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

April 11, 2014

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

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 3 – RELIEF REQUEST 3-008 FROM ASME SECTION XI, SUBSECTION IWA-4422.1 TO ALLOW TEMPORARY NON-CODE REPAIR TO SERVICE WATER PIPING (TAC NO. MF3111)

Dear Sir or Madam:

By letter dated November 20, 2013, Entergy Nuclear Operations, Inc., the licensee, requested relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) at Indian Point Nuclear Generating Unit No. 3 (Indian Point 3). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(ii), the licensee requested to use the proposed alternative in Relief Request (RR) IP3-008 on the basis that compliance with the specified ASME requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The relief request provides requirements for a temporary non-code repair at the defect areas of the degraded plant service water supply piping.

On December 11, 2013, the Nuclear Regulatory Commission (NRC) staff verbally authorized the use of RR IP3-008 until the next refueling outage which is scheduled for spring 2015. This safety evaluation documents the NRC staff's detailed technical basis for the verbal authorization.

The NRC staff determined that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the service water piping and that lines 1093 and 1099 (cooling water supply to emergency diesel generators) will be maintained until the next refueling outage. The staff found that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii) and is in compliance with the

requirements of the ASME Code, Section XI, for which relief was not requested. Therefore, the staff authorizes the use of Relief Request IP3-008 at Indian Point 3 until the next refueling outage which is scheduled for spring 2015.

Sincerely,

Benjamin G. Beasley

Benjamin G. Beasley, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-286

Enclosure:
Safety Evaluation

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST IP3-008

TEMPORARY NON-CODE REPAIR TO SERVICE WATER PIPING

ENTERGY NUCLEAR OPERATIONS, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3

DOCKET NO. 50-286

1.0 INTRODUCTION

By letter dated November 20, 2013, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13329A422) as supplemented by letters dated December 6 and 9, 2013 (ADAMS Accession Nos. ML13346A017 and ML13350A110, respectively), Entergy Nuclear Operations, Inc., the licensee, requested relief from selected requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) at Indian Point Unit Nuclear Generating Unit No. 3 (Indian Point 3).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(ii), the licensee requested to use the proposed alternative in Relief Request (RR) IP3-008 on the basis that compliance with the specified ASME requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The relief request provides requirements for a temporary non-code repair at the defect areas of the degraded plant service water (SW) supply piping. The licensee proposed an alternative to the monitoring requirements of ASME Code Case N-513-3 at the defect areas of the service water piping.

On December 11, 2013 (ADAMS Accession No. ML13346A145), the Nuclear Regulatory Commission (NRC) staff verbally authorized the use of RR IP3-008 until the next refueling outage which is scheduled for spring 2015. This safety evaluation documents the staff's detailed technical basis for the verbal authorization.

2.0 REGULATORY EVALUATION

The regulations at 10 CFR 50.55a(g)(4) specifies that ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the

components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(b), 12 months prior to the start of the 120 month interval, subject to the conditions listed therein.

Section 50.55a(a)(3) of 10 CFR Part 50, states, in part, that alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Any proposed alternatives must be submitted and authorized prior to implementation.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 RELIEF REQUEST IP3-008

The affected component is ASME Class 3 10-inch diameter service water (SW) supply line piping, line number 1093 from the 409 header to the emergency diesel generators (EDGs), to the instrument air closed cooling (IACC) heat exchangers (HX) and the central control room (CCR) air conditioning condensers. This line is one of the two lines which supplies water from the Hudson River to the EDGs which are used to provide emergency power to safety related equipment following a design bases accident.

The licensee stated that the code of record for the fourth 10-year ISI interval is the ASME Code, Section XI, 2001 Edition with the 2003 Addenda. The affected portion of the service water piping was designed and constructed in accordance with the requirements of the USAS [United States of America Standards] B31.1.0, 1967 Edition of the Power Piping Code.

The ASME Code, Section XI, Paragraph IWA-4422.1 requires that defects be removed or reduced to an acceptable size and if the resulting section thickness is less than the minimum required thickness, the component shall be corrected by repair/replacement activities in accordance with the requirements of IWA-4000.

The ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," provides requirements for temporary acceptance of flaws, including through-wall flaws, in moderate energy ASME Class 2 or 3 piping, without performing a repair/replacement activity.

The licensee stated that the degraded area was discovered as a result of uncovering the service water lines during the on-going modification to the 32 Main Transformer Moat. The licensee identified several areas where the coating was degraded requiring coating removal to assess the condition of the piping under the defective coating.

As stated by the licensee, the coating degradation was noted at a total of ten locations on two main SW headers (10"-Line #1093 and 10"-Line #1099) to the EDGs and other safety related equipment. Ultrasonic Testing (UT) examination was performed at each of these locations and the examination identified two unsatisfactory locations (Area 1 and Area 3 of the licensee's UT Erosion/Corrosion Examination Report No. IP3-UT-13-058, ADAMS Accession No. ML13329A424) which were less than the minimum wall thickness requirement of the ASME Section XI Code. As stated by the licensee, the total area of degradation for Area 1 is approximately 8 inches long by 2.5 inches wide and Area 3 is approximately 8.25 inches long by 2 inches wide. The areas in which the licensee assumed or measured to be below the allowable limits were ½ inch long by 1 inch wide and ¾ inch wide by 6 inches long for Area 1 and Area 3, respectively. Minor weepage and signs of wetness with no visible flow was observed in Area 1. The licensee evaluated both of these locations using the rules provided in ASME Code Case N-513-3 and both were found to be within the flaw allowable limits of the Code Case through the next refueling outage which is currently scheduled for March 2015. However, the Code Case requires that daily walkdowns be performed and UT examinations be performed at least once every 90 days to ensure that the assumption and inputs used in the evaluation remain valid until the affected piping is repaired or replaced in accordance with the IWA-4000 rules. In order to satisfy the requirements for the daily walkdowns, the piping would have to remain exposed to the environment and exposed to freezing conditions during the winter months.

The licensee further stated that since the current through-wall defects are beyond the acceptance criteria of IWD-3000 and removal is not practical without system depressurization, the proposed temporary repair method would not be consistent with the requirements of IWA-4422.1. The proposed backfill of the area for freezing and other protection is consistent with the requirements of ASME Code case N-513-3 with the exception of monitoring requirements.

The licensee performed a system hydraulic analysis to ensure that the SW system is capable of delivering the required accident design flows to the various related components under the worst case leakage conditions. The evaluation confirmed that the SW system remained capable of delivering the required design flow rates even assuming the loss of flow through a conservatively assumed hole size. In order to provide additional margin against the potential loss of flow, the licensee proposed to install an engineered leakage mitigation clamp to the pipe defect areas. The clamp and the surrounding area are then coated with corrosion resistant coating to minimize the probability of additional corrosion until the scheduled spring 2015 refueling outage. A corrosion resistant coating was applied to all the areas in which degradation was found prior to backfilling of the moat.

3.2 NRC STAFF EVALUATION

The NRC staff evaluated the design, installation, flaw evaluation, and inspection of the engineered clamp design and temporary repair.

By letter dated December 6, 2013, the licensee explained the assumptions used to determine the structural integrity requirements of the defect areas. The licensee assumed through-wall defects in accordance with the requirements of ASME Code Case N-513-3 and concluded that the piping meets all of the structural requirements of the code case. The licensee further stated

that no clamping devices were required to maintain structural integrity of either location (i.e., Areas 1 and 3). However, the licensee performed a hydraulic/leakage analysis 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. This analysis demonstrated that the SW system flow would still be adequate to meet its design requirements without the engineered leak mitigation clamp over the degraded area. However, the licensee's analysis demonstrated that the clamp is necessary for the 10 CFR 50, Appendix R shutdown scenario. If the clamp was not installed, the service water pump used for Appendix R shutdown would be declared inoperable per the Technical Requirements Manual. Thus, when not in the Appendix R shutdown scenario, the clamp provides additional system hydraulic margin. A clamp was only intended to be installed over the larger degraded area, Area 3, (non-weeping portion of pipe) because of these calculations. The NRC staff finds that the subject pipe can tolerate certain leakage without affecting plant safety; therefore, the staff determines that the licensee assumptions and decision to install a clamping device were adequate.

The NRC staff questioned the leak tightness of the proposed engineered clamp design. By letter dated December 6, 2013 the licensee explained that the engineered clamp was installed over the larger degraded area (Area 3) to eliminate potential leakage through the corroded area. The size of the clamp, structural capability of the clamp and the gasket material applied over the degraded area were sized to eliminate all leakage. The clamp was not designed to provide structural reinforcement for the pipe because the pipe was determined to meet all of the ASME structural requirements of ASME Code Case N-513-3 through the next refueling outage when the ASME Code repair will be implemented. The licensee also stated that at a minimum, the two areas with measured wall thickness below the construction code minimum required thickness will be repaired in accordance with the IWA-4000 requirements during the next refueling outage. The NRC staff finds the sizing and type of clamp to be satisfactory in order to minimize leakage at the degraded areas of piping until the next refueling outage.

The NRC staff further questioned the licensee regarding the installation of only one clamping device to the piping system. By letter dated December 9, 2013, the licensee indicated that it would also install a clamp on the second degraded location (Area 1 weeping location) of the piping. The additional clamp would meet the same design parameters of the first clamp but will use straps instead of a two part pipe clamshell design. The clamp will consist of a 3/16 inch plate with sufficient clamping force to compress the gasket to minimize leakage. The NRC staff finds the installation of the second clamping device to maintain the systems hydraulic margin is adequate until an ASME Code repair is performed on the degraded piping.

As noted by the licensee, the corrosion rate used in its flaw growth calculation was conservatively estimated to be approximately 0.012 inches per year based on historical inside diameter data for the SW system carbon steel piping. The licensee noted that the actual corrosion rate is expected to be significantly less than this value because the corrosion is outside diameter initiated and all degraded areas were re-coated prior to backfill, which would minimize any future corrosion. The corrosivity of the brackish water environment inside the pipe is considered bounding compared to the soil corrosivity seen by the outside diameter of the piping. The NRC staff finds that the corrosion rate used in the licensee's flaw growth calculation is adequate to properly predict further degradation of the piping system until the next refueling outage because the degradation was initiated from the pipe outside surface where the corrosion

rate would be less than the inside diameter corrosion rate that was used in the licensee's calculation.

The NRC staff further questioned the licensee's proposed inspection of the monitoring well located by the degraded piping once the moat area was backfilled. The licensee explained that the wells will be monitored daily for level increase. The licensee further stated that if the temporary repair clamp was to start leaking and increase to 10 gallons per minute (gpm) the moat area would be excavated and the affected piping would be inspected. The amount of 10 gpm was 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 licensee stated that a decision would be made to excavate and assess the pipe well before the 10 gpm limit if adverse trends were occurring. The NRC staff finds that the licensee's daily monitoring of the well is acceptable because the monitoring frequency would provide reasonable assurance of the structural integrity of the degraded piping until the spring 2015 refueling outage.

With respect to the hardship justification, the licensee noted that in order to perform a repair/replacement in accordance with subsection IWA-4000 of the ASME Section XI, a plant shutdown would have to occur. This would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee stated that the affected pipe has been demonstrated to remain structurally capable of performing its intended safety function through the scheduled spring 2015 refueling outage using the methodology and the flaw allowable limit determined from ASME Code Case N-513-3. The NRC staff finds that the licensee could repair the degraded pipe in accordance with the ASME Code. However, a plant shutdown would be required, which may introduce unintended transients and system perturbations. In addition, the staff determines that the proposed alternative repair provides for the structural integrity and leak tightness of the piping system whereas an ASME Code repair would not provide a compensating increase in the level of safety of the plant when considering the hardship to implement an ASME Code repair.

In summary, the NRC staff finds that the proposed alternative will provide reasonable assurance of structural integrity and leak tightness of the subject pipe and is acceptable for use until the next refueling outage which is scheduled for spring 2015.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the service water piping, and that lines 1093 and 1099 (cooling water supply to emergency diesel generators) will be maintained until the next refueling outage. The staff finds that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii) and is in compliance with the requirements of the ASME Code, Section XI, for which relief was not requested. Therefore, the staff authorizes the use of Relief Request IP3-008 at Indian Point Unit 3 until the next refueling outage which is scheduled for spring 2015. At that time, the licensee will permanently repair/replace the subject pipe in accordance with the ASME Code, Section XI.

All other requirements of ASME Code, Section XI for which relief has not been specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Steve Vitto

Date: April 11, 2014

requirements of the ASME Code, Section XI, for which relief was not requested. Therefore, the staff authorizes the use of Relief Request IP3-008 at Indian Point 3 until the next refueling outage which is scheduled for spring 2015.

Sincerely,

/ra/

Benjamin G. Beasley, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-286

Enclosure:
Safety Evaluation

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