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Waterford 3

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Long Term Solution Plan For RCS
Inconel 600 Nozzle Cracking

Gentlemen:

On March 10, 1999 (W3F1-99-0043), under the provisions of 10 CFR 50.55a(a)(3)(I), Entergy requested NRC Staff authorization for use of Mechanical Nozzle Seal Assemblies (MNSAs) for restoring structural integrity and leak tightness to three leaking RCS hot leg (Inconel 600) nozzles. Licensee Event Report (LER) 99-002-00 (W3F1-99-0059) reported these three leaking nozzles, and two other leaking instrument nozzles on the top head of the pressurizer. The NRC Staff approved the Entergy request to install MNSAs via letter dated March 25, 1999 (TAC No. MA4952), as an interim measure during Cycle 10, while long term solution plans could be developed. The three MNSAs were installed and the two pressurizer nozzles were weld repaired during Refuel 9 (March 1999). A commitment was made in LER 99-002-00 to determine (during Cycle 10) long term solutions for the Inconel 600 nozzle cracking. The purpose of this letter is to provide (Attachment 1) the NRC Staff with a summary of our long-term plan to address RCS nozzle cracking at Waterford 3.

During the upcoming refueling outage (Refuel 10), Entergy is planning to perform permanent weld repairs on eight Inconel 600 nozzles, two on the top of the pressurizer and six on the RCS hot legs. Three of the six hot leg nozzles are the nozzles that were fitted with MNSAs during the Refuel 9 outage. Inspections for leakage will be performed on the nozzles on the pressurizer, steam generators, and RCS hot legs and cold legs (including the presently installed MNSAs). Dependent upon the results of the planned inspections, it may be necessary for Entergy to

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request NRC Staff concurrence to extend the use of one or more of the existing MNSAs and possibly for the installation of additional MNSAs during Refuel 10. Specifics and details will be presented to the NRC Staff at the time of the request for concurrence (if applicable).

Entergy is currently evaluating the possibility of requesting an exemption to Subsection NB-3337 of the ASME Code, which governs diametrical clearance on partial penetration welded nozzles in the RCS. During Refuel 9, Entergy experienced considerable difficulty in meeting the diametrical clearance criteria, when field machining was performed for the "partial nozzle replacement" repairs on two of the pressurizer top instrument nozzles. The precise machining requirements were very time consuming and resulted in increased radiation exposure to the machinist involved. Combustion Engineering has advised Entergy that the nozzle to vessel bore diametrical clearance is not credited in the revised stress analysis for the redesigned nozzle, because the weld is relocated to the outside surface of the RCS pressure boundary. Care would still be taken during machining, to minimize the diametrical clearance to the extent practical. Additional justification will be submitted in the future if the decision is made to request the Code exemption.

No new commitments are included in this submittal. If you have any questions, please contact O.P. Pipkins, at (504) 739-6707.

Very truly yours,

M. C. Kansler
for

E.P. Perkins
Director
Nuclear Safety Assurance

EPP/OPP/rtk
Attachment

cc: E.W. Merschoff, NRC Region IV
N. Kalyanam, NRC-NRR
J. Smith
N.S. Reynolds
NRC Resident Inspectors Office

LONG TERM SOLUTION SCHEDULE FOR INCONEL 600 NOZZLE CRACKING

BACKGROUND:

On February 25, 1999, during a planned inspection (during Refuel 9), Entergy discovered evidence of Reactor Coolant System (RCS) pressure boundary leakage on two Inconel 600 instrument nozzles on the top head of the Pressurizer. Subsequent inspections of the remainder of Inconel 600 nozzles identified 3 more leaking nozzles. One of the latter three leaks was on RCS hot leg #1 RTD nozzle, one was on RCS hot leg #1 sampling line, and one was on RCS Hot Leg #2 differential pressure instrument nozzle. No evidence of leakage was found on the RCS Cold Legs or the Steam Generators. The cause of the leaks was axial cracks near the heat-affected zone (HAZ) of the nozzle partial penetration welds resulting from Primary Water Stress Corrosion Cracking (PWSCC). The leaking Pressurizer nozzles were repaired during Refuel 9 using welded partial nozzle replacements. The leaking hot leg nozzles were temporarily repaired using Mechanical Nozzle Seal Assemblies (MNSAs). The NRC Staff had approved (on March 25, 1999) the use of the MNSAs as an alternate repair method under 10CFR50.55a(a)(3)(I), until the next refueling outage (Refuel 10). Entergy continued to evaluate and identify a long-term solution for the Inconel 600 nozzle cracking. The purpose of this submittal is to provide the NRC Staff with a summary of planned long-term solutions to address nozzle cracking at Waterford 3.

The condition described above did not result in a compromise to the health and safety of the general public or employees at Waterford 3.

Refueling Outage 10:

Entergy plans to inspect the Inconel 600 nozzles on the Pressurizer (top, bottom, side and heater sleeves), Steam Generators, and RCS hot and cold legs, during Refuel 10.

Entergy plans to repair as many of the nineteen RCS hot leg nozzles as the available outage window in Refuel 10 will support. If no new leaks are identified, it is estimated that we will repair six RCS nozzles, during Refuel 10, using welded partial nozzle replacements. These repairs will be similar to the repairs made on the Pressurizer nozzles, during Refuel 9. Three of the six nozzles will be nozzles that were temporarily repaired with MNSA clamps (during Refuel 9). The remaining three RCS nozzles include nozzles located below mid loop of the RCS hot legs. These repairs require a core off-load to be performed to allow draining the RCS down to the level necessary to allow welding. Based on past experience, at least a 3 or 4 day window will exist to complete the repairs and support the scheduled 30-day outage. In addition to these six

nozzles, the remaining two nozzles on the top of the Pressurizer (same weld heat numbers as the two Pressurizer nozzles repaired in Refuel 9 and susceptible to future leakage) will be repaired.

If the number of RCS nozzle leaks identified during RF10 exceeds the scope of six estimated hot leg nozzle repairs planned, then the alternate plan is to permanently repair six of the leaking nozzles using welded partial nozzle replacements, and to request NRC concurrence for (as necessary) extending use of existing MNSA applications, installing additional MNSA applications and/or installing a new seal assembly design currently being developed jointly by Framatome Technologies and Entergy. Note that, if leaks are found on the side or bottom nozzles of the pressurizer, during RF10, a request will be made for NRC concurrence to repair those leaks using MNSA clamps and/or the new clamp design.

Refuel 11:

Entergy plans to repair as many of the remaining RCS hot leg nozzles, as the available outage window in RF11 will support (while the RCS level is down to half loop). Plans are to inspect (NDE) CEDM nozzles, instrument (ICI) nozzles and the vent piping nozzle on the Reactor Vessel head during Refuel 11. Also, plans are to perform visual inspections of cold leg RTD nozzles and Steam Generator instrument nozzles.

Balance of Nozzles:

Subsequent to RF11, repair of the remaining nozzles will be determined based on results of Entergy inspections performed and future industry studies. At that point, remaining nozzles would include any remaining hot leg nozzles, the RCS cold leg nozzles (12), the pressurizer bottom head nozzles (2), the pressurizer shell side nozzle and pressurizer heater sleeves (30). Repairs deemed necessary would be by either welded partial nozzle replacements or (with NRC concurrence) MNSA clamps or the new seal assembly currently being developed jointly by Framatome Technologies and Entergy.