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W3F1-2007-0015

April 23, 2007

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

SUBJECT: Clarification to Request for Additional Information Regarding RF13 Steam Generator Tube Inspections
Waterford Steam Electric Station, Unit 3
Docket No. 50-382

REFERENCES: 1 Entergy letter dated December 27, 2006 "Response to Request for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections" (W3F1-2006-0066)

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc. (Entergy) provided a response to the Request for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections.

On February 28, 2007, Entergy received communications from members of the NRC Staff requesting clarification to information contained within the Entergy response to RAI question 1. On March 7, 2007, a member of the NRC Staff requested that Entergy provide a follow-up letter that clarifies the information regarding the source of the mechanical plug found in the steam generator during an inspection. Entergy agreed to provide a follow-up letter with the appropriate clarification. Entergy's response is contained in Attachment 1.

There are no new commitments contained in this letter. If you have any questions or require additional information, please contact Ron Williams at 504-739-6255.

Sincerely,

RJM/RLW/dpg

Attachment:

1. Clarification to Response to Requests for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections

A001

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Attachment 1

W3F1-2007-0015

Clarification to Response to Requests for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections

Clarification to Response to Request for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections

REFERENCES: 1. Entergy letter dated December 27, 2006 "Response to Request for Additional Information (RAI) Regarding RF13 Steam Generator Tube Inspections" (W3F1-2006-0066)

The following RAI question 1 and Entergy's response, contained in Reference 1, are being repeated in this letter to provide background to the NRC Staff follow-up clarification questions:

"**RAI 1** - On page 3 of the May 24, 2005, report and page 3 of the May 17, 2006, report, you indicated that possible loose parts indications were identified during the inspection. Please discuss the scope and results of the foreign object search and retrieval on each steam generator (SG). If any loose parts were identified, discuss whether the loose parts were removed. If the parts were not removed or the locations were not visually inspected, please discuss the results of any evaluations performed to ensure these parts (or suspected parts) would not result in a loss of tube integrity for the period of time between inspections."

Excerpt from the Entergy Response:

"During RF13 (April 2005), the as found condition of the SG thermal liner resulted in the initiation of Condition Report CR-WF3-2005-01762. A second Condition Report, CR-WF3-2005-01861, was initiated based on concerns from eddy current examination that identified potential loose parts (PLPs). There were 41 PLPs identified in SG 31 and 17 PLPs in SG 32 when the CR was written.

An evaluation of the loose parts was performed during RF13. The evaluation, contained in CR-WF3-2005-01861, concluded that 12 tubes in SG 31 and 3 tubes in SG 32 should be plugged / stabilized as a preventive measure against potential wear. Waterford 3 implemented a contingency Foreign Object Search and Retrieval (FOSAR) inspection on SG 31 because of concerns of potential pieces from the degraded condition of the FW Thermal Liner, previously identified in CR-WF3-2005-01762. The FOSAR inspection revealed a few minor sized objects (e.g. small diameter wire) which were of low concern due to their small cross section relative to flow. One object, a mechanical SG plug called a "Pop-a-Plug," was found in SG 31 Blowdown lane, which was not previously identified as a PLP by eddy current examination. The Pop-a-Plug was removed. This condition was also entered into the site's Corrective Action Program as CR-WF3-2005-01958. The potential pieces from the degraded condition of the FW Thermal Liner were not seen during the FOSAR inspection and therefore concluded not to exist.

Based on the FOSAR results from SG 31, additional actions to perform a FOSAR on SG 32 were considered unnecessary. This plant management decision was based on a future secondary side inspection scheduled for RF14 (Fall 2006) along with sludge lancing activities that were considered a normal activity associated with the inspection. The decision not to inspect SG 32 was later determined to be a deviation to Section 3.8 of the NEI 97-06 Guideline Requirements. Section 3.8 specifies that a secondary side visual

examination shall be performed each time the secondary side of the SG is opened for maintenance access. Condition Report CR-WF3-2006-0933 was entered into the plant's Corrective Action Program and a deviation was processed in accordance with the requirements of the EPRI SG Administrative Procedures and Entergy Procedures."

On February 28, 2007, the NRC Staff had the following clarification questions to the Entergy Response:

Please discuss the source of the steam generator "pop-a-plug." If it came from a previously plugged tube, discuss the nature of the flaws in this tube (i.e., did the tube have adequate tube integrity) and discuss whether this tube was plugged. Discuss the cause of the plug failure.

Entergy Response

RAI 1 contains an error. The plug found in SG 31 during RF13, as referred to in Entergy's response to RAI 1, was a feed water heater plug, not a Steam Generator (SG) plug.

On March 7, 2007, the NRC Staff requested that Entergy provide a follow-up letter that corrects the source of the plug found in SG 31 and the follow-up actions to the feedwater heater plug discovery.

1. Describe the actions taken in response to this feedwater heater tube plug coming loose.

2. Describe the potential for this or other feedwater heater plugs ending up in the Steam Generators and whether they can challenge SG tube integrity.

Entergy Response

1. Actions in Response to Loose Feedwater Heater Tube Plug

   During RF13 [April/May 2005]

   a. The feed water heater plug was retrieved from the SG when it was identified during Foreign Object Search And Retrieval (FOSAR).

   b. The discovery of the plug during FOSAR was entered into Entergy's Corrective Action Program as CR-WF3-2005-01958. The source of the plug was determined to be from the "1C" Feedwater Heater (FWH).

   c. An inspection, utilizing a boroscope, was performed on "1C" outlet tubesheet on 5/25/05. The results of the inspection determined that there were between 2 and 5 tube plugs (total including the one found in SG 31) potentially missing from "1C" FWH. The exact number of "1C" FWH plugged tubes proved to be difficult due to not being able to locate the original 1997 tube plugging work order in plant records and the limitations of the boroscope inspection. The only available record was a Quality Assurance report of the tube plugging that contained a list of 15 tubes with wall thinning greater than 25% and two additional tubes that appear to be plugging candidates for other reasons. Review of this list identified 8 tubes that were "most

likely plugged." The verification of the tube plugging locations within the outlet side of the FWH also proved to be difficult due to the limitations of the boroscope inspection. Since the feedwater heater has a welded divider plate (between inlet and outlet), accessibility to the inlet required cutting and re-welding the divider plate, which was not planned. A modification to the divider plate to install a bolted design was approved for RF14, but due to implementation challenges the heater modification was delayed until RF15.

Research indicated the loose FWH plug found in SG 31 was not fully expanded into the tube during installation. Operation in this condition probably has existed for several cycles since it is likely that the plugs dislodged soon after plugging. No operational impact on the feedwater heater has been noted to date, probably because the majority of the tubes plugged were preventatively plugged.

d. An evaluation of operational risk due to the missing plugs was performed.

<u>During RF14 [Nov/Dec 2006]</u>

The inspection program of both SG included:

(1) Secondary Side Inspection including FOSAR
(2) 100 % of the hot leg Top of Tubesheet (TTS) MRPC (motorized rotating pancake coil)
(3) Cold Leg TTS (approximately 10%) periphery exam [three tubes into bundle] to identify potential loose parts, this exam had not been previously utilized.

These activities did not discover any additional FWH plugs in the SG. Loose parts discovered in the SG were entered into Entergy's Corrective Action Program and evaluated within CR-WF3-2006-04034.

<u>Response Deficiencies Determined Post RF14</u>

CR-WF3-2007-0041 was written, documenting that corrective actions associated with CR-WF3-2005-01958 to access 1C FWH for Eddy Current Testing and plug inspection/replacement was not completed during RF14. A modification to the divider plate to install a bolted design was approved for RF14, but due to implementation challenges the heater modification was delayed until RF15. The feedwater heater 1C plug inspection is planned to coincide with the divider plate modification at RF15 in April 2008.

2. Potential for Feedwater Heater Plugs Entering the Steam Generators and Challenging SG Tube Integrity

<u>Potential for Migration</u>

The source of the plugs is 1C FWH. The plugging of the W3 1C FWH was accomplished during 1997. The discovery of the loose plug during RF13 was in April 2005. It could not be conclusively determined when the FWH plug dislodged and how long it took to migrate into the Steam Generator.

Waterford 3 has completed two SG chemical cleanings since 1997, which included bundle flushes and would have likely discovered FWH plugs within the steam generators.

During RF14, Waterford 3 completed FOSAR and Eddy Current Testing specifically to identify loose parts and no FWH Plugs were found. The Eddy Current Testing included TTS testing with RPC on the Cold Leg Side, specifically looking for Loose Parts.

It is unlikely that FWH plugs would migrate to the Steam Generators due to the feedwater riser design; however, if it did migrate, it would be discovered and removed during an inspection interval.

Challenge to SG Tube Integrity

Loose FWH plug parts have a potential challenge to tube integrity. Loose parts discovered during SG inspections are removed if possible and evaluated if not removed. The evaluation is based on the part and location (high flow or low flow).

The pop-a-plug from the 1C FWH is basically a tapered cylinder which is between 0.428" - 0.338" in diameter; it is 1.9" long and has a ribbed section. Based on these dimensions, this plug weighs approximately 1.25 ounces.

Based on discussions with the SG Original Equipment Manufacturer, a pop-a-plug is similar to a tube guide that was extensively tested as a loose part in the mid-1970's. As long as the weight was less than 4 ounces, there would not be any impact issues.

Thus, the probability is quite low for this type of plug to challenge SG tube integrity.