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Waterford 3

W3F1-2009-0051

September 24, 2009

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Response to Request for Additional Information for License Amendment Request to Modify Technical Specification Section 5.6, Fuel Storage, and Add New Technical Specification 3/4.9.12, Spent Fuel Pool (SFP) Boron Concentration
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

References:
1. W3F1-2008-0052, License Amendment Request to Modify Technical Specification Section 5.6, Fuel Storage and Add New Technical Specification 3/4 9.12, Spent Fuel Pool Boron Concentration, September 17, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082660649).
2. W3F1-2009-0007, Response to Request for Additional Information Regarding "License Amendment Request to Modify Technical Specification Section 5.6, Fuel Storage, and Add New Technical Specification 3/4.9.12, Spent Fuel Pool (SFP) Boron Concentration, February 26, 2009 (ADAMS Accession No. ML090610134).
3. W3F1-2009-0022, Response Request for Additional Information RAI #2 RE: License Amendment Request to Modify Technical Specification Section 5.6, Fuel Storage, and Add New Technical Specification 3/4.9.12, Spent Fuel Pool (SFP) Boron Concentration (TAC NO. MD9685), June 30, 2009 (ADAMS Accession No. ML091831258).

Dear Sir or Madam:

In letter W3F1-2008-0052 (Reference 1), Entergy Operations, Inc. (Entergy) proposed a change to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Technical Specifications (TS). The change would modify TS Section 5.6 (Fuel Storage) and add new TS 3/4 9.12 (Spent Fuel Pool Boron Concentration).

A001
NRR

During the submittal review process, the Nuclear Regulatory Commission (NRC) determined that Requests for Additional Information (RAIs) were required to complete the review of the Entergy request. Responses to these RAIs were provided in letters W3F1-2009-0007 and W3F1-2009-0022 (References 2 and 3). During the RAI review process, the NRC determined that additional information was needed and is included in Attachment 1 to this letter.

There are no new commitments contained in this letter.

If you have any questions or require additional information, please contact Robert Murillo, Licensing Manager at (504) 739-6715.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 24, 2009.

Sincerely,

Attachments: 1. Response to Request for Additional Information

cc: Mr. Elmo E. Collins, Jr.
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U. S. Nuclear Regulatory Commission
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Attachment 1

W3F1-2009-0051

Response to Request for Additional Information

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

NRC Question

The critical experiments used to validate MCNP do not contain any fission product or actinide data. Please evaluate this effect on the bias and bias uncertainty for MCNP.

Waterford 3 Response

The proposed change updates the existing Waterford-3 spent fuel storage Criticality Safety Analysis (CSA) to allow limited credit for soluble boron and to incorporate a new fuel type. The existing licensing basis for the Waterford-3 CSA was established in conjunction with the re-rack project (1998). The CSA includes credit for the reactivity reduction associated with fuel depletion (burnup) for Region 2 of the racks. The CSA is based on extensive code benchmarking which includes experiments with mixed oxide. Due to the lack of experiments containing fission products, the CSA methods qualification is based on benchmarking critical experiments using fresh fuel, so additional uncertainties associated with the fuel depletion calculations were included. Instead of performing detailed in-core calculations to justify the uncertainties and biases in this area, the potential effect of this lack of data is addressed in the analysis, consistent with the currently approved analysis and industry standard methodology, by the use of 5 percent of the burnup credit (reactivity decrement) that is applied as an uncertainty. This is the NRC recommended method for addressing the lack of experimental data in this area. This method is endorsed in Regulatory Issue Summary (RIS) 2005-05, Regulatory Issues Regarding Criticality Analyses for Spent Fuel Pools and Independent Spent Fuel Storage Installations, which states in part:

"Additionally, licensees can choose to use conservative and bounding assumptions previously accepted by the NRC, such as a 5-percent decrement on burnup, in lieu of performing detailed calculations to justify smaller uncertainties and biases in the criticality analyses."

The position in the RIS 2005-05 is consistent with the NRC positions in "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants", dated June 1998, Section A.5.d, as endorsed in SECY 98-208, that states:

"In the absence of any other determination of the depletion uncertainty, an uncertainty equal to 5 percent of the reactivity decrement to the burnup of interest is an acceptable assumption."

The current NRC Safety Evaluation Report (SER) for the Waterford-3 analysis states that the bias and uncertainties meet the previously stated NRC requirements and are acceptable. When applied, this approach results in a 1.5 - 2 % delta-k penalty which

significantly exceeds uncertainties associated with core reactivity performance (~0.3 % delta-k).

This approach has been widely adopted by the nuclear power industry. Of note is the recent analysis for ANO-2 that was approved in September 2007. The NRC SER specifically noted the 1998 guidance document as one of the documents which define acceptable methods for Spent Fuel Pool (SFP) criticality analysis.

The ANO-2 analysis has many similar features to the current Waterford-3 analysis that is under review. Both analyses use the same physics analysis software, include credit for soluble boron, treat burnup credit in the same fashion, and allow checkerboard type fuel loadings. One difference is the credit for the reactivity reduction due to isotopic transformations that occur following discharge of fuel from the reactor (cooling time). ANO-2 credits this reduction but the proposed Waterford-3 analysis does not. In essence the Waterford-3 analysis has similar conservatisms, and may be slightly more conservative, than the approved ANO-2 analysis.

Consistent with the previous approvals and NRC guidance, and in the absence of any other determination of the depletion uncertainty, the Waterford-3 CSA applied an uncertainty equal to 5 percent of the reactivity decrement to the burnup of interest. The 5 percent uncertainty allowance bounds the effect of fission product or actinide uncertainty on reactivity.

Based on our discussions with the NRC staff, we believe the technical question inherently is an issue that would require engagement and resolution by the industry. While a few proprietary critical experiments with some decay or fission products may have been conducted, this information is not generally available. The use of commercial reactor critical data has been evaluated by various organizations and provides an alternative approach to address the accuracy of modeling effects of fission products in combination with actinides. Some commercial reactor criticals have been analyzed for other applications, but additional criticals would need to be analyzed to supplement this data. The complexities of these types of calculations require significant resources and take about 12 months.

A review of the vendor's criticality analyses and the Waterford 3 proposed spent fuel pool TS limit shows that several conservatisms exist which would compensate for any non-conservatism in the MCNP bias uncertainty.