



Department of Energy

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YUCCA MOUNTAIN – THREE-DIMENSIONAL (3-D) THERMAL ANALYSES OF THE HANDLING OF NAVAL SPENT NUCLEAR FUEL (SNF) CANISTERS AND WASTE PACKAGES

Reference: Ltr, Boyle to Weber, dated 2/19/09 (Update to the Yucca Mountain Repository License Application [LA] for Construction Authorization)

At the February 25, 2009, meeting with the U.S. Nuclear Regulatory Commission (NRC) on the content of the LA update submittal, the U.S. Department of Energy (DOE) described the LA changes resulting from the ongoing work associated with the thermal analyses of handling of naval SNF canisters and waste packages in the Initial Handling Facility (IHF) and transporting waste packages in the Transport and Emplacement Vehicle (TEV). In response to NRC questions, DOE explained that the three-dimensional thermal analyses for the handling of naval SNF canisters and waste packages would be completed by the end of March 2009. The purpose of this letter is to provide to the NRC the completed three-dimensional analyses that are described in the Yucca Mountain Repository LA. A summary of the results, conclusions reached, and future Safety Analysis Report (SAR) changes are also provided.

As described in the LA update meeting, the bases for the Total System Performance Assessment and Preclosure Safety Analysis for naval SNF remain unchanged. DOE will include the SAR changes described in the enclosure in a future LA update.

This letter contains a commitment to include SAR changes necessary to reflect the completion of the 3-D thermal analyses of naval SNF canisters and waste packages in a future update of the Yucca Mountain Repository LA. These calculations will be made available to the public upon request. If you have any questions regarding this letter or its enclosures, please contact Jeffrey R. Williams at (202) 586-9620, or by email at jeff.williams@hq.doe.gov.

William J. Boyle, Director
Regulatory Affairs Division
Office of Technical Management

OTM:SAB-0602

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Enclosures:

1. Summary of Thermal Analyses and Safety Analysis Report Changes
2. BSC (Bechtel SAIC Company) 2009. *Three Dimensional Evaluation of Naval Canister Temperatures in the IHF*. 51A-00C-DN00-00100-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.
3. BSC 2009. *Naval Canister Temperatures in the Canister Transfer Machine*. 51A-00C-DN00-00200-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.
4. BSC 2009. *Thermal Evaluation of Naval Waste Packages in the TEV*. 800-00C-DN00-00100-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.

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ENCLOSURE 1

SUMMARY OF THERMAL ANALYSES AND SAFETY ANALYSIS REPORT CHANGES

Table 2 from the Yucca Mountain Repository License Application (LA) update submittal letter included the following descriptions of the naval spent nuclear fuel (SNF) thermal analyses changes in the LA update:

- LA Change Number 31: This LA change modified the thermal limit for naval SNF canister in the Initial Handling Facility (IHF) and transported in the Transport and Emplacement Vehicle (TEV), due to replacing a one-dimensional (1-D) thermal analysis with a more sophisticated three-dimensional (3-D) thermal analysis. As a result, the requirement for processing naval canisters was changed to limit the canister outside surface temperature to 400°F with a processing time of 30 days. To ensure that these limits are met, preclosure handling requirements were added to the LA and operating conditions were modified to establish a temperature limit with an imposed administrative maximum handling duration. Since these limits exist to ensure naval SNF cladding integrity to support preclosure performance, a Preclosure Parameter limit on temperature and handling was added. This addition to the LA supports the existing preclosure nuclear safety design basis of the naval SNF canister. These limits are not relied upon to limit or prevent potential preclosure event sequences or mitigate their consequences.
- LA Change Number 60: To support the changes in the IHF and TEV emplacement described above, this LA change replaced the description of the 1-D thermal analysis with a description of on-going 3-D thermal modeling for naval SNF canister handling in the IHF and the TEV. The new 3-D analysis will demonstrate that the thermal limit of 400°F is met during handling operations in the IHF and emplacement. The safety bases for the Total System Performance Assessment and Preclosure Safety Analysis for naval SNF remain unchanged.

The 3-D thermal analyses for handling naval SNF canisters and waste packages have now been completed. Enclosures 2, 3 and 4 are the calculations which constitute the 3-D analyses of the naval SNF canister and waste package from detensioning of the transportation cask to emplacement of the waste package in the subsurface. The enclosed calculations include:

- *Three Dimensional Evaluation of Naval Canister Temperatures in the IHF*, (51A-00C-DN00-00100-000-00A);
- *Naval Canister Temperatures in the Canister Transfer Machine*, (51A-00C-DN00-00200-000-00A);
- *Thermal Evaluation of Naval Waste Packages in the TEV*, (800-00C-DN00-00100-000-00A).

Each of these calculations contains a 3-D analysis of two waste package configurations, naval short and naval long, each loaded eight different ways, for a total of 16 different canister/waste package thermal cases. The first calculation, *Three Dimensional Evaluation of Naval Canister Temperatures in the IHF*, (51A-00C-DN00-00100-000-00A) evaluates the 16 canister/waste package thermal cases in the waste package transfer trolley (WPTT) shielded enclosure located in various rooms within the IHF as well as handling of the transportation cask after detensioning of the closure bolts. The second calculation, *Naval Canister Temperatures in the Canister Transfer Machine*, (51A-00C-DN00-00200-000-00A), evaluates the 16 thermal cases in the canister transfer machine (CTM) shielded transfer bell. The third calculation, *Thermal Evaluation of Naval Waste Packages in the TEV*, (800-00C-DN00-00100-000-00A), evaluates the 16 thermal cases in the TEV.

Based on these calculations, the LA will be updated to reflect the results of the 3-D thermal analyses. The following table lists the SAR sections that are impacted by these analyses and describes the changes to be made in each section:

SAR Section	Changes to Incorporate Completed Thermal Analyses
1.2.2	Revise text to reflect that analyses are complete and demonstrate that the canister loading/waste package combinations remain within the thermal limits specified in the SAR. Appropriate references for the completed three-dimensional thermal analyses are added.
1.2.3	Revise text to reflect that analyses are complete and demonstrate that the canister loading/waste package combinations remain within the thermal limits specified in the SAR. Add a description of the calculations performed for the IHF and the specific results obtained. Appropriate references for the completed three-dimensional thermal analyses are added.
1.3.3	Revise text to reflect that analysis is complete and demonstrates that the canister loading/waste package combinations remain within the thermal limits specified in the SAR. Add a description of the calculations performed for the TEV and the specific results obtained. The appropriate reference for the completed three-dimensional thermal analysis is added.
1.5.1	Revise text to reflect that analyses are complete and demonstrate that the canister loading/waste package combinations remain within the thermal limits specified in the SAR. Appropriate references for the completed three-dimensional thermal analyses are added.