

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

**Adam H. Levin
Exelon Generation Company, LLC**

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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
 - Confinement
 - Sub-criticality
 - Thermal performance
 - Radiological protection
 - 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