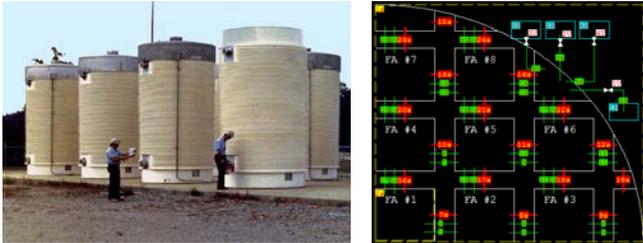


Zachry Nuclear's Analysis Division has supported detailed analyses of spent fuel pools (SFP), independent spent fuel storage installation facilities (ISFSI), spent fuel shipping and storage casks and operating procedures associated with loading and unloading casks and shipping fuel.



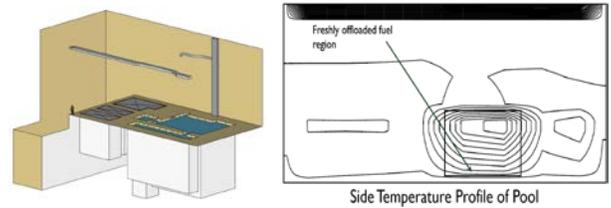
Examples of our experience include:

- Developed detailed evaluations of dry storage cask with configurations for different fuel types (e.g., 16x16, 17x17, etc.) using GOTHIC. Evaluated cask heat-up and performance including:
 - Time-to-boil during initial loading
 - Drain, Dry, and Gas Filling prior to cask isolation
 - Reflood scenarios
 - Long term storage

GOTHIC model included representations of fuel assemblies, baskets with neutron absorber, formers, cask walls, and external shielding and calculated convection, 2D conduction, and radiant heat transfer to determine steady-state and transient response, including circulation patterns, internal cask pressure and temperature profiles in the fuel, cask walls and concrete region below the cask. Various environmental conditions were considered based on location of the cask.

- Completed dose/shielding and heat-up evaluations of ISFSIs, including the storage canisters and transportation cask.
 - Developed procedures/processes and tests to assure the facility met design requirements.
 - Performed analyses supporting procedural actions for loading, transporting and unloading the canister/cask/ modules and cask/module maintenance.
- Completed evaluations for SFPs to evaluate wall gamma heating and temperature profile under normal and accident conditions.
- Performed heat-up and dose evaluations to support SFP storage of other BWR and PWR fuel.

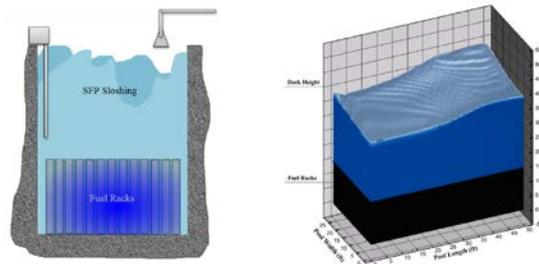
- Constructed 3D models of SFPs to investigate normal and off-normal operating conditions.



- Performed heat-up analyses for the SFP with loss of residual heat removal (RHR) to demonstrate the time available until boiling occurred. The models were benchmarked against actual data and matched very well. The analyses supported outage planning flexibility.
- Supported the development of the Technical Requirements document for DOE's Geologic Waste Repository, including performing heat-up and dose analyses.



- Performed SFP hydrodynamic analyses of a design basis earthquake considering plant-specific seismic acceleration time histories, pool geometry, pool equipment (e.g., pool racks), and pool contents (e.g., platforms). GOTHIC was then used to calculate the hydrodynamic response of the spent fuel pool inventory, particularly near spent fuel pool instrumentation. Hydrodynamic loads from sloshing and wave impact on SFP water level monitoring equipment was evaluated for EA-12-051.



Zachry Nuclear has significant experience with modeling and evaluating dry fuel storage casks, ISFSIs and SFPs to determine transient temperature profiles for various events and evolutions.