UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 12, 2011

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Power Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1, REQUEST FOR ADDITIONAL INFORMATION RE: RELIEF REQUEST NO. RR-PZR-01 FOR MODIFICATIONS TO THE PRESSURIZER HEATER SLEEVE AND LOWER LEVEL NOZZLE PENETRATIONS (TAC NO. ME5423)

Dear Mr. Gellrich:

By letter dated January 31, 2011, and pursuant to Title 10 of the *Code of Federal Regulations* 50.55a(a)(3)(i), Calvert Cliffs Nuclear Power Plant, LLC submitted relief request number RR-PZR-01 for Nuclear Regulatory Commission (NRC) approval. RR-PZR-01, which is an alternative to the American Society of Mechanical Engineers Boiler and Pressure Code requirements, would permit modifications to the Calvert Cliffs Unit No. 1 pressurizer heater sleeve and lower level nozzle penetrations in order to mitigate the propensity for primary water stress-corrosion cracking from occurring.

The NRC staff has determined that additional information is needed to complete its review. The staff's request for additional information (RAI) is enclosed. Based upon discussions with your staff, we understand that you will respond to the enclosed RAI by May 6, 2011.

Please contact me at 301-415-1364 if you have any questions.

Sincerely,

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-317

Enclosure:
As stated

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REQUEST FOR ADDITIONAL INFORMATION

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1

RELIEF REQUEST RR-PZR-01

FOR MODIFICATION TO PRESSURIZER HEATER SLEEVE NOZZLE PENETRATION

DOCKET NO. 50-317

By letter dated January 31, 2011, Calvert Cliffs Nuclear Power Plant, LLC submitted for NRC review and approval Relief Request RR-PZR-01 to perform modifications to Calvert Cliffs Unit 1 pressurizer heater sleeve and lower level nozzle penetrations to mitigate the potential for primary water stress-corrosion cracking. The section and page numbers below refer to RR-PZR-01.

1. Section 1, Page 1, states that the new heater sleeve and instrument nozzle will be made of stainless steel type 316/316L. (1) Provide the inside and outside diameters (or the nominal diameter and wall thickness) of the new sleeve; (2) Section 4, page 4, second paragraph, states that "...Stainless steel 316 base material with less than 0.03% maximum carbon content, and ER309 weld material with 0.03% maximum carbon content, both of which are resistant to PWSCC, will be used for the modifications. The stainless steel material to be used is dual certified as it meets both the low carbon content requirement of the "T" grade and the mechanical properties of the "non-L" grade material..." Describe how stainless steel 316 is combined with stainless steel 316L to achieve a dual certified material and (3) Clarify the "T" grade.

2. Cracking has occurred in stainless steel components resulting from contact with halogens (such as chlorides and fluorides) or being sensitized. (1) Discuss whether Regulatory Guide (RG) 1.44, "Control of the Use of Sensitized Stainless Steel," will be followed in welding of the new sleeve. If yes, discuss the measures to minimize sensitization in the new sleeve per RG 1.44. Provide justification for any deviations from RG 1.44; (2) Discuss measures to limit the contact with halogens; and (3) Discuss pressurized-water reactor operating experience using the stainless steel heater sleeves in pressurizers.

3. Section 2, page 1, cited Code Case N-638-1 as the applicable code case. The NRC has approved Code Case N-638-4 as documented in NRC RG 1.147, Revision 16. Discuss why Code Case N-638-4 was not used as the applicable code case in Request RR-PZR-01.

4. Section 4, page 4, discusses the five steps of sleeve modification. Step 2 states that "... Liquid penetrant (PT) examination of the machined area that is to be welded..." This inspection is needed to ensure that prior to modification, no flaws exist in the lower head penetration bore as a result of machining or existing degradation. Any flaws occurring on the bore surface of the lower head need to be repaired before installing the new sleeve. Discuss whether the entire machined area in the bore will be inspected with PT. If not, justify how the bore is demonstrated to be free of defects prior to sleeve installation.

Enclosure

5. Section 4, page 4, Step 3 states that "...Welding the replacement stainless steel lower sleeve/nozzle to the pressurizer bottom head using stainless steel weld material. (Refer to Figure 2)..."

   (1) Confirm that the welding in Step 3 refers to the weld joining the new sleeve to the bore and is located inside the bore, not the outside surface of the pressurizer bottom head.
   (2) Specify the axial length of the inside weld per the design specification and identify the length in Figure 2.
   (3) Discuss the verification procedure to ensure that the actual weld axial length satisfies the designed length.

6. Section 4, page 4, Step 4 states that "...Machining the weld inner surface and adjacent area to provide a surface suitable for nondestructive examination (NDE)..." (1) Specify the exact axial length of the adjacent area that will be machined in Figure 2, and (2) Describe in detail the machining procedure, e.g., what is the thickness that will be removed, what is the quality control procedure, what is the surface finish requirement, and will there be any cold work imposed on the weld?

7. Section 4, page 4, Step 5 states that "...PT and ultrasonic (UT) examination of the weld and adjacent area (Refer to Figure 2)..." Section 5.2, page 6, third paragraph, states that "...The PT area includes the new weld surface and the 1/2 inch minimum distance above and below the weld..." Provide the axial length of the heat affected zone and significant residual stress region in the new sleeve and the ferritic steel of the lower head to demonstrate that 0.5 inch is sufficient.

8. Section 4. The final sleeve configuration after modification is not clearly depicted in Figure 2. It is not clear in Figure 2 whether there is a gap between the bottom of the old sleeve and the top of the new sleeve inside the bore even though Figure 3 seems to suggest that there is a gap. Also, it appears that there is no weldment at the junction of the bottom of the new sleeve and the outside surface of the pressurizer head shell. Submit a new figure or modify Figure 2 to document the final configuration after modification. The figure for the final sleeve configuration should include the following information: (1) the heating element joining the new sleeve, (2) the axial length of the gap between the old and new sleeve, (3) whether a weld exists at the junction of the outside surface of the pressurizer and the new sleeve, (4) the original J-groove weld with respect to the original sleeve, (5) the system pressure boundary weld, and (6) relevant dimensions (e.g., weld length).

9. Section 4. Figure 1 shows various bore diameters after machining without explanation: (1) Explain why there are two different machined diameters in the bore and show their diametrical and axial dimensions; and (2) Include the location of the original J-groove weld in Figure 1.

10. Provide a diagram/figure that shows the existing configuration of the sleeve, heating element, and weld(s) with respect to the pressurizer lower head before modification.

11. Section 4. (1) Discuss whether the new sleeve will be roll-expanded when it is inserted into the bore before welding. If not, discuss how the sleeve can be held in place before welding and how the crevice between the new sleeve and the bore can be minimized to prevent the potential crevice corrosion; and (2) In the lower part of Figure 2, explain why an empty space/annulus region exists between the new sleeve outer wall and the bore.

12. Section 5.2, page 6, mid-page, states that "...The UT is qualified to detect flaws in the new weld and base metal interface beneath the new weld...The volume of interest for UT includes the new weld, the bottom head low alloy steel base material heat affected zone, and the sleeve/nozzle to weld interface and will be covered to the maximum extent practical..." (1) Discuss to which ASME Code Section and subarticles is the UT qualified, and (2) Section 5.3, page 7, 6$^{th}$ paragraph states that the weld configuration precludes examination of a small portion of the ferritic steel heat affected zone that is shadowed by the interface of the OD of the nozzle. Provide the specific examination coverage (percentage of the required examination volume) of the small portion of the ferritic steel heat affected zone that cannot be examined. Provide the examination coverage of the heat affected zone that can be examined.

13. Section 5.3, page 7, sixth paragraph states that "...The UT transducers and delivery tooling are capable of scanning from the bore of the nozzles with inside diameters near 1.20 inches..." Clarify this sentence. The staff understands that the UT can be performed from the inside the bore but it is not clear what is meant by "near 1.20 inches."

14. Section 5.4, page 8, first paragraph stated that "... Mock-up testing has verified that the anomalies may exist and do not exceed 0.05 inches in length..." (1) Discuss the smallest size of indications that the UT is qualified to detect and size; (2) Describe how mock-up testing concludes that the anomaly does not exceed 0.05 inches in length; and (3) If after sleeve installation the UT detects a triple point anomaly that exceeds 0.05 inches, the proposed fracture mechanics calculation assuming a flaw size of 0.05 inches may be invalid. The relief request may also be invalid. Discuss corrective actions if the UT detects a triple point anomaly that exceeds 0.05 inches.

15. Discuss whether a full scale mock-up was or will be prepared to qualify the sleeve modification procedures, including machining, welding, and inspections. If yes, describe the qualification of modification procedures. If not, discuss how the sleeve modification can be ensured to achieve acceptable results.

16. Section 5.4, page 8, seventh paragraph states that "...Based on evaluation procedures and acceptance criteria contained in Article IWB-3612 and Appendix C of ASME Section XI, results of fracture mechanics analyses demonstrate that a 0.05 inch weld anomaly in either a repaired heater sleeve or instrumentation nozzle is acceptable for a 40-year design life..." Submit the flaw evaluation for the triple point anomaly.

17. Section 5.5, page 9. Submit the flaw evaluation of the J-groove weld between the original sleeve and pressurizer lower head nozzle penetration.

18. Discuss the inservice inspection of the new sleeve and new weld, including the frequency and method.

19. Discuss the design qualification of the proposed repair or submit the design calculations and specifications. Specifically, discuss how the new sleeve and the new weld satisfy the design requirements of the ASME Code, Section III. This discussion should explain how the new sleeve and weld support the loading so that the new sleeve and the associated heater element will not be ejected from the pressurizer penetration.

April 12, 2011

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