

# International Conference on Management of Spent Fuel from Nuclear Power Reactors: An Integrated Approach to the Back End of the Fuel Cycle



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## A Unified Spent Nuclear Fuel Database and Analysis System

A fully integrated waste management system involves managing the waste from the time it is discharged from the reactor and designated as spent nuclear fuel (SNF) to the time it is disposed of in a geologic repository. Performing the different types of analyses required to account for the changing nuclear and mechanical characteristics of SNF over time, and understanding how these characteristics affect the different storage, transportation, and disposal options, can require many tools and types of data. To support the US Department of Energy Office of Nuclear Energy (DOE-NE) Nuclear Fuels Storage and Transportation Planning Project (NFST) planning activities to lay the groundwork for implementing interim storage, including associated transportation, per the Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste, an integrated data and analysis tool—the Used Nuclear Fuel-Storage, Transportation & Disposal Analysis Resource and Data System (UNF-ST&DARDS)—has been developed. UNF-ST&DARDS provides a controlled source of technical data integrated with key analysis capabilities to characterize the inputs to the overall US waste management system from reactor power production through ultimate disposition. This system is a new and unprecedented capability/resource that enables automated assembly-specific and cask-specific evaluations for assessing issues and uncertainties related to the extended storage and transportability of loaded canisters; supporting safety confidence and R&D prioritization; and providing a foundational data and analysis capability resource for the future. Various types of data are stored within the a comprehensive, domestic SNF system database, the Unified Database, including: fuel assembly discharge information; fuel assembly design data; reactor-specific operation data; cask design and loading data; infrastructure and logistics-related data to support systems analyses; and nuclear safety analysis characterization results for individual assemblies and SNF canister/cask systems. Key elements of the system design include the data relations defined within the Unified Database and an application agnostic template engine that allows the large number of inputs required to characterize the SNF for each respective site to be generated automatically. This paper provides an overview of: the UNF-ST&DARDS architecture; automated analysis capabilities that include assembly depletion and decay, cask criticality and shielding via the SCALE code system, cask thermal analysis via the COBRA-SFS code; and some of the results visualization and data interrogation capabilities available through the user interface.

### Country/ int. organization

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