Entergy

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Michael A. Krupa
Director
Nuclear Safety & Licensing

CNRO-2002-00023

April 11, 2002

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555-0001

SUBJECT: Entergy Operations, Inc.
Response to NRC Request for Additional Information Regarding Proposed Use of the New Mechanical Nozzle Seal Assembly (MNSA-2) (TAC No. MB4272)

Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

REFERENCES:

1. Letter No. CNRO-2002-00010 from Entergy Operations, Inc. to the NRC, "Use of Mechanical Nozzle Seal Assemblies," dated March 1, 2002

2. Letter No. CNRO-2002-00019 from Entergy Operations, Inc. to the NRC, "Use of Mechanical Nozzle Seal Assemblies," dated March 29, 2002

3. Letter from the NRC to Entergy Operations, Inc., "Waterford Steam Electric Station, Unit 3 – Request for Additional Information Regarding Proposed Use of the New Design of Mechanical Nozzle Seal Assembly (MNSA-2) (TAC No. MB4272)," dated April 9, 2002

Dear Sir or Madam:

In Referenced Letter #1, Entergy Operations, Inc., (Entergy) submitted ASME Request for Alternative W3-R&R-002, Rev. 0 for Waterford Steam Electric Station, Unit 3 (Waterford 3). In that submittal, Entergy requested NRC staff approval to use the new design of the Mechanical Nozzle Seal Assembly (MNSA-2) in temporary applications on locations in the reactor coolant system that exhibit leakage due to Primary Water Stress Corrosion Cracking (PWSCC).

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During the course of review, the NRC staff determined that additional information was necessary to complete their review. Draft requests for additional information (RAIs) were provided to Entergy via e-mail on March 13 and 21, 2002. The staff discussed these comments with Entergy representatives in telephone calls on March 19 and 21, 2002. To address these comments, Entergy submitted revised Request for Alternative W3-R&R-002 via Referenced Letter #2.

By Referenced Letter #3, the NRC staff officially transmitted the requested additional information to support the review and approval of Request W3-R&R-002, Rev. 0. Entergy's responses to the staff's comments are contained in Attachment 1.

This letter contains one commitment, identified in Attachment 2, that supercedes the commitment made in Referenced Letter #2.

Should you have any questions regarding this submittal, please contact Guy Davant at (601) 368-5756.

Very truly yours,

for

MAK/GHD/baa

Attachment:
1. Response to NRC Request for Additional Information Questions Regarding Proposed Use of the New Mechanical Nozzle Seal Assembly (MNSA-2)
2. Identified Commitments

cc: Mr. W. R. Campbell (ECH)
Mr. J. K. Thayer (ECH)
Mr. J. E. Venable (W3)
Mr. G. A. Williams (ECH)

Mr. T. R. Farnholtz, NRC Senior Resident Inspector (W3)
Mr. N. Kalyanam, NRR Project Manager (W3)
Mr. E. W. Merschoff, NRC Region IV Regional Administrator

ATTACHMENT 1

CNRO-2002-00023

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING PROPOSED USE OF THE NEW MECHANICAL NOZZLE SEAL ASSEMBLY (MNSA-2)

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING PROPOSED USE OF THE NEW MECHANICAL NOZZLE SEAL ASSEMBLY (MNSA-2)

1. The use of the counter-bore hole has the potential for problems to occur since there is no way to do visual inspections of the area. One problem is for corrosion of the pressurizer material and cracking of the bolts if leakage occurs in the annulus region on the external edge of the hole. Explain how the design eliminates leakage in the annulus region between the pressurizer and the MNSA-2.

   Response:

   Unlike the original MNSA design, the MNSA-2 has a secondary seal. If the primary seal were to fail, the secondary seal would channel any leakage through the leak-off tube away from the bolting and pressurizer surface. Additionally, even if there were leakage in the annulus region or around the bolting, the area is open and available for visual inspection. Entergy will visually inspect for leakage in and around the counter-bore/annulus region of each installed MNSA-2 device during each refueling outage. Upon discovering leakage that occurred during the operating cycle, Entergy will remove the MNSA-2 and inspect it and the surrounding pressurizer surface for corrosion.

2. Regarding the installation of the MNSA, what steps will Entergy take to assure that the area of the pressurizer adjacent to the annulus is in a condition to assure that the MNSA will seal correctly?

   Response:

   The MNSA-2 seating surface is machined to a 125 finish, which enhances sealing.

3. What inspections will Entergy perform to verify pressurizer thickness prior to drilling for the counter-bore and the four tie rod holes?

   Response:

   Entergy has no plans to perform physical inspections to verify pressurizer wall thickness. Insulation will be removed for installation allowing the surface to be inspected for any degradation. By design the MNSA-2 is qualified to meet minimum wall thickness requirements. Installation procedures require inspections to verify that the bolt hole depth and counter-bore are within design depths.

   Calculation No. CN-CI-02-1, Rev. 3, Section 6.3.2, beginning on page 23 of 230, addresses the reinforcement requirements for modification to the pressurizer to account for the additional area removed by machining the tapped holes and the counter-bore. This report updates the reinforcement calculations in the original Waterford 3 pressurizer stress report (CENC-1244).

   The updated reinforcement calculations use the minimum vessel tolerances on design thickness (the same as was performed in the original stress report CENC-1244) and the

maximum tolerances on the machined tapped holes and counter-bore. The minimum required thickness of the pressurizer bottom head and shell is used in the calculations in accordance with the ASME Section III NB-3332 and the original pressurizer stress report, CENC-1244.

The resulting calculations show that substantial margin exists between the area available for reinforcement compared to the area required for reinforcement, taking into account material removal due to the introduction of the tapped holes and counter-bore required for MNSA-2 installation.

4. If leakage occurs, what is the impact on the Grafoil seal?

Response:

There is no impact on the seal. The Grafoil seal is designed to come in contact with the reactor coolant. Additionally if the primary seal were to degrade, leakage would only be seepage, since through-wall flaws due to PWSCC are very tight. No steam cutting would occur. Grafoil is a proven sealing material used in various applications throughout the plant (e.g. incore instrument nozzles).

5. Appendix 1 states that the corrosion rate data and the bounding allowable material loss calculations for repair life is 56 years for a pressurizer nozzle. The report that was referenced did not consider the impact of the counter-bore. Does the counter-bore affect the calculations for determining the impact of corrosion on the integrity of the pressurizer?

Response:

The counter-bore does not affect the calculations and has no impact on the integrity of the pressurizer due to corrosion. The MNSA-2 design has a primary Grafoil seal that is maintained under constant load using the Belleville washer stacks. Therefore, this area is expected to remain dry; hence no corrosion is expected.

As discussed in the response to Question 1, above, Entergy will visually inspect for leakage in and around the counter-bore/annulus region of each installed MNSA-2 during each refueling outage. Upon discovering leakage that occurred during the operating cycle, Entergy will remove the MNSA-2 and inspect it and the surrounding pressurizer surface for corrosion.

6. The thermal stress between the rod and the pressurizer wall due to differential expansion is converted into a concentrated normal load acting on the shell. This load is then used with Case 2 to calculate membrane plus bending stresses in the meridional and circumferential directions, assuming the load acts normal to the surface. However, this thermal stress also acts on the hole wall in the radial direction. It should therefore be included as a radial tensile thermal stress in the fatigue analysis.

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #1).

7. Additional loading on the tapped holes occurs due to differential expansion between the rods and the compression collar, equivalent to a pull-out load acting on the rods. This load acts on the threads as a shear load, creating radial stress in the wall. The stress due to this loading is also a thermal stress and should be included in the fatigue calculations as a tensile thermal stress in the radial direction.

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #2).

8. What is the basis for using an axi-symmetric thermal analysis for a 3-dimensional geometry, when the nozzle is inclined to the surface at almost 50 degrees?

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #3).

9. Please provide the rationale for not considering the local shear stresses in the wall between the heater nozzle counterbore and the adjacent tapped holes. These stresses may be of significant magnitude.

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #4).

10. Please explain if the 3-dimensional finite element analysis reflects the complete local geometry of the tapped holes and the counterbore/heater nozzle.

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #5).

11. Please provide justification for not including seismic stresses in the fatigue analyses, in particular for the pressurizer sidewall and the nozzle grooved section.

Response:

Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #6).

12. The comments in 6 and 7 on the inclusion of thermal stresses apply to all tapped holes.

    Response:

    Entergy provided a response to this comment in Letter CNRO-2002-00019 (Enclosure 3, Response to Item #7).

ATTACHMENT 2

CNRO-2002-00023

IDENTIFIED COMMITMENTS

IDENTIFIED COMMITMENTS

COMMITMENT	TYPE		SCHEDULED COMPLETION DATE (If required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will visually inspect for leakage in and around the counter-bore/annulus region of each installed MNSA-2 device during each refueling outage. Upon discovering leakage that occurred during the operating cycle, Entergy will remove the MNSA-2 and inspect it and the surrounding pressurizer surface for corrosion.		✓	N/A