

Repackaging Used Fuel at Commercial Nuclear Power Plants

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Major Impacts to Nuclear Operators

- Dose/safety considerations
 - Additional radiation exposure
 - Additional heavy load lifts
- Plant operations
 - Spent fuel pool overhead crane use
 - Radiation protection and security coordination
- Cost considerations
 - Additional support staffing
 - Cask loading costs (\$300k - \$400k)

Magnitude of the Issue [1]

- Dry storage systems at operating units
 - 1650 DSCs containing used fuel
 - Estimated 2900 DSCs in 2020 [EPRI 2012; 1025206]
 - Estimated that all currently operating plants will need dry cask storage by 2025 [EPRI 2012; 1025206]

Magnitude of the Issue [2]

- Ten shutdown units – 2813 MTU / 248 DSCs
 - Big Rock Point, Connecticut Yankee, Maine Yankee, Yankee Rowe, Rancho Seco, Trojan, Humboldt Bay, LaCrosse, Zion 1&2 (Fort St. Vrain)
 - Additional 15 DSCs with greater-than-Class C (GTCC) waste
 - No spent fuel pool available on site to execute repackaging operations

Magnitude of the Issue [3]

- Additional shutdown units
 - Crystal River 3, SONGS 1-3, Kewaunee, (Vermont Yankee – 2014, Oyster Creek – 2019)
 - Evaluations/decisions regarding wet v. dry storage during SAFSTOR in progress
- Normal plant retirements begin with Dresden Unit 2 in December 2029 (after 60 years power operation)

What Does Repackaging Involve?

- Return existing DSCs to SFP
- Cut open welded DSC canisters / remove lids from bolted DSCs
- Offload assemblies to SFP
- Place new/smaller DSC in SFP and load SNF
 - 1 PWR / 4 BWR
 - 4 PWR / 9 BWR
 - 12 PWR / 32 BWR
- Return new/smaller DSC to storage or transport

Impact on Nuclear Operators [1]

- Example - Schedule for loading DSC at dual-unit BWR with two-year operating cycles
 - 1.5 weeks per system
 - 2 weeks for mobilization / 2 weeks for demob
 - Schedule typically runs 10-12 weeks
- Other uses for overhead cranes
 - Refueling related activities – 24 weeks
 - Crane preventative maintenance and inspection
 - Fuel receipt
 - Fuel inspect and movement (staging)
 - Pre- and post-outage movement restrictions

Impact on Nuclear Operators [2]

- All other activities then occur in remaining 14-16 weeks including:
 - Scheduled training, vacation and holiday schedules (4-8 weeks)
 - SNM inventory, SFP non-outage operations (moving filters, control rods, discharged assemblies)
- Results in limited availability (approximately 4-5 weeks) to repackage DSCs

Impact on Nuclear Operators [3]

- Fuel loading and welding will result in shorter loading duration for smaller system
 - Fuel selection and loading
 - Canister closure weld, dewatering, drying, helium backfill
 - Balance of schedule – placing canister in transfer cask, placing transfer cask in pool, removal transfer cask from pool, transfer canister to DSC overpack, move to storage location
- Rather than 1.5 weeks per DSC, estimate 1 weeks per DSC load

Impact on Nuclear Operators [4]

- BWR typically loads 4-5 DSCs
 - Assume 1 week per smaller system
 - 9-11 systems required (for 32-assembly BWR DSCs), or 31-38 systems (for 9-assembly BWR DSCs)
 - Requires minimum of 9 weeks schedule for 32-assembly systems, with a maximum of 38 weeks schedule for 9-assembly systems
- Results in a significant impact to plant operations: safety, time and cost

From the Utility Perspective – Repackaging DSCs at Reactor Sites

- Does repackaging at operating reactor sites holistically improve the US high-level waste management system?
 - Yes – allows flexibility of disposal options, but...
- Does repackaging at operating reactor sites holistically improve the nuclear fuel cycle?
 - No – major impediment to plant operations, likely to result in additional collective worker exposure, safety challenges and crane unavailability (costs)
 - Flexibility of disposal options can be introduced after acceptance by DOE for disposal