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

March 18, 2013

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 NOS. 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION REGARDING: RELIEF REQUEST RR-ISI-04-08, ALTERNATIVE FOR MITIGATION OF BURIED SALTWATER PIPING DEGRADATION, (TAC NOS. MF0568 AND MF0569)

Dear Mr. Gellrich:

By letter dated January 17, 2013, Constellation Energy (the licensee) requested relief from the requirements of the American Society of Mechanical Engineer Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000, at Calvert Cliffs Nuclear Power Plant Units 1 and 2. The licensee proposed an alternative to mitigate the potential degradation in buried saltwater system ductile cast iron piping as documented in Relief Request RR-ISI-04-08.

The Nuclear Regulatory Commission staff is reviewing the submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). On March 14, 2013, the Calvert Cliffs staff indicated that a response to the RAI would be provided within 60 days of the date of this letter.

If you have any questions regarding this issue, please contact me at (301) 415-3308.

Sincerely,

B.K. Vaidya

Bhalchandra K. Vaidya, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

RELIEF REQEUST RR-ISI-04-08

ALTERNATIVE FOR MITIGATION OF BURIED SALTWATER PIPING DEGRADATION

CALVERT CLIFFS NUCLEAR POWER PLANT, LLC.

CALVERT CLIFFS NUCLEAR POWER PLANT UNITS 1 AND 2

CONSTELLATION ENERGY

DOCKET NOS. 50-317 AND 50-518

TAC NOS. MF0568 AND MF0569

By letter dated January 17, 2013 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML13022A048), Constellation Energy (the licensee) requested relief from the requirements of the American Society of Mechanical Engineer Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4000, at Calvert Cliffs Nuclear Power Plant Units 1 and 2. The licensee proposed an alternative to mitigate the potential degradation in buried saltwater system ductile cast iron piping as documented in Relief Request (RR)-ISI-04-08. To complete its review, the Nuclear Regulatory Commission (NRC) staff requests additional information as follows.

Design

1. On Page 8 of the RR, the licensee stated that "...The internal mechanical seal (i.e., EPDM [Ethylene Propylene Diene Monomer] Rubber & Retaining Bands), upon which this design is based on, has been utilized as a corrosion barrier in numerous Class 3 systems throughout the industry for many years..." Discuss whether the subject sleeve design is the same as those that have been installed in the salt water environment in other nuclear plants. If yes, discuss the operating experience of the sleeve used in the nuclear plants and identify the nuclear plants. If not, discuss whether the proposed sleeve assembly has been tested for structural integrity and leak tightness under the same operating conditions as in the saltwater system in a full scale mock up.

2. The licensee stated that the design pressure is 50 psig and the licensee's calculation used a temperature range from 32 degrees F to 95 degrees F. (1) Provide the pressure and temperature for various conditions such as the normal operation, emergency and faulted conditions. (2) Discuss whether the rubber material used for the gasket has been qualified for use under all temperature and pressure range that the subject pipe will experience. (3) Discuss how many years for which the gasket material is qualified under the salt water environment.

Enclosure

3. The licensee's calculation in Enclosure 1 to the RR showed that the retaining band thickness is 0.1875 inches. The backing plate thickness is 0.0598 inches. The gasket thickness is 0.3 inches. Provide the thickness of the cement liner, wedge, and shim. Provide the final cross sectional height (thickness) of the sleeve assembly.

4. The sleeve assembly is not welded or glued to the inside surface of the pipe. It seems that salt water may seep into the crevice between the backing plate and inside surface of the pipe. Discuss how the sleeve assembly can prevent salt water from seeping into the crevice underneath the gasket.

5. On Page 5 of the RR, the licensee stated that "...The repair sleeve assembly is capable of restoring pressure boundary of localized pipe wall thinning that can be contained within a 3" diameter area..." Based on this statement, it appears that the sleeve can only be installed for a wall thinning area or pin hole no more than 3 inches in diameter. After the sleeve is installed the flaw (degraded area) may grow and expand either laterally or through wall or in both directions. The NRC staff finds that the sleeve cannot be applied at a flaw that is already 3 inches in diameter at the time of installation unless the licensee inspects the flaw size frequently to ascertain that the flaw will not grow to more than 3 inches in diameter. The NRC staff thinks that the sleeve should be installed for a flaw that is less than 3 inches in diameter, for example, at X inches in diameter, because the flaw would grow to the limitation of 3 inches. However, the sleeve should be qualified for Y inches in diameter. The Y-inch diameter should include the initial flaw size at the time of sleeve installation plus any future flaw growth projected to the end of the design life of the sleeve. If the flaw size is found to exceed the Y diameter during subsequent inspections, the sleeve will not be applicable and will have to be removed. The above argument assumes that the sleeve may fail in the future and the salt water may leak into the gasket and in contact with the flaw. Discuss the flaw size at the time of sleeve installation and the flaw size that the sleeve is qualified for application.

6. Degradation in the saltwater piping may be manifested in a cluster of wall thinning spots or pits that are not connected to each other (e.g., a shotgun pattern). Each of the spots/pits could be less than 3 inches in diameter. However, the total degraded area of the spots and pits may exceed 3 inches. Discuss whether the sleeve is applicable in this scenario.

7. Table 1 of the RR shows that the required minimum wall thickness of the host pipe to support a sleeve assembly is 0.326 inches and 0.348 inches for the 30-inch and 36-inch diameter pipe, respectively. Confirm that the sleeve cannot be applied to a flaw whose surrounding pipe area has less wall thickness than these values. That is, the sleeve can be applied to a flaw that has a wall thickness less than 0.326 or 0.348 inches, but the wall thickness in the surrounding pipe area has to be greater than 0.326 or 0.348 inches to support the sleeve installation.

8. Provide the duration of the proposed alternative (i.e., the time period of the sleeve design application).

Installation

9. (1) Provide a detailed description of the sleeve installation, including pre-installation inspection and preparation, installation, post-installation inspection, and acceptance criteria

for the installation. (2) On page 4 of the RR the licensee stated that retaining bands are held in place by wedges. The drawing on page 2 of Attachment A to Enclosure 1 show the cross section of the wedge, push tabs and retaining band but it is not clear how the wedge or push tabs hold down the retaining band. Provide a sketch of the wedge and how the wedge holds down the retaining bands. (3) The licensee stated that the retaining bands are expanded against the inside surface of the pipe. Clarify whether it is the expansion of the retaining bands or wedges that assist the retaining band in holding the gasket in place. (4) The drawing on page 2 of Attachment A shows a shim. However, the shim was not discussed on page 4 of the RR. Discuss how the shim is installed and whether it supports any loading. (5) Confirm that the backing plate will not be hydraulically expanded against the pipe wall. Does the backing plate support any loading? (6) The drawing on page 3 of Attachment A to Enclosure 1 is illegible. Provide a legible drawing.

10. For a hole on the pipe, discuss the measures to prevent groundwater leaking from the outside surface into the pipe prior to installing the sleeve. For the wall thinning area on the inside surface of the pipe, discuss the measures applied to the wall thinning area prior to installing the sleeve.

11. On Page 6 of the RR, the licensee stated that "...This proposed repair system will not be used in cases of discovered cracking or on corrosion that initiated on the external diameter of the saltwater piping..." Discuss the degradation mechanisms and flaws that the proposed alternative will be applicable. Discuss whether the sleeve can be installed on the inside surface of an elbow.

12. Provide a video of the sleeve installation if it is available or a website link for the video that the NRC staff can access and view so that the NRC staff can understand exactly how the sleeve will be assembled in the pipe.

Examination

13. Section 4 of the RR stated that the licensee will use Broadband Electromagnetic (BEM) examination to inspect the saltwater system piping to determine pipe conditions. Discuss whether BEM will be used in the future ISI. If yes, discuss whether BEM can detect a flaw that is hidden behind a sleeve assembly.

14. On page 8 of the RR, the licensee stated that it will disassemble the first installed repair system and inspect the degraded area after two operating cycles. In case of multiple installations, the licensee will only disassemble one of the proposed repair systems while the rest will be visually inspected every other refueling outage during conduct of current preventive maintenance task to inspect Saltwater System piping. The licensee further stated that subsequent inspection frequencies of the encapsulated degraded area will also be determined. Monitoring of the size of the degradation will be performed as required. (1) Discuss exactly how often the sleeve will be inspected after the first inspection and what type of inspection will be conducted (e.g., disassembly inspection or visual inspection without disassembly). (2) Discuss how often monitoring of the size of the degradation will be performed and the monitoring method. (3) Explain how the visual examination can determine whether a sleeve assembly is acceptable for continue operation because the visual examination may not be able to determine whether salt water has or has not leaked into the crevice behind the backing plate without disassembly.

15. On page 8, the licensee stated that during the future inspections, it will disassemble the sleeve assembly and check the retaining bands and backing ring for corrosion, the liner under the sleeve for wetness, and any damage of the liner. The rubber ribs on the gasket may be deformed after they are being pressed against the pipe by the retaining bands. It appears that once the gasket is used in the sleeve assembly and removed for inspection, it should not be re-used. The retaining bands are fit into the pipe wall by hydraulic expander which means that they may be plastically deformed after installation. After disassembly, it appears that they should not be re-used also. (1) After disassembling the sleeve for inspection, discuss whether the new or old parts will be used for retaining bands, gasket, wedge and backing plate to re-install the sleeve assembly. (2) Discuss the conditions that would cause the retaining band, gasket and back plate to be replaced. (3) Discuss whether the wedge and push tab will be examined during the future inspections.

Analysis

The following questions are related to licensee's Calculation 11-2357-C-003 in Enclosure 1 of the January 17, 2013 submittal.

16. (1) In section 2.0 of the Calculation, Assumption number 5 stated that "...It is assumed that during the abnormal operating condition, the upstream retaining band will be lost and the sleeve will fold back on itself..." However, in Section 4.5 of the Calculation, the analysis assumed that three upstream retaining bands are lost and only one retaining band remains. Clarify the discrepancy between the assumption number 5 and the analysis performed in Section 4.5. (2) Assumption 10 stated that "...A maximum of long term stress relaxation of EPDM gasket is assumed to be 12%..." Provide the technical basis of 12 percent stress relaxation. Clarify how many years are considered as the "long term." (3) It seems that the 12 percent is also applied to the stress relaxation of the retaining bands. This implies that the compressive stresses of the retaining bands may be relaxed and the gasket may reduce its contact on the pipe inside wall in the future. This may cause salt water to seep into the crevice between the backing plate and pipe inside surface or in a worse scenario, the retaining bands may dislodge from the pipe inside wall. Discuss how the sleeve design addresses the problem of stress relaxation of the retaining bands.

17. On Page 8 of the Calculation, the licensee calculated the pipe inside diameter as 30.90 inches and 37.04 inches for the 30-inch and 36 inch pipe, respectively. It appears that these diameters did not consider the cement liner thickness. On page 9 of the calculation, it appears that the licensee calculated the retaining band outside diameter without considering cement liner thickness. (1) Provide the cement liner thickness. (2) Explain why the cement liner thickness was not considered in the retaining band outside diameter calculations. (3) Explain why the design drawing on page 2 of Attachment A to the Calculation also did not include the cement liner as part of pipe inside surface.

18. Section 4.5 of the Calculation analyzed a postulated abnormal condition where 3 of the 4 retaining bands (the upstream bands) are dislodged and the sleeve is held in place by one remaining retaining band. The gasket would fold back over the remaining retaining band. The NRC staff finds that the calculation in Section 4.5 is an ideal case. Under the actual field condition the pipe will be clogged by the loose gasket, retaining bands, wedges and backing plate as discussed in the following estimates. The NRC staff estimated that

cross-sectional area of the inside diameter for the 30-inch pipe (this pipe size is used as an example) is about 750 square inches (ID is 30.90 inches). The circumference of the 30-inch pipe considering the sleeve thickness is about 95 inches based on an ID of 30.30 inches. The width of the gasket is about 20 inches. However, the gasket is assumed to be held by one retaining band (the band's width is 2 inches). The width of gasket that would be loose from the pipe wall would be 18 inches (20 – 2 = 18). The area of the loose gasket is 1710 square inches (95" x 18"). The backing plate has a width of 14 inches and its area is 1330 square inches (14" x 95"). The gasket or backing plate area size is much greater than the cross-sectional area of the pipe. The likely scenario is that the loose gasket and backing plate will restrict the fluid flow severely. (1) Discuss how the loose part(s) in the saltwater system pipe can be identified. Is there an alarm in the control room to alert the operator? (2) Identify the potential components and equipment downstream of the saltwater system that may be affected by the loose parts. (3) Discuss the worst case safety consequence caused by the loose parts, considering the entire sleeve is dislodged from the pipe wall. (4) Discuss possible operator actions that could avert the serious damage to the downstream components, given a dislodged sleeve.

System Leakage Test

19. The RR did not specify a system leakage test after the sleeve is installed. Discuss whether a system leakage test will be performed in accordance with the ASME Code, Section XI, IWA-5244 or IWD-5000. If a system leakage test will not be performed, discuss how the licensee can ensure that the sleeve will perform its intended function.

March 18, 2013

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Sincerely,
/ra/

Bhalchandra K. Vaidya, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318
Enclosure:
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ADAMS ACCESSION NO: ML13073A150
(*) No substantial change in the RAI Memo, ML13038A003

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