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February 19, 2002

Mr. Joseph E. Venable
Vice President Operations
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17265 River Road
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SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 - ISSUANCE OF AMENDMENT RE: REVIEW AND APPROVAL OF LICENSING BASIS CHANGE REGARDING GENERIC LETTER 96-06 OVER-PRESSURIZATION OF CONTAINMENT PENETRATIONS (TAC NO. MB2460)

Dear Mr. Venable:

The Commission has issued the enclosed Amendment No. 179 to Facility Operating License No. NPF-38 for the Waterford Steam Electric Station, Unit 3 (Waterford 3). The amendment authorizes changes to the Final Safety Analysis Report (FSAR) in response to your application dated July 23, 2001, as supplemented December 11, 2001.

The amendment authorizes revisions to sheet 23 of 26, and 26 of 26, of FSAR Table 3.2-1, "Classification of Structures, Systems, and Components." As a follow-up response to Generic Letter 96-06, Waterford 3 had proposed to revise their FSAR to resolve ten containment penetrations, susceptible to thermally induced over-pressurization, through evaluation, detailed analysis, or installation of physical modifications prior to startup from the spring 2002 outage. This amendment authorizes a change to the licensing basis, through procedural controls, risk analysis, and engineering analysis, for seven penetrations.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

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

Enclosures: 1. Amendment No. 179 to NPF-38
2. Safety Evaluation

cc w/encls: See next page

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ENTERGY OPERATIONS, INC.

DOCKET NO. 50-382

WATERFORD STEAM ELECTRIC STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 179
License No. NPF-38

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (EOI) dated July 23, 2001, as supplemented by letter dated December 11, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, this license amendment authorizes changes to the Final Safety Analysis Report (FSAR) Table 3.2-1, Pages 23 of 26 and 26 of 26. As a follow-up response to Generic Letter 96-06, Waterford Steam Electric Station, Unit 3 had proposed to revise their FSAR to resolve ten containment penetrations, susceptible to thermally induced over-pressurization, through evaluation, detailed analysis, or installation of physical modifications prior to startup from the spring 2002 outage. This amendment outlines changes to the licensing basis, through procedural controls, risk analysis, and engineering analysis, for seven penetrations, as set forth in the application for amendment by EOI dated July 23, 2001, as supplemented by letter dated December 11, 2001. EOI shall update the FSAR to reflect the revised licensing basis authorized by this amendment in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of its date of issuance and shall be implemented prior to startup from Refuel 11 scheduled for March 2002. Implementation of the amendment is the incorporation into the FSAR of the changes to the description of the facility as described in the licensee's application dated July 23, 2001, as supplemented by letter dated December 11, 2001, and evaluated in the staff's Safety Evaluation attached to this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: February 19, 2002

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 179 TO

FACILITY OPERATING LICENSE NO. NPF-38

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By application dated July 23, 2001, as supplemented by letter dated December 11, 2001, Entergy Operations, Inc. (Entergy or the licensee), requested the approval of its licensing basis change involving penetrations in the steam generator blowdown system, primary sampling system, and secondary sampling system as a result of the licensee's implementation of provisions in Nuclear Regulatory Commission (NRC) Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions."

The December 11, 2001, supplemental letter provided additional information that did not change the scope of the request or the initial proposed no significant hazard consideration determination (66 FR 48285, published September 19, 2001).

2.0 BACKGROUND

GL 96-06, issued on September 30, 1996, requested all holders of operating licenses for nuclear power reactors to address overpressurization of isolated piping sections, and also issues such as waterhammer in certain cooling water systems and two-phase flow in safety-related piping and components.

The issue of overpressurization of isolated piping concerns water, trapped in isolated piping sections, that is heated and is capable of producing extremely high pressures, because of its thermal expansion. This phenomenon is typically a design consideration. Piping design codes have explicitly recognized the need to consider the effects of heating fluid that is trapped in an isolated section of piping. The potential for systems to fail to perform their safety functions as a result of thermally induced overpressurization is dependent on many factors, which include leak tightness of valves, piping and component material properties, ambient and post-accident temperature response, pipe fracture mechanisms, heat transfer mechanisms, relief valves and their settings, and system isolation logic and setpoints.

Licensees were required either by their commitment to USAS B31.1 or the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) for piping design or by virtue of 10 CFR 50.55a, which endorses various editions of the ASME Code, to comply with design criteria which specify that piping systems which have the potential to experience

pressurization due to trapped fluid expansion shall either be designed to withstand the increased pressure or shall have provisions for relieving the excess pressure.

If systems are found to be susceptible to the conditions discussed in GL 96-06, addressees were expected to assess the operability of affected systems and take corrective action as appropriate in accordance with the requirements stated in 10 CFR Part 50, Appendix B and as required by the plant Technical Specifications.

The NRC Staff in a letter dated December 22, 2000, "Completion of Licensing Action for Generic Letter 96-06," had accepted the licensee's commitment to resolve the ten remaining containment penetrations that were potentially susceptible to thermally induced overpressurization through an evaluation, detailed analysis, or installation of physical modifications prior to startup from the Spring 2002 refueling outage 11 (RFO 11). Entergy determined the permanent resolution to the GL 96-06 issues for the ten penetrations could be satisfied through the installation of thermal relief valves on three penetrations during RFO 11 and a change to the license basis commitment (to comply with ASME Section III, Class 2 design provisions) for the remaining seven containment penetrations.

3.0 EVALUATION

3.1 Deterministic Evaluation

The Staff reviewed the Entergy application requesting approval of its license basis change regarding GL 96-06. The following evaluation addresses the issue of thermally induced pressurization of the remaining seven unresolved piping runs penetrating the containment. The contribution of thermally induced overpressurization failure mechanism of the seven containment piping penetrations on the core damage frequency (CDF) and large early release frequency (LERF) was also reviewed.

In its submittal of July 23, 2001, the licensee stated that for the permanent resolution to the GL 96-06 issues for the remaining ten containment penetrations, it plans to install a thermal relief valve on three of the containment penetrations during the spring 2002 refueling outage. The licensee requested a license basis change for the remaining seven containment penetrations. The affected seven penetrations consist of: two in the steam generator blowdown system (SGBS), three in the primary sampling system, and two in the secondary sampling system. The licensee requested the staff's approval for changing the Final Safety Analysis Report (FSAR) license basis for the SGBS, primary sampling system, and secondary sampling system containment penetrations to identify a Waterford Steam Electric Station, Unit 3 (Waterford 3), deviation to ASME Section III, Class 2 Code provisions because of its potential to exceed ASME Section III, Subsection NC 3600 Code allowable stress. The licensee, in its justification for requesting the license basis change, provided its deterministic engineering evaluation and probabilistic safety assessment of the seven penetrations. In addition, the licensee committed to implement administrative controls to insure that (1) the subject penetrations/systems are in service and flowing or flushed with process fluid at a temperature representative of reactor coolant during plant heatup prior to entering Mode 4 (200 ^{o}F) and Mode 3 (350 ^{o}F), and (2) the containment isolation valves for the five sample line penetrations will be closed to minimize process fluid cooldown when the process fluid samples have been obtained during normal plant operation and the laboratory sample valve downstream of the containment isolation valves are closed or flow through the penetration has stopped.

The licensee provided its engineering evaluation of the seven penetrations and stated that the stress in the penetrations meet the allowable stress in paragraph F-1341.2 of Appendix F to Section III of the ASME Code (1995 edition). In addition, the licensee stated that the calculated internal pressure in the penetrations resulting from the final water specific volume at 260 °F is below the calculated burst pressure, and the final hoop strain is below 2.6%. The licensee concluded that the penetration piping would experience plastic deformation but would retain its ability to perform its safety function and maintain containment integrity. In supplement 1 to GL 96-06, the staff has accepted the use of allowable stress in Appendix F to Section III of the ASME Code as a viable alternative to plant modification with adequate justification. On the basis of its commitment to implement administrative controls to minimize penetration heat-up and overpressurization, and its engineering evaluation, the licensee concluded that the proposed change does not involve a significant reduction in a margin of safety. The staff finds the licensee's evaluation reasonable and acceptable.

3.2 Probabilistic Evaluation

The staff requested additional information to determine the contribution of thermally induced overpressurization failure mechanism of the seven containment piping penetrations on the CDF and LERF.

The CDF is unchanged by the potential for overpressurization failure of the identified piping because the potential failure mechanism has little or no significant impact on operational risks. However, the overpressurization failure mechanism has an impact on the consequences of a LERF event. The probabilistic safety assessment (PSA) parameters affecting the sensitivity of the LERF impact due to potential overpressurization mechanism on the identified penetration piping are:

(a) the CDF estimate due to the large break loss-of coolant accident (LBLOCA), main steam line break (MSLB), or a feedwater line break (FWLB) while the plant is in Mode 4 operation,
(b) the probability of the plant being in Mode 4 status, and
(c) the failure probability of a pipe with diameter of at least 2 inches at the pressure calculated for the hypothesized scenarios.

The licensee used the Level 1 PSA model to calculate a CDF estimate of 7.3E-7 per reactor-year due to the LBLOCA, MSLB, or FWLB scenarios. Since the licensee did not have a PSA model to evaluate risks at Mode 4 operation, this CDF value of 7.3E-7/reactor-yr was assumed to be a bounding estimate of Mode 4 risks because: (1) the low pressures in all of the pressurized systems during Mode 4 should result in a lower likelihood of the initiating events, and (2) the low initial heat loads and lower decay heat loads should allow longer response times and more alternatives for success paths. Based on plant operating experience from 1992 through 2000, the probability of the plant being in Mode 4 status was estimated to be 0.011 by considering the proportion of the total time of 849 hours in Mode 4 over the total time of 78,912 hours of full power operation. The failure probability of a SGBS pipe with diameter of greater than 2 inches was estimated to be 6.6E-2 based on the methodology described in NUREG/CR-5745, "Assessment of ISLOCA [Interfacing-Systems Loss-of-Coolant Accident] Risks: Methodology and Application to Combustion Engineering Plants," April 1992.

Using the estimates for the probabilistic parameters discussed above, the change in LERF resulting from the failure of two SGBS pipes is estimated to be (7.3E-7)x(0.011)x(2x0.066) = 1.0E-9/reactor-year. This estimate of the change in LERF is considered bounding for the seven containment penetrations because the radiological releases from any one of the remaining five containment penetrations of ½-inch diameter piping from the Primary Sampling System and Secondary Sampling System are expected to be negligibly small. Since the absolute LERF estimate for Waterford 3 is about 1.8E-6 per reactor-year, the estimate of 1E-9/reactor-year for the change in LERF is below the very small LERF change of 1.0E-7/year, as allowed by the risk acceptance guidelines contained in NRC Regulatory Guide 1.174, for an absolute LERF of less than 1.0E-5. Therefore, the staff finds that the risk impact of not installing thermal relief valves to mitigate overpressurization failure of the identified piping is very small.

Based on its review of the licensee's commitment to implement administrative controls to minimize penetration heat-up and overpressurization, engineering and risk evaluations, and the corrective action, the staff concludes that the licensee has provided an acceptable basis for approving the requested FSAR license basis change for SGBS, primary sampling system, and secondary sampling system containment penetrations.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Louisiana State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (66 FR 48285, published September 19, 2001). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: B. Jain, See-Meng Wong

Date: February 19, 2002