

Integrated Used Nuclear Fuel Storage, Transportation, and Disposal Canister System

UT-B ID 201102603



Technology Summary

Researchers at ORNL have developed an integrated system that reduces the total life-cycle cost of used fuel storage while improving overall safety. This multi-canister approach provides superior assembly and burnup/damaged fuel capacity. The invention also reduces the need for future repackaging of fuel for transit or storage.

The shutdown of the Yucca Mountain Project is leading to increased reliance on dry cask storage of used nuclear fuel at existing plant sites. Because a long-term plan for used fuel disposal does not yet exist, a variety of large capacity storage and transportation casks will continue to be loaded at these sites. However, the majority of these casks will not satisfy expected requirements for direct disposal of used fuel at sites requiring low thermal profiles, so they will require repackaging of the fuel for transportation and/or disposal. Repackaging fuel, particularly after an extended storage period, leads to significant radiological, operational, and financial liabilities.

This invention reduces or eliminates the need for future repackaging by supporting multiple used fuel disposal options, while increasing operational flexibility and safety. The system's unique features enable canisters to be handled separately or collectively within the larger storage cask. In addition, the system offers potential reductions in cask loading and drying time; a higher percentage of fuel to meet subcriticality requirements; the incorporation of features for handling damaged fuel assemblies after transport; achievement of geologic disposal thermal management requirements; and, a reduction in overall radiation exposure and fuel handling risk. All of these features also eliminate the need to upgrade current structures or crane capacities at existing nuclear facilities.

Advantages

- Allows improved decay heat management of high-burnup and mixed oxide fuel
- Enables increased percentage of fuel acceptable in terms of subcriticality requirements
- Works within existing framework and overpack designs
- Features lighter, easier-to-handle small modular canisters
- Features reusable large storage canister

Potential Applications

- Spent nuclear fuel dry cask storage, transportation, and disposal

Patent

John Scaglione and John Wagner. *Flexible Integrated Modular Used Nuclear Fuel Storage, Transportation, and Disposal Canister System (FIRST)*, U.S. Provisional Patent Application US 61/509,715, filed July 20, 2011.

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