waste Form (2)

- Research on cladding properties and fuel structural material becomes limited, and possibly unnecessary
- Monitoring and inspections at utility sites will begin from the exterior of the canisters, rather than inside
- Focus will remain on integrity of canisters/casks and overpacks, and in some respects, these SSC may have to perform to higher standards