April 8, 2004

Mr. Joseph E. Venable
Vice President Operations
Entergy Operations, Inc.
17265 River Road
Killona, LA 70066-0751

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 (WATERFORD 3) - REQUEST FOR ADDITIONAL INFORMATION RELATED TO REVISION TO FACILITY OPERATING LICENSE AND TECHNICAL SPECIFICATIONS - EXTENDED POWER UPRATE REQUEST (TAC NO. MC1355)

Dear Mr. Venable:

By letter dated November 13, 2003, and supplemented by letters dated January 29 and March 4, 2004, Entergy Operations, Inc. proposed revisions to the Waterford 3 operating license and Technical Specifications which would allow an increase in the rated thermal power from 3,441 megawatts thermal (MWt) to 3,716 MWt.

After reviewing your request, the Nuclear Regulatory Commission staff has determined that additional information is required to complete the review. We discussed this information with your staff by telephone and they agreed to provide the additional information requested in the enclosure within 30 days of receipt of this letter.

If you have any questions, please call me at (301) 415-1480.

Sincerely,

/RA/

N. Kalyanam, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure: Request for Additional Information

cc w/encl: See next page

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Waterford Steam Electric Station, Unit 3

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REQUEST FOR ADDITIONAL INFORMATION

WATERFORD STEAM ELECTRIC STATION, UNIT 3 (WATERFORD 3)

EXTENDED POWER UPRATE (EPU) REQUEST

TAC NO. MC1355

1. On page 2.2-3, you indicated that the modal superposition method with a constant 3 percent damping was used for the branch line pipe break (BLPB) analyses. You also indicated that the response of entire reactor coolant system (RCS) to BLPBs was calculated using non-linear response time history analysis. Please discuss the non-linear response time history analysis and describe how modal superposition method is applied for the non-linear response time history analysis. Also, please confirm how the use of 3 percent constant damping used for the EPU time history analysis is consistent with the design basis damping, described in your submittal, where the mass-stiffness damping of not more than 3 percent at significant modes of vibration was used.

2. On page 2.2-4, you state that "[S]ince the simpler model has fewer loading points for the blowdown loads than the detailed model, some of the blowdown loadings are combined for the RCS analysis. The RVI [reactor vessel internal] model and sets of blowdown load time histories were used for the RCS primary side BLPB analyses." It appears that the simplified RVI model is not sufficient to contain the structural characteristics of the RVI. Please confirm whether and how the use of the simplified RVI model is adequate for the RVI and the RCS analysis subject to BLPB loading time histories. Describe the applicable blowdown loadings and how these loadings were combined and applied to the RVI and RCS analyses to account for depressurization loading inside reactor vessel for the EPU loading conditions.

3. On page 2.2-5, you indicated that the analysis methodology is similar to that previously used for RCS asymmetric loads analysis which was approved by the U.S. Nuclear Regulatory Commission (NRC) for main loop breaks. Please confirm whether the methodology includes applied asymmetric loads and utilizes computer codes and analytical models that are consistent with the current design basis analyses.

4. On page 2.2-12, you indicated that a 10 percent increase in steam flow for the EPU condition will result in a 20 percent increase in the pressure differential across the dryer and results in a 50 percent higher stress in the dryer supports than currently reported in the analysis of record. Please provide an evaluation of flow induced vibration of the steam dryer, dryer supports and flow-reflector with respect to the fluid-elastic instability, acoustic loads and vortex shedding due to steam flow for the EPU.

5. In reference to Section 2.2.2.1.4, “NSSS Component Evaluations,“ please provide a summary of evaluation for pressuirizer. The evaluation should include components in the lower end of pressurizer (such as the surge nozzle, lower head well and penetration, and support skirt) which are affected by the pressure and the hot leg temperature. Also, include the evaluation of the components in the upper end of the pressurizer (such as the spray nozzle, instrument nozzle, safety and relief nozzle, and upper head and shell)

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which are affected by the pressure and the cold leg temperature for operation at the uprated conditions. Additionally, please provide a summary of calculated stresses and cumulated fatigue usage factor (CUF) for each component at the EPU and the current rated power conditions in comparison to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) allowable limits. Also, please identify Codes and Code editions used for the evaluation of pressurizer at the EPU condition. If different from the Code of Record, provide justification and reconcile the differences.

6. In reference to Section 2.2.2.1.4.3.6, you concluded that the pre-uprate conditions bound the EPU conditions since the T_{hot} temperature for power uprate is lower than the temperature used in the analysis fo record for pre-uprate, and the steam temperature remains the same. However, Table 1-2 shows that the hot leg temperature for EPU is higher than the current value, and the steam generator (SG) pressure (and the saturated steam temperature) is lower for EPU than the current rated value. Explain the apparent discrepancy.

7. In reference to Section 2.2.2.1.4.3, please provide a summary of the evaluation for the SG internals (baffle, feedwater sparger, steam dryer, flow reflector, tubes) and their supports with respect to the maximum stress and fatigue usage factor for the EPU condition. Also, identify the Code, and Code edition for the evaluation of the proposed EPU and if different from the Code of Record, please provide a justification.

8. In reference to Section 2.2.2.1.4.5.2, you indicated that inclusion of BLPB loads in the current evaluation necessitated a re-analysis of the Reactor Coolant Pump (RCP) safe end primary stresses for the faulted conditions. Please provide a summary of evaluation for the crossover piping between RCP and SG, RCP nozzle safe ends at both the suction and discharge sides. The evaluation should include the calculated stresses, CUFs, and Code allowable limits.

9. In reference to Section 2.2.2.1.4.6.3, “Tube Vibration,” the Waterford 3 SG tubes were evaluated by calculating the most limiting fluid-elastic stability ratio and the maximum turbulent induced bending stresses on the limiting tube. Please provide a summary of evaluation regarding the vortex induced vibration stresses on the limiting SG tubes for the EPU condition.

10. At Waterford 3, the limiting BLPBs replace the main coolant loop breaks (MCLBs) in the mechanical design basis, following elimination of MCLBs based on NRC approved leak-before-break technology. For the EPU evaluation, the analytical model consists of the entire RCS including RVI, SG, RCP, and their supports as well as control element drive mechanism. Please provide a summary of calculated maximum stresses and CUFs for each of the major component supports including the pressurizer supports for the EPU and the current rated condition in comparison against the Code allowable limits. Also, identify the Code and Code editions used for the EPU evaluation, and if different from the Code of Record, provide a justification.

11. In reference to Section 2.2.2.2, you indicated that for the Waterford 3 EPU evaluation, "[a]ll essential plant piping systems were evaluated to assess the impact of the various changes due to uprate and/or due to new branch line pipe break, LOCA [loss-of-coolant accident], thermal stratification, and new transient loading for the Chemical and Volume

Control System charging and letdown lines." The EPU analysis results for piping systems were evaluated in accordance with the allowable from Section III of the Code. Please identify the Code and Code editions which were used in the EPU evaluation. If different from the Code of Record, provide justification for applicability of the Code and Code editions used.

12. On page 2.2-43, you indicated that "[P]iping qualification does not specifically evaluate for effects of vibration due to equipment or fluid flow. To ensure that changes resulting from EPU do not cause excessive vibration that could be detrimental to system performance, vibration monitoring will be performed following EPU to identify sources of vibrations and appropriate corrective actions will be taken to eliminate or minimize these vibrations." However, Subsection NB3622.3 of Section III of the Code requires that piping shall be designed so that vibration will be minimized. Please provide a summary of evaluation for flow effects on the main steam line vibration which will be higher for the EPU condition and describe your plan and schedule of the vibration monitoring program with regard to the power ascension, monitoring methods (installing accelerometers, using hand-held devices), strategic locations of monitoring, and acceptable criteria. Also, please confirm whether the vibration monitoring will be performed for both main steam and feedwater lines and branch line piping and components in accordance with the ASME Operations and Maintenance Code.

13. In reference to Section 2.5.5.3, you indicated that the heat loads on the component cooling water (CCW) and auxiliary component cooling water systems are higher during normal shutdown. These higher heat loads increase the temperature of the CCW system return piping sections. Please provide a summary of evaluation, including stresses and CUFs (if applicable) for CCW system piping, supports, and components such as heat exchanges, which are affected by the higher temperature in the proposed power uprate condition. In the evaluation, please include the Code allowable limits, Code including Code Edition used in the analysis.

14. Please discuss the functionality of safety-related mechanical components (i.e., all safety-related valves and pumps, including power-operated relief valves) affected by the power uprate to ensure that the performance specifications and technical specification requirements (e.g., flow rate, close and open times) will be met for the proposed power uprate. Also, please confirm that safety-related motor-operated valves (MOVs) in your Generic Letter (GL) 89-10 MOV program at Waterford 3 will be capable of performing their intended function(s) following the power uprate including such affected parameters as fluid flow, temperature, pressure and differential pressure, and ambient temperature conditions. Identify the mechanical components for which functionality at the uprated power level was not evaluated. Also, discuss effects of the proposed power uprate on the pressure locking and thermal binding of safety-related power-operated gate valves for GL 95-07 and on the evaluation of overpressurization of isolated piping segments for GL 96-06.

    - Please discuss issues such as the design and testing for the atmospheric dump valves, which are now credited in the small break LOCA under EPU conditions, including the direct current voltage issue.

- Discuss the impact of higher flow rate under EPU conditions on the stroke time of applicable valves, such as the main steam isolation valves and feedwater isolation valves.
- Discuss any modifications of valves to support EPU operation, such as the moisture separator reheater safety valves.
- In Section 2.2.4 on page 2.2-52, the application states "No changes to the programs related to GL 89-10, GL 96-05, or GL 95-07 are required." Section 2.2.4 also states that the safety-related air-operated, motor-operated, and hydraulic-operated valves were evaluated for any impact due to EPU conditions. Please discuss briefly, using a few example valves, the evaluations and the results obtained, including the effects of flow, ambient temperature, and voltage.
- Since vibration-induced performance problems are a primary issue for certain power uprates, please address this issue with respect to Waterford 3 EPU.