Nuclear Fuel Cask Storage

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Nuclear Cooperation Meeting on Spent Fuel
and
High-Level Waste Storage and Disposal
Las Vegas
March 7-9, 2000

Abstract

As nuclear units continue operations during their design lifetimes, the spent fuel pools eventually become full. The lack of available pool storage limits the plant's ability to continue uninterrupted operations, and could also interfere with the capability to off-load an entire core in order to carry out unplanned vessel inspections. Reracking of spent fuel pools, where possible, can extend the need date for expanding fuel storage facilities. However, upon plant shutdown, either at the end of the license period or prematurely, fuel storage options must be planned to accommodate all the fuel to permit an orderly and timely decommissioning of the plant.

Dry storage is a licensed, proven, and economical method for expanding a plant's capability to store spent nuclear fuel (SNF). Technologies for dry storage include metal casks, concrete casks, modular concrete vaults, and concrete modules. Moreover, dual-purpose systems (i.e. storage and transportation) allow the user to transport SNF fuel after an extended storage period without the need to reopen the casks and off-load the contents into a licensed transportation cask. Multi-purpose systems have also been considered which add the potential capability, depending upon the long term design criteria, for a canister to be placed in a geologic repository without reopening the canister and rehandling the SNF.

This paper will review the design, licensing, and operational history of the various SNF storage technologies and present design details for one type of dual-purpose concrete cask technology. Both At-Reactor (AR) and Away-From-Reactor (AFR) facility options will also be explored. Current licensing issues will also be discussed. Future trends in storage technologies to accommodate more recent trends in fuel design (i.e. high burnup) will also be described. Special design and licensing challenges of SNF storage components to accommodate decommissioning plants will be presented which address damaged fuel, fuel debris, and Greater-than-Class-C (GTCC) waste.