Entergy Nuclear Northeast
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

Robert Walpole
Licensing Manager
Tel (914) 254-6710

NL-13-155

December 6, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Response to RAI on Relief Request IP3-008 to Allow Temporary Non-Code Repair to Service Water Piping (TAC No. MF3111)
Indian Point Unit Number 3
Docket No. 50-286
License No. DPR-64

REFERENCES:
1. NRC Letter to Entergy, Request for Additional Information Regarding Relief Request 3-008 to Allow For a Temporary Non-Code Repair to The Service Water Piping (TAC No. MF3111), dated December 3, 2013.
2. Entergy Letter NL-13-147 to NRC, Relief Request 3-008 From ASME Section XI, Subsection IWA-4422.1 to Allow Temporary Non-Code Repair to Service Water Piping), dated November 20, 2013.

Dear Sir or Madam:

Entergy Nuclear Operations, Inc., (Entergy) is hereby providing, attached, a response to the NRC request for additional information, Reference 1, associated with the proposed Relief Request for a non-code repair, Reference 2.

A copy of this response and the associated attachment is being submitted to the designated New York State official in accordance with 10 CFR 50.91.

A047
NRR

There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact me.

Sincerely,

RW/sp

Attachment: Response to Request for Additional Information Regarding Relief Request IP3-008 to Allow Temporary Non-Code Repair to Service Water Piping

cc: Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
Mr. William Dean, Regional Administrator, NRC Region 1
NRC Resident Inspectors
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Dept. of Public Service

ATTACHMENT TO NL-13-155

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING RELIEF REQUEST IP3-008 TO ALLOW TEMPORARY NON-CODE REPAIR TO SERVICE WATER PIPING

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286

Response To Request For Additional Information

By letter dated November 20, 2013 (ADAMS Accession No. ML13329A422), Entergy Nuclear Operations, Inc. requested relief from certain requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4422.1 regarding the repair of service water piping at Indian Point Unit 3. Entergy proposed an alternative repair for the degraded service water piping as documented in Relief Request Number IP3-008. To complete its review, the Nuclear Regulatory Commission (NRC) requested additional information provided in response to the following questions.

Question 1

Page 1 of the relief request states that Line 1093 contains 5 locations with coating degradation and Line 1099 contains 4 locations with coating degradation. The licensee ultrasonically examined these 9 locations. The licensee discussed the degradation in 2 of 9 locations that exceeded the acceptance standards of the ASME Code, Section XI, but the licensee was silent on the other 7 locations. (a) Discuss the details of the inspection results of each of other 7 locations. (b) Discuss whether coating at all 9 locations will be restored before the pipe is buried underground.

Response

As a result of the ongoing excavations in the 32 Main Transformer (MT) moat which exposed a portion of Service Water (SW) lines 1093 and 1099 a visual inspection identified an area of corrosion approximately 2" wide (axial direction) by 8.25" long (circumferential direction) in SW line 1093. Since the surface condition (i.e. irregularities) of the corroded area did not allow for an UT examination to be performed, a pit gage was used to estimate the remaining wall thickness. Based on these pit gage measurements, it was determined that an area approximately ¾" wide by 6" long had a remaining wall thickness below the minimum thickness required by the Construction Code (i.e. ANSI B31.1, 1967 Edition). Note that although UT measurements could not be taken inside the corroded area, UT measurements were obtained adjacent to the corroded area and no degradation was observed).

Following the discovery of the above corroded area, an extent of condition inspection was performed on the remaining SW piping inside the moat. This extent of condition visual inspection, identified nine additional locations (for a total of ten areas) with coating degradation. The degraded coating was then removed from these additional nine locations and a UT inspection was performed to measure the remaining wall thicknesses. All nine of these additional locations were found to have remaining wall thicknesses which exceeded the minimum design thickness required by the Code of Construction (measured thicknesses ranged from 0.102" to the maximum thickness of 0.407"). However, one of these nine locations had an area (approximately ½" wide (axial direction) by 1" long (circumferential direction)) located over the pipe circumference weld which could not be UT inspected because of the surface condition. Signs of wetness (no visible flow was observed) were also found at this weld location during the visual examination. All ten locations have been re-coated with an approved coating.

Question 2

Page 2 of the relief request states that two locations in Line 1093 contain defects that exceed the acceptance standards of the ASME Code, Section XI. However, these two defect locations are acceptable in accordance with ASME Code Case N-513-3. (a) Provide the acceptance standards of the ASME Code, Section XI that these 2 defects exceeded. (b) Discuss whether a clamp is installed at each of the 2 defect locations. If only one defect location is installed, identify the location and explain why the other defect location is not installed with a clamp.

Response

a) As discussed above, surface irregularities at two locations prevented the remaining wall thickness from being measured by UT and therefore they were conservatively assumed to be through wall. Since through wall defects are considered to be outside of the ASME Section XI Code requirements (see section C.12, NRC Inspection Manual, Part 9900, Technical Guidance page C-13), these two locations were determined to be outside of the ASME XI Code requirements.

b) Both of the locations with assumed through wall defects were evaluated in accordance with the requirements of ASME Code Case N-513-3 and were found to meet all of the structural requirements. No clamping devices were required to maintain structural integrity of either location. However, a hydraulic/leakage analysis was performed to estimate the amount of flow which could be lost through a hole equivalent to that area where the remaining wall thickness was less than the minimum required by the Construction Code (i.e. ¾" wide by 6" long). This analysis demonstrated that the SW system flow would still be adequate to meet its design requirements (see discussion in Question 11) with the engineered leak mitigation clamp over the degraded area (i.e. the entire 2" wide by 8.25" long degraded area) to restore additional system hydraulic margin (see Item 11 discussion). A clamp was not installed over the other area because of the small (i.e. ½" by 1") affected area.

Question 3

a) Page 3 of the relief request states that at Area 1 in Line 1093, all ultrasonic testing (UT) readings are above the minimum wall thickness. The relief request also states that there is weepage at Area 1. Discuss why there is weepage if all the UT readings of Area 1 are above the minimum wall thickness. (b) Page 3 of the relief request does not mention that Area 3 in Line 1093 has any weepage. In Enclosure 3, Calculation IP-Calc-13-00063, page 5, it appears that the leakage calculation was based on the Area 3 defect. Discuss why the leakage calculation focuses on the Area 3 defect, which has no stated weepage, instead of Area 1 defect, which has weepage. (c) Page 3 of the relief request states that the Area 3 degradation area, which resulted in a wall thickness of less than the minimum required wall thickness was approximately ¾ inches wide by 6 inches long. Page 3 also states that "...it was conservatively assumed that the entire degraded area of 2 inches by 8.25 inches was 100 percent through wall...". These areas were different from the defect area identified in the calculation IP-CALC-13-00063 page 5 of 0.75 inches by 3 inches. Discuss the discrepancy in the defect area used in the calculation. Discuss why the larger area of 2 inches by 8.25 inches was not used in the calculation.

Response

a) As discussed above, all of the UT wall thickness measurements exceeded the Construction Code minimum required thicknesses. However a small area approximately ½" by 1" within the larger area could not be UT inspected because of surface irregularities. The weepage was observed within this area which could not be UT inspected.

b) It is correct that the leakage calculation focuses on area 3 where no leakage was observed rather than on area 1 where weepage was observed. The reason for this is because the size of the area with remaining wall thickness below the minimum Code required in area 3 bounded the size of the area with remaining wall thickness below the minimum Code required in area 1. Therefore, the leakage calculation bounds both areas.

c) The 2" wide by 8.25" long is the approximate size of the area which showed some form of corrosion and which could not be UT examined because of the surface irregularities. However, pit gage measurements were performed over this 2" by 8.25" area and these measurements indicated that the remaining wall thickness was below the minimum Construction Code requirements in an area approximately ¾" by 6". Based on these results, a structural calculation was performed assuming a through wall defect of 2" by 8.25" and a hydraulic/leakage evaluation was performed using an area equivalent to a ¾" by 6" through wall defect.

Question 4

Page 4, Item 4, of the relief request states that a hole of 3/4 inches wide by 6 inches long was postulated in the system hydraulic analysis. (a) Discuss the technical basis for the postulated hole size. (b) Discuss whether this is the allowable defect size for the subject pipe. That is, if the defect exceeds the allowable hole size, discuss whether the pipe would be required to be repaired/replaced in accordance with the ASME Code in mid-cycle.

Response

a) As discussed above, the hydraulic/leakage calculation used a hole size equivalent to a ¾" by 6" defect because this was the size of the area where the remaining wall thickness was estimated to be below the minimum design thickness required by the Construction Code based on pit gage measurements.

b) The maximum allowable flaw size based on the ASME Code Case N-513-3 calculation was 4.7" in the axial direction and 9" in the circumferential direction. These allowable flaw dimensions bound the dimensions of the estimated flaw of approximately 2.02" by 8.27" by the next refueling outage currently scheduled for March 2015. Note that although the corrosion rate used in the calculation was conservatively estimated to be approximately 0.012"/per year based on historical inside diameter (ID) data for SW system carbon steel piping, the actual corrosion rate is expected to be significantly less than this since the corrosion is outside diameter (OD) initiated and all areas were re-coated prior to backfill essentially arresting any future corrosion. See Question 8 for additional information.

Question 5

Sections E.5 and F of the relief request state that the pipe will be repaired in accordance with the ASME Code, Section XI during the next refueling outage scheduled for March 2015. It is not clear to the NRC staff exactly which pipe line(s) will be repaired/replaced in March 2015 and whether the pipe segments that contain the 9 locations with coating degradation will all be repaired/replaced. Identify the exact piping that will be repaired in March 2015.

Response

The exact repair scope to be performed during the next refueling outage has not yet been finalized. However, as a minimum the two areas (i.e. area 1 where weepage was observed and area 3 where pit gage measurements indicated wall thickness below the minimum required thickness) with low wall thicknesses will be repaired or replaced as required by IWA-4000. None of the other areas require repair because the remaining measured wall thicknesses are greater than the minimum required thickness and the areas have been re-coated arresting any future corrosion. Note that some of these areas may be repaired for convenience purposes if they are in the vicinity of the two areas being repaired.

Question 6

Based on the review of Calculation IP-Calc-13-00070 in Enclosure 2 to the November 20, 2013 letter, it appears that the clamp design may minimize some leakage but would not stop all leakage because the design does not include sufficient sealing function (e.g., the ends of the clamp are open and no sealant is applied). (a) Discuss whether the proposed clamp provides structural integrity and leak tightness for the degraded pipe. (b) If the piping is not repaired in the next refueling outage, will the identified areas be re-inspected and ensured to not degrade any further in the future?

Response

a) As discussed above, the engineered clamp was installed over area 3 to eliminate potential leakage through the corroded area. The size of the clamp, structural capability of the clamp and the gasket material (6" by 12" gasket material) applied over the degraded area were sized to eliminate all leakage. The clamp was not designed to provide any structural reinforcement for the pipe because the pipe was determined to meet all of the ASME Code Case N-513-3 requirements through the next refueling outage when the repair will be implemented.

b) As a minimum, the two areas with measured wall thickness below the Code minimum required thickness will be repaired in accordance with the IWA-4000 requirements during the next refueling outage currently scheduled for March 2015.

Question 7

Page 4, Section E.6, states that the monitoring well in the moat area will be inspected periodically. (a) Discuss the inspection frequency. (b) Discuss the leak rate that will cause the degraded pipe to be excavated for inspection. (c) Discuss the leak rate that will cause the degraded pipe to be repaired/replaced during mid-cycle.

Response

One of several monitoring wells will be placed in the vicinity of the service water line. This will consist of a perforated pipe down to the bottom of the moat. As a minimum the well will be monitored daily for level increase. The level will be evaluated based on rainfall and any other external water sources into the containment moat. If the clamp was to start leaking and increase to 10 gpm the area would be excavated and the affected pipe would be inspected. Any detected degradation would be evaluated against the ASME Section XI requirements (or any other NRC approved alternative such as Code case N-513-3) and unacceptable degradation would be repaired in accordance with the ASME XI, IWA-4000 requirements. Note that the 10 GPM leak rate has been chosen based on engineering judgment since it is sufficiently high to indicate greater than expected pipe degradation while still significantly lower than any leak rate which could impact the SW system flow requirements. The 10 gpm is an upper bound since all leakage would be monitored and if adverse trends occur, a decision could be made to excavate and assess the pipe well before that limit.

Question 8

(a) Section 6.8 (page 6) of Calculation IP-Calc-13-00062 states that the corrosion rate used in the analysis is 12 mils per year. Discuss how this corrosion rate was derived. (b) Calculation IP-Calc-13-00062 evaluated the defect area as a planar flaw (see Page 4 of Attachment A). The NRC staff understands that the defects in service water piping usually are caused by general corrosion which results in nonplanar flaws. ASME Code Case N-513-3 provides an evaluation method for planar flaws and nonplanar flaws. Discuss whether the subject defect areas were evaluated and accepted based on the nonplanar flaw method in ASME Code Case N-513-3.

Response

a) The corrosion rate of 0.012"/year was established based on the historical, average corrosion rates for the IPEC Service Water systems for inside diameter (ID) initiated corrosion. The rate is derived from trending periodic UT measurements. This corrosion rate is considered conservative for this application because (1) the current corrosion was outside diameter (OD) initiated and the areas have been coated with corrosion resistant coating especially approved for buried piping and this coating is expected to arrest any future corrosion and (2) the corrosivity of the brackish water environment inside the pipe is considered bounding compared to the soil corrosivity.

b) Wall thinning creates a cavity in the pipe which is not considered planar. The non-planar flaws were evaluated as two separate planar flaws since paragraph 3.2(d) of Code Case N-513-3 allows through wall non-planar flaws to be evaluated as planar flaws where the axial component is equivalent to the axial extent of the non-planar flaw and the circumferential component is equivalent to the circumferential extent of the non-planar flaw.

Question 9

Attachment B, page 7, shows a block supporting the pipe in the area of the defect area. Discuss if this support block is intended to remain in place until the next refueling outage and how it will affect

any repair to the pipe (i.e., how the clamp can be installed if the block is situated underneath the defect area of the pipe?).

Response

The support block shown on page 7 of attachment B was subsequently removed to allow characterization of the remainder of the corroded area and to allow for the installation of the leakage clamp. This support block was replaced with two new blocks installed approximately two feet on each side of the degraded area. This supporting scheme will be evaluated and modified as required during the upcoming refueling outage to facilitate repair/replacement of the degraded area.

Question 10

The NRC staff notes that ASME Code Case N-513-3, paragraph 5(a), requires that the licensee conduct an engineering evaluation to identify the most susceptible locations for degradation in piping systems and that augmented examinations be conducted at those locations. The NRC staff also notes that a discussion of this engineering evaluation, particularly related to the need for inspections outside the moat, is not provided in the relief request. Please indicate whether the required engineering evaluation has been conducted and documented. Additionally, please provide a summary of the evaluation.

Response

As a result of the degradation identified in area 3, a visual inspection of 100% of the piping inside the 32 moat was performed. This visual inspection identified an additional nine locations (for a total of ten) which exhibited some coating degradation. The degraded coating was then removed, the area was cleaned and a visual and ultrasonic examination was then performed at all nine of these locations. Although this inspection identified one additional area where some weepage was observed, the remainder of the locations were found to have measured wall thicknesses greater than the Construction Code required thickness. Additional excavations outside of the moat were not considered necessary because of the differences in backfill and soil hydraulic conditions between the inside and the outside of the moat. The piping located outside of the moat is subjected to the ASME Section XI system flow testing requirements specified for buried piping and this testing has not identified any unacceptable system testing conditions. Additionally all buried piping at IPEC is subjected to the IPEC buried piping program which has been developed consistent with the requirements provided in Section XI.M41, "Buried and Underground Piping and Tanks", of NUREG-1801 revision 2. Inspection scope, frequency, sample expansion and other corrective measures applicable to the all IPEC buried piping including the piping outside of the moat are provided in the Buried Piping Program. Buried SW System piping inside and outside of the moat area is also subject to internal visual inspections via remote robotic crawlers under the GL 89-13 Program.

Question 11

Discuss the flooding analysis and the results.

Response

The hydraulic analysis was provided in Calculation IP-CALC-13-00063. The analysis evaluated the effects of a postulated hole with an area equivalent to the area of the pipe where the remaining wall thickness is less than the thickness required by the Construction Code (i.e. ¾" by 6"). As noted in FSAR Section 9.6, there is an essential service water header and a non-essential service water header with either set of SW pumps and header being aligned as the essential or non-essential header. The essential loads are those which must be supplied with cooling water immediately in the event of a blackout and/or Loss-of-Coolant Accident. The cooling water for these loads is supplied by the essential service water header. The non-essential loads are those which are supplied with cooling water from the non-essential service water header where the pumps are manually started. The component cooling heat exchangers are considered non-essential loads since they are not required during the injection phase of a LOCA. During the switchover to the recirculation phase following a postulated Loss-of-Coolant-Accident, one Diesel Generator (DG), one Control Building air conditioning unit and one component cooling heat exchanger will be transferred to the essential header.

SW system will still meet its intended design function even under worst case leakage conditions as long as the SW pump degradation is limited to10% for 31, 32 and 33 pumps and 15% for 34, 34 and 36 pumps. These degradation pump limits will ensure that the system will maintain adequate flow through the fan cooler units when the degradation was on the essential header. Surveillance test controls have been implemented to ensure that pump degradation does not exceed these limits. Therefore the non-safety pipe clamp is not credited for accident events.

The analysis also found, for the Appendix R shutdown analysis, that the component cooling water heat exchanger (CCW HX) HX outlet valve will have to be opened to 15 degrees rather than the current requirement for 13 degrees. This procedural guidance has not been implemented because the Appendix R event occurs during normal operation and non-safety components (i.e., the clamp) can be credited. Should the clamp fail or be removed during normal operation, the 38 service water pump (used for Appendix R shutdown) would be declared inoperable per the Technical Requirements Manual. This requires action to be taken to restore operability. Increased leakage would be detected by the monitoring program and trended so action could be taken to investigate indications of an impending failure. See response to question 7.

Question 12

The November 20, 2013, cover letter identifies the proposed relief request as Number 3-008. However, the top of page 1 of the relief request identifies Relief Request No: IP3-008. Clarify the exact identification of the relief request.

Response

The correct number for this relief request should be IP3-008. This discrepancy has been corrected in this RAI response.