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Hypothetical Logistics Case Study for Shipping Used Nuclear Fuel from Orphan Sites

There are nine decommissioned (orphan) reactor sites in the U.S. with used nuclear fuel (UNF) and greater-than-Class C (GTCC) waste in dry storage. One option under consideration for removing the UNF from these sites is to ship the UNF to a consolidated storage facility. The purpose of this hypothetical case study was to explore the logistics and costs associated with this option.

This case study is hypothetical because the location of the consolidated storage facility and the starting date of its operations were selected arbitrarily. The main goals of the study were to test the new logistics modeling tool and to obtain a better understanding of what resources would be required to unload the orphan sites. The Transportation and Storage Logistics (TSL) model is a new tool being developed to support the Used Fuel Disposition (UFD) program. TSL is a merger of the existing modeling codes TOM (the Transportation Operations Model) and CALVIN (the CRWMS Analysis and Logistics Visually Interactive tool). The currently available version of TSL was used to generate UNF pickup schedule from the orphan sites and to evaluate different transportation scenarios. CALVIN models the operations at the reactors and the interim storage facilities, and TOM models the transportation of the SNF and GTCC.

The study case assumed that a hypothetical consolidated storage facility starts its operations in 2014, and that the UNF is unloaded from the orphan sites in six years. The UNF at the orphan sites is stored in canisters within storage overpacks. Actual information regarding the site-specific UNF inventory and type of canisters was used in the simulations. Two hypothetical consolidated storage facility locations were considered. The cask maintenance facility, trailer maintenance facility, and railcar maintenance facility were co-located with the consolidated storage facility. For the orphan sites located away from a railhead, heavy haul truck and barge (if applicable) shipments were evaluated. The consist for rail shipments included two engines, a buffer car, three cask cars, a buffer car, and a rail escort car.

The results of these simulations provide schedule, cost, acquisition (fleet), and trip cost information for the different scenarios of the hypothetical case. An example of an acquisition schedule for one of the scenarios is demonstrated in Figure 1. In all scenarios that were considered, the cask acquisition was the major cost driver.

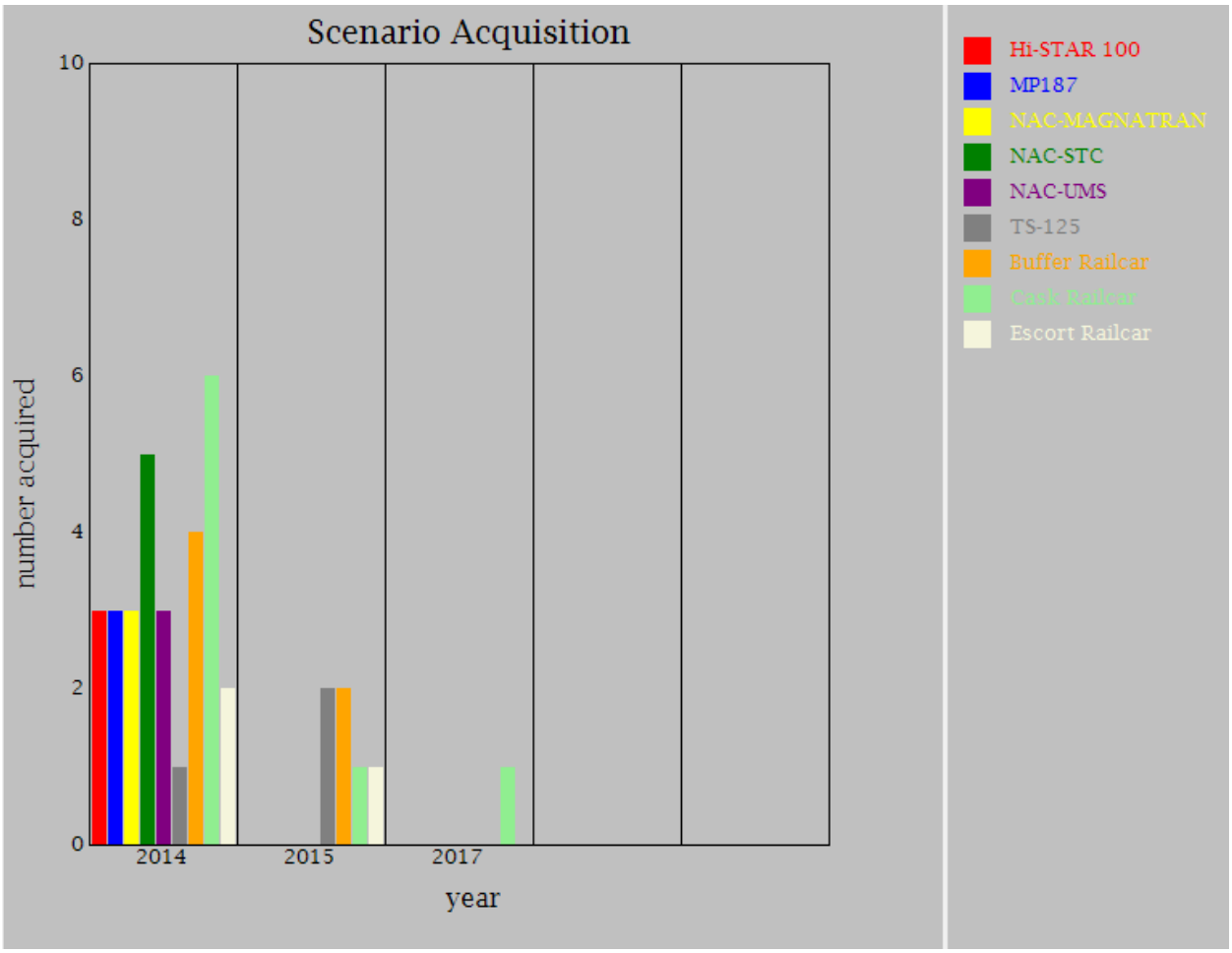

Figure 1. Example of Acquisition Required for Unloading Orphan Sites