November 23, 2007

Mr. Kevin T. Walsh Vice President of Operations Entergy Operations, Inc. 17265 River Road Killona, LA 70057-3093

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 - SUMMARY OF CONFERENCE CALLS REGARDING ITS 2007 MID-CYCLE STEAM GENERATOR INSPECTIONS

Dear Mr. Walsh:

On October 12, 13, 14, and 15, 2007, the staff from U.S. Nuclear Regulatory Commission headquarters and from Region IV participated in conference calls with Waterford Steam Electric Station, Unit 3 representatives regarding their 2007 mid-cycle steam generator inspections. The majority of the discussions focused on degraded batwings in the steam generators.

A summary of these discussions is provided in the enclosure.

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

Sincerely,

/RA/

N. Kalyanam, Project Manager Plant Licensing Branch IV Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Docket No. 50-382

cc: See next page

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*no substantial changes to input

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OCTOBER 2007 CONFERENCE CALL SUMMARY

MID-CYCLE STEAM GENERATOR INSPECTIONS

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

On October 12, 13, 14, and 15, 2007, the staff from U.S. Nuclear Regulatory Commission (NRC) headquarters and from Region IV participated in conference calls with Waterford Steam Electric Station, Unit 3 (Waterford 3) representatives regarding their 2007 mid-cycle steam generator (SG) inspections. The majority of the discussions focused on degraded batwings in the SGs. A summary of these discussions is provided below. The list of attendees at these calls is provided at the end of the summary.

Waterford 3 has two Model 3410 SGs designed and fabricated by Combustion Engineering. The mill-annealed Alloy 600 SG tubes have an outside diameter of 0.750 inches and a nominal wall thickness of 0.048 inches. Each SG contains 9350 tubes. The tubes are explosively expanded for the full depth of the tubesheet at each end and are supported by a number of carbon steel lattice-grid (i.e., eggcrate) tube supports, diagonal bars (also referred to as batwings), and vertical straps. The tubes in rows 1 through 18 are U-bends and the tubes in rows 19 through 147 are square bends. The repair criteria approved for the plant is the 40 percent through-wall repair criteria.

During the spring 2005 outage, Waterford 3 discovered two batwing supports in SG 32 which had separated at the support bar in the stay cavity region in the center of the SG. The batwings serve as a spacer to prevent tube-to-tube contact during normal operation. These two batwings caused minor tube wear which did not compromise tube integrity. These findings were described in Information Notice 2005-29, "Steam Generator Tube and Support Configuration" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML052280011).

As a result of eddy current and visual inspections conducted during the fall 2006 outage, an additional 20 broken batwings were discovered in the stay cavity region in SG 32. During inspection of the batwing-to-wrapper bar welds at the outer periphery of the tubes, two of the welds in SG 32 were found to be broken and numerous others were found to be undersized.

Waterford 3 performed extensive tube plugging and stabilization as well as weld repair in an effort to protect active tubes from being damaged as a result of the broken batwings.

A summary of the actions taken by Entergy Operations, Inc. (Entergy or the licensee), as well as a list of commitments, was submitted by the licensee on December 20, 2006 (ADAMS Accession No. ML063600109). The NRC acknowledged the licensee's commitments via letter dated December 22, 2006 (ADAMS Accession No. ML063560370).

On March 22, 2007, Entergy met with the NRC staff at NRC Headquarters in Rockville, Maryland. The purpose of the meeting was to discuss Entergy's investigation of the batwing degradation condition, to review analysis supporting safe plant operation, to review the mitigation actions taken, and to discuss Entergy's plans for a mid-cycle outage to inspect the SG batwings and their support structures. A summary of this meeting was issued on April 3, 2007 (ADAMS Accession No. ML070870718).

Since the purpose of the mid-cycle inspection conducted in October 2007 was, in part, to evaluate the batwing damage, there were no plans to perform any primary side inspections except as a contingency. Visual inspections by the licensee included the upper and lower portions of the generator from the secondary side. The wraparound bar and the upper batwing welds were inspected in both SGs. The wraparound bar was neither bent nor twisted. The upper end of the batwings were properly attached to the wrap-around bar with the exception of the one batwing, located between columns 84 and 85 in SG 32. This batwing-to-wraparound bar weld failed during a prior cycle, and the batwing had slipped into the bundle (as detected during the 2006 outage). This broken batwing was in the same relative location as it was in the 2006 outage (i.e., it had not slipped further into the tube bundle). The wraparound bar and batwing inspections focused on the portion of the wraparound bar and batwings associated with the degraded batwings in the stay cavity region.

A visual inspection by the licensee of the upper region of the stay cavity was performed in SG 32 by inserting a small camera between the tubes until it reached the stay cavity area. This inspection was performed from the top of the tube bundle and is referred to as the "45-degree inspection" since the camera was inserted at a roughly 45-degree angle to the tubes. A guide tube that had been developed to insert the camera into the tube bundle was not used due to a concern that it could get stuck between the tubes. The quality of this inspection was very good. The spacing between the tubes could be verified. There was no evidence of wear on the side of the tubes that are normally in close proximity to the batwings. There was, however, some wear on a few tubes on the "front face" of the tube (i.e., wear on the portion of the tube facing the stay cavity region, a location where a non-severed batwing would not be present). It was postulated that this wear was caused by one of the severed batwings. The location of these wear scars would not affect the ability of the tube to attenuate the forces associated with a severed batwing.

A visual inspection of the batwings was performed from the top of the secondary face of the tubesheet in SG 32. The picture quality was good primarily because of a better light source and recording media. There were no significant differences between this inspection and the previous inspection in 2006 (except that broken-off pieces of batwing that had previously been detected during the 2006 outage were no longer lying on top of the distorted batwings). The broken-off batwing pieces (from the 2006 outage) in SG 32 had migrated downward. Pieces of the broken batwings were found on the fourth and sixth eggcrate supports. The pieces were not directly adjacent to the tubes, and there was no evidence of tube wear in this region. No pieces of loose batwing were found on the top of the tubesheet. All of the batwing pieces in SG 32 were accounted for (i.e., all pieces of the batwings were found) during this visual inspection.

A visual inspection of the batwings was performed from the top of the secondary face of the tubesheet in SG 31. This inspection revealed four batwings that had displaced (i.e, broken) at the notch. The condition of these batwings was similar to the condition of the batwings in SG 32 during the 13th refueling outage in 2005.

A foreign-object search and retrieval was performed by the licensee in SG 31 and no loose parts were detected. The foreign-object search and retrieval performed in SG 32 detected eight loose parts. One of these parts was removed from the SG and was a piece of flexitallic gasket. The other seven pieces were also suspected to be remnants of a flexitallic gasket. These pieces could not readily be removed. The licensee was performing an evaluation to determine whether the parts could remain in the SG until the next scheduled inspection (spring 2008). There was visual evidence of possible tube wear on one tube. A review of previous eddy current and visual examinations from the 2006 outage indicated that this indication was present at that time. No eddy current examinations were performed during the 2007 mid-cycle inspection.

Based on a comprehensive visual inspection by the licensee of the Waterford 3 SGs to look for various degradation mechanisms associated with the batwings, the licensee concluded that none of the performance criteria in NEI 97-06 were exceeded. The licensee also concluded that the end of cycle condition would not exceed the performance criteria. The NRC staff concludes that there are no technical issues that warrant follow-up action at this time since the inspections appear to be consistent with the objective of detecting potential tube degradation associated with the degraded batwing condition.

List of Attendees at the calls:

| <u>NRC/HQ.</u> | NRC/Region IV | <u>Entergy</u> |
|----------------|---------------|----------------|
| K. Karwoski | J. Clark | K. Cook |
| M. Yoder | G. Miller | R. O'Quinn |
| A. Hiser | G. Replogle | R. Murillo |
| N. Kalyanam | R. Azua | R. Williams |
| et. al. | et. al. | et. all |

Waterford Steam Electric Station, Unit 3

cc: Senior Vice President Entergy Nuclear Operations P.O. Box 31995 Jackson, MS 39286-1995

Senior Vice President and COO Entergy Operations, Inc. P.O. Box 31995 Jackson, MS 39286-1995

Vice President, Operations Support Entergy Services, Inc. P.O. Box 31995 Jackson, MS 39286-1995

Site Vice President Waterford Steam Electric Station, Unit 3 Entergy Operations, Inc. 17265 River Road Killona, LA 70057-3093

General Manager, Plant Operations Waterford Steam Electric Station, Unit 3 Entergy Operations, Inc. 17265 River Road Killona, LA 70057-3093

Director, Nuclear Safety & Licensing Entergy Services, Inc. 440 Hamilton Avenue White Plains, NY 10601

Director, Nuclear Safety Assurance Entergy Operations, Inc. 17265 River Road Killona, LA 70057-3093

Senior Manager, Nuclear Safety & Licensing Entergy Services, Inc. P.O. Box 31995 Jackson, MS 39286-1995

Manager, Licensing Entergy Operations, Inc. 17265 River Road Killona, LA 70057-3093 Louisiana Department of Environmental Quality Radiological Emergency Planning and Response Division P.O. Box 4312 Baton Rouge, LA 70821-4312

Louisiana Department of Environmental Quality Office of Environmental Compliance P.O. Box 4312 Baton Rouge, LA 70821-4312

Parish President Council St. Charles Parish P.O. Box 302 Hahnville, LA 70057

Chairman Louisiana Public Services Commission P.O. Box 91154 Baton Rouge, LA 70825-1697

Richard Penrod, Senior Environmental Scientist/State Liaison Officer Office of Environmental Services Northwestern State University Russell Hall, Room 201 Natchitoches, LA 71497

Resident Inspector Waterford NPS P.O. Box 822 Killona, LA 70057-0751

Regional Administrator, Region IV U.S. Nuclear Regulatory Commission 611 Ryan Plaza Drive, Suite 400 Arlington, TX 76011