



From pool to pad at Zion

Marking a milestone in the 10-year, nearly \$1 billion decommissioning project, Zion's spent nuclear fuel was transferred to dry storage.

In January, ZionSolutions, a special-purpose subsidiary of EnergySolutions, completed the removal of all the spent nuclear fuel from the storage pool at the Zion nuclear power plant in northeastern Illinois, moving the fuel to dry storage. Over the course of 52 weeks, the company transferred 2,226 spent nuclear fuel assemblies from wet storage to 61 NAC International Magnastor dry cask storage containers. The casks were placed on the plant's independent spent fuel storage installation (ISFSI) along with four similar containers of greater-than-Class C waste.

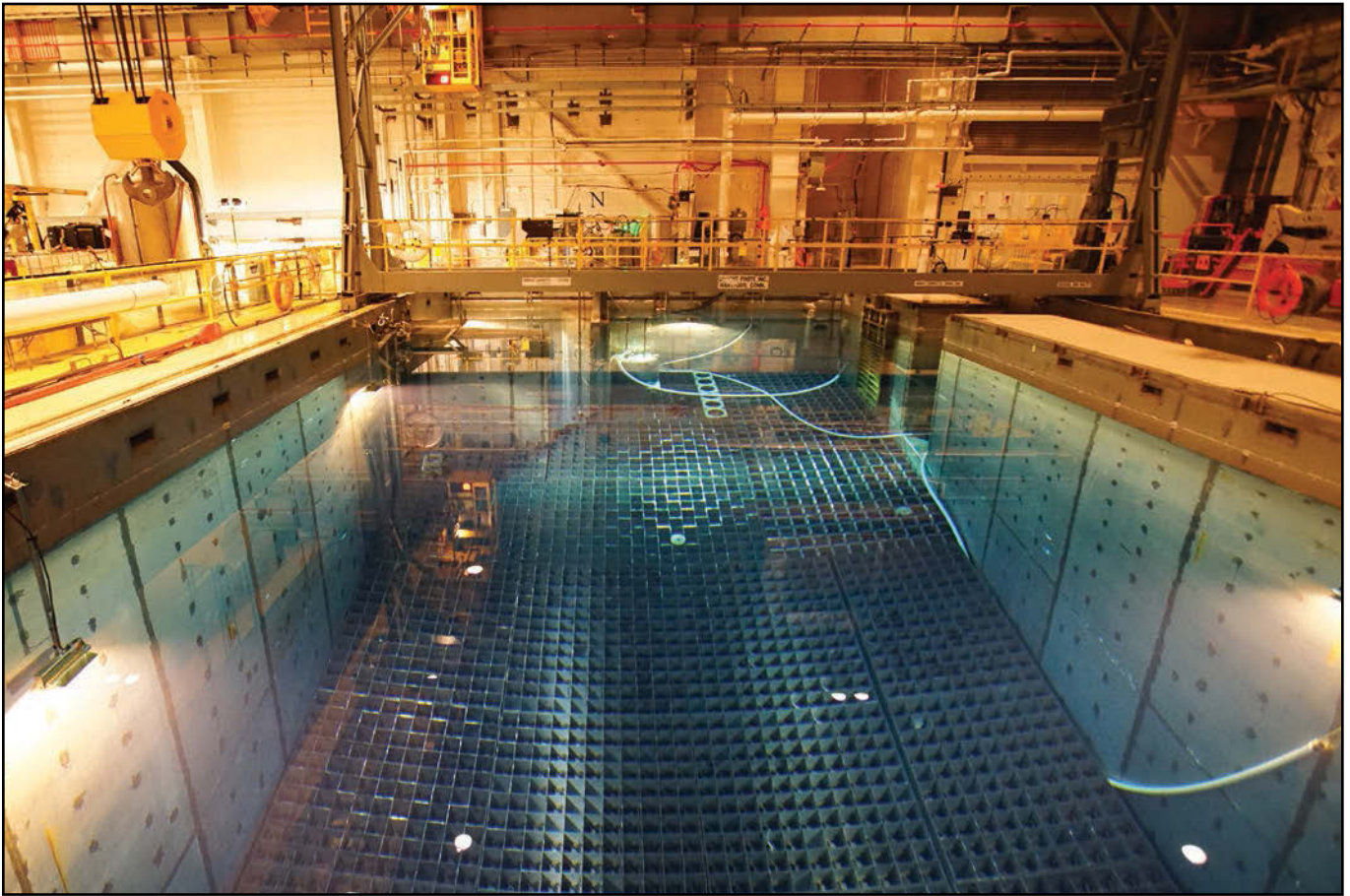
According to EnergySolutions, the completion of the fuel transfer in less than a year positions the Zion decommissioning project to be completed ahead of schedule. Zion owner Exelon Generation transferred its license for the two-unit pressurized water reactor in 2010 for the sole purpose of decommissioning the plant. ZionSolutions will maintain the security and monitoring of the ISFSI until the decommissioning project is complete, which is expected to be by 2020. Once decommissioning is done, the operating licenses, ISFSI, and the associated fuel will be transferred back to Exelon's custody. The ISFSI and fuel will remain in the care of Exelon until such time as the Department of Energy takes possession of the fuel.

Long before the company began transferring the spent fuel

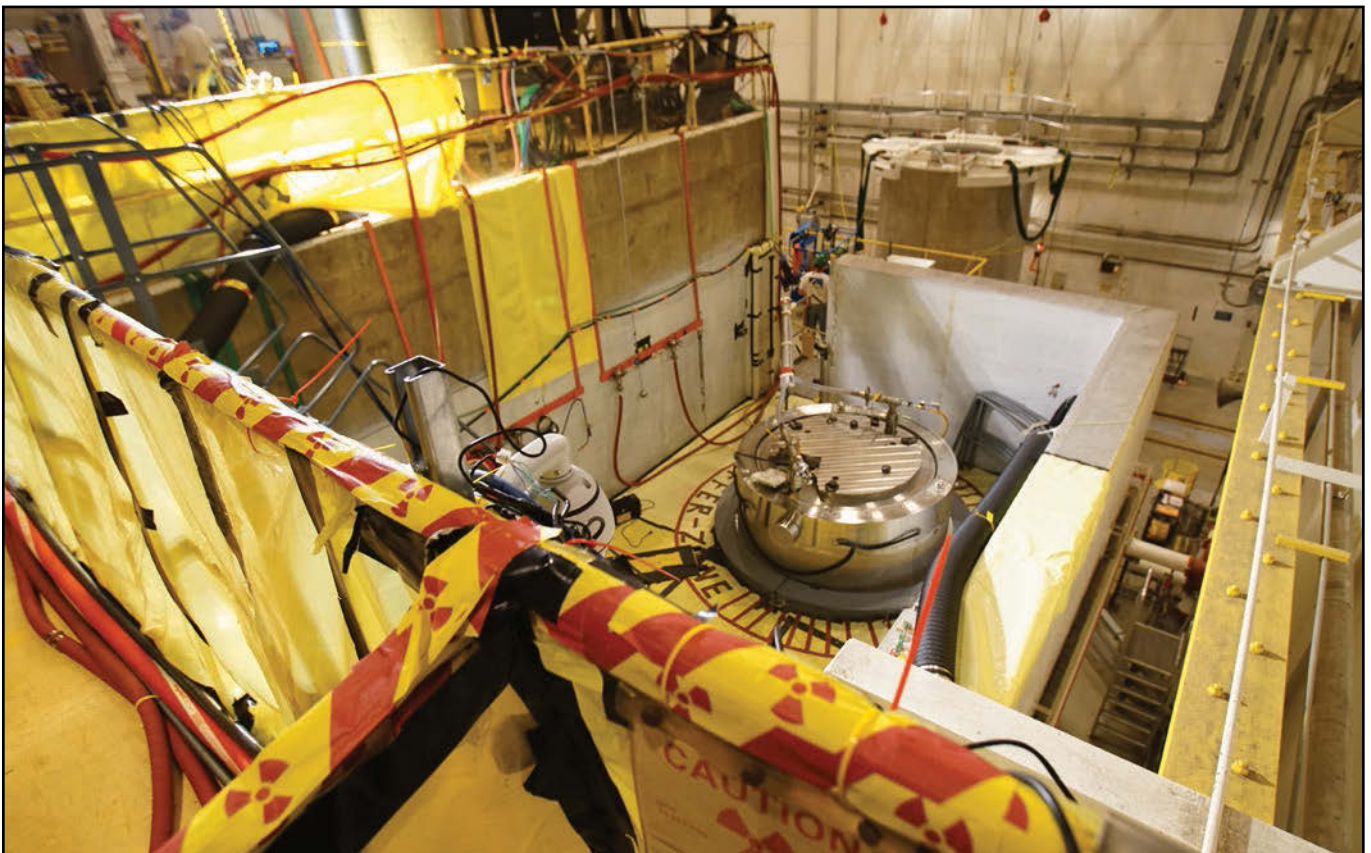
Above: ZionSolutions reached a major milestone in the decontamination and decommissioning of the Zion Nuclear Power Station with the completion in January of the transfer of all the plant's spent nuclear fuel to dry storage.

to the ISFSI, ZionSolutions engineers began work geared to ensuring safe fuel handling, as well as developing the fuel pedigree and fuel-loading plan. For example, according to ZionSolutions, Zion's fuel was susceptible to damage due to a generic top-nozzle separation issue, which was resolved by adding instrument tube tie-rod repairs in 1,478 fuel assemblies and guide-tube anchor repairs in three assemblies. Likewise, the company had to demonstrate the fuel's pedigree for compliance with the NAC's certificate of compliance requirements. This included fuel characterization and classification supported by fuel historical reviews, visual inspections, and vacuum sipping.

To optimize cask loading and placement so as to limit the dose at the site boundary, which is less than 550 feet south of the ISFSI, ZionSolutions' fuel-loading plan was developed in parallel with the ISFSI off-site dose calculation. Fuel assemblies were selected by their source strength (dose classification) and by their impact on transport criticality. Fuel with lower source term was placed in cask locations facing the south boundary. Fuel assemblies, however, were also required to be loaded in a manner that more equally distributed the source term first within the fuel casks themselves and then by locations on the ISFSI pad. ZionSolutions accomplished this by loading lower source term fuel on the cask periphery and the higher source term fuel in interior cell locations. Individual casks were then selected by relative source strength and their distribution on the ISFSI pad synchronized with the requirements of the off-site dose calculation. —Tim Gregoire



The spent fuel pool at Zion held 2,226 fuel assemblies. The plant's two pressurized water reactors operated from 1973 until being permanently shut down in 1998.



After being loaded and welded shut, a spent fuel canister undergoes drying before being placed in a Magnastor concrete cask, which can be seen in the background.



A cask is loaded onto a track-driven cask transporter in preparation of transfer to the Zion ISFSI.



The cask transporter slowly makes its way to the ISFSI with the loaded cask. It takes about four hours for the cask to be moved to the ISFSI, located about 300 yards from the reactor building.



The full Zion ISFSI contains 61 Magnastor spent fuel casks and four greater-than-Class C waste casks. Other than a switchyard, the ISFSI will be the only remaining structure on the site once decommissioning is completed in 2020. ■