Public Meeting with Holtec on June 7, 2017

Meeting Handout for
Amendment 3 to Certificate of Compliance No. 1040 for the
HI-STORM 100 UMAX Canister Storage System
Docket No. 72-1040
Summary of Technical Issues

Technical Issue in Criticality Analysis

Criticality Safety Evaluation of Holtec's RSI Responses and Corresponding Regulatory Bases
The criticality review and evaluation ensures that spent nuclear fuel (SNF) to be placed into the dry storage system (DSS) remains subcritical under normal, off-normal, and accident conditions involving handling, packaging, transfer, and storage. SNF storage systems must be designed to remain subcritical unless at least two unlikely independent events occur. Moreover, the SNF cask must be designed to remain subcritical under all credible conditions.

Title 10 CFR 72.236 *Specific requirements for spent fuel storage cask approval and fabrication*, states that: "The certificate holder and applicant for a CoC shall ensure that the requirements of this section are met…(b) Design bases and design criteria must be provided for structures, systems, and components important to safety. (c) The spent fuel storage cask must be designed and fabricated so that the spent fuel is maintained in a subcritical condition under credible conditions." NUREG-1536, Rev. 1, "Standard Review Plan for Spent Fuel Dry Storage Systems at a General License Facility" (SRP), has guidance for NRC staff to complete a review. In Section 7.5.1, Criticality Design Criteria and Features, NRC staff is instructed to look at the general dimensions of the cask components and the spacing of the fuel assemblies, as well as the use of neutron poisons. In Section 7.5.3.2, Material Properties, the NRC reviewer is required to verify that the compositions and densities are provided for all materials used in the calculation model. The applicant should also cite, in the SAR Chapter 8, "Materials Evaluation", the source of all materials data, particularly the data for fuel and poison materials. Holtec's application and proposed evaluation approach using a surrogate cask for the analysis does not provide the required licensing design information (dimensions, geometry, materials, densities, etc.) specific to the 24PT1-DSC in a UMAX storage configuration. In addition, Holtec's application does not provide design criteria for the components of a surrogate cask that is bounding for the use of the 24PT1-DSC in a UMAX storage configuration.

Title 10 CFR 72.124 *Criteria for nuclear criticality safety*, states that: "(a) Design for criticality safety…The design of handling, packaging, transfer, and storage systems must include margins of safety for the nuclear criticality parameters that are commensurate with the uncertainties in the data and methods used in calculations and demonstrate safety for the handling, packaging, transfer and storage conditions and in the nature of the immediate environment under accident conditions." In SRP Section 7.5.3.1, Configuration, reviewers are to verify poison material dimensions and concentrations, and that the most reactive conditions are used. In SRP Section 7.5.4.2, Multiplication Factor, the k_{eff} of the storage cask are to be evaluated, and an independent confirmatory calculation should be performed because of the importance and complexity of the criticality evaluation. This includes verifying that the k_{eff} is conservative and that the applicant has appropriately modeled the storage cask geometry and materials. This section of the SRP also requires staff evaluate the potential for off-normal events that may result in partial or full flooding conditions of the canister. The analysis provided evaluated a surrogate canister (MPC-24) with modified parameters of configuration and ^{10}B loading to approximate the

k_{eff} of a 24PT1-DSC. This approach does not provide the information required for the staff to conduct an assessment of the k_{eff} for the proposed storage system that considers the margins of safety of the actual nuclear criticality parameters based upon known uncertainties in data and methods used in calculations.

Technical Issue in Thermal Analysis

The application does not contain sufficient information for the staff to conduct its review. The applicant's modeling approach and analysis results of the HI-STORM-UMAX thermal design's predicted peak cladding temperatures rely on a homogenized dry shielded canister (DCS). However, the application does not contain information (for example, validation or benchmarking studies performed for similar designs) to demonstrate the homogenized canister modeling approach used in the application is sufficient and conservative in the calculation of the peak cladding temperatures. Accurate prediction of peak cladding temperature is necessary to demonstrate compliance with 10 CFR Part 72.236(b) which requires that design bases and design criteria must be provided for structures, systems, and components important to safety and 72.236(f) which requires that the spent fuel storage cask must be designed to provide adequate heat removal capacity without active cooling systems. In the license amendment request the applicant did not provide adequate design basis analyses which demonstrate the cask would provide adequate heat removal capacity. Staff has previously accepted thermal analysis that relies on homogenized fuel assemblies when accompanied by appropriate justification (see Section 4.5.4.1.2 of NUREG-1536 and Section 2.2 of NUREG-2208).