

April 22, 2003

Mr. Michael Kansler, President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: REQUEST FOR RELIEF NOS. 3-14 AND 3-16 FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE SECTION XI, INDIAN POINT NUCLEAR GENERATING UNIT NO. 3 (TAC NO. MB4766)

Dear Mr. Kansler:

By letter dated April 3, 2002, as supplemented on September 23, 2002, and February 3, 2003, Entergy Nuclear Operations, Inc. submitted Request for Relief (RR) Nos. 3-12, 3-14, 3-16, and 3-17, which were associated with the third 10-year interval for the inservice inspection (ISI) at Indian Point Nuclear Generating Unit No. 3 (IP3). Specifically, relief was sought from the 100% examination coverage requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," pursuant to Section 50.55a(g)(6)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR). By the September 23, 2002, letter, you withdrew RR 3-12 and RR 3-17.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the proposed relief requests. The results are provided in the enclosed safety evaluation.

The NRC staff concludes that the ASME Code examination coverage requirements are impractical for the components listed in RR 3-14, Revision 2, and RR 3-16, Revision 3. Furthermore, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that are being performed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval at IP3, which is until July 20, 2009. The granting of relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

M. Kansler

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If you should have any questions, please contact the IP3 Project Manager, Patrick Milano, at 301-415-1457.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate 1
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-286

Enclosure: Safety Evaluation

cc w/encl: See next page

M. Kansler

- 2 -

If you should have any questions, please contact the IP3 Project Manager, Patrick Milano, at 301-415-1457.

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Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF NOS. RR 3-14, REVISION 2 AND RR 3-16, REVISION 3

ENTERGY NUCLEAR OPERATIONS, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3

DOCKET NO. 50-286

1.0 INTRODUCTION

By letter dated April 3, 2002 (Reference 1), as supplemented on September 23, 2002 (Reference 2), and February 3, 2003 (Reference 3), Entergy Nuclear Operations, Inc. (ENO, the licensee) submitted Requests for Relief (RR) Nos. 3-12 (Revision 1), 3-14 (Revision 2), 3-16 (Revision 3), and 3-17 (Revision 2), associated with the third 10-year inservice inspection (ISI) interval at Indian Point Nuclear Generating Unit No. 3 (IP3). By letter dated September 23, 2002, the licensee withdrew RR 3-12 and RR 3-17.

The licensee sought relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

The U.S. Nuclear Regulatory Commission (NRC) staff, with technical assistance from its contractor, Pacific Northwest National Laboratory (PNNL), reviewed and evaluated the information provided by the licensee in support of RRs 3-14 and 3-16.

2.0 REGULATORY EVALUATION

Inservice inspection of ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by Section 50.55a(g) of Title 10 of the *Code of Federal Regulations* (10 CFR), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if: (i) the proposed alternatives would 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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the

pre-service examination requirements, set forth in the ASME Code, Section XI, 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable Code of record for the third 10-year ISI interval for IP3 is the 1989 Edition of the ASME Code.

3.0 TECHNICAL EVALUATION

The NRC staff adopts the evaluations and recommendations for granting relief contained in the attached Technical Letter Report (TLR), prepared by PNNL.

3.1 RR 3-14, Revision 2

For RR 3-14, Revision 2, the NRC staff determined that it is impractical for the licensee to perform the Code-required volumetric examination of the pressurizer upper shell-to-head circumferential weld (no. 17), and one foot of the adjoining longitudinal shell-to-head welds (nos. 2 and 16) for both the upper and lower heads. Complete examinations, as required by the Code, are restricted by several factors, including the biological and missile shield, proximity of pressurizer safety relief piping, permanently installed insulation, and welded pads. It would be a significant burden on the licensee to perform the Code-required examinations, because the subject components would be required to be redesigned. The licensee has proposed, as an alternative, to perform VT-2 visual examinations of the upper head welds (nos. 16 and 17) for evidence of leakage during system pressure tests. The licensee noted that it is expected that any through-wall defects would be detected by this visual examination prior to the failure of the pressurizer based on the expectation that the component will experience leakage before a catastrophic failure. In addition, the licensee proposed to perform a volumetric examination by ultrasonic testing (UT) of the lower head longitudinal weld no. 2 to the extent practical. In lieu of the adjoining 1-foot of weld no. 2, the licensee will examine an accessible foot of weld. Therefore, the NRC staff determined that reasonable assurance of the structural integrity of the subject components has been provided based on the volumetric examinations and Code required VT-2 visual examination performed during system leakage tests during each outage.

3.2 RR 3-16, Revision 3

For RR 3-16, Revision 3, the NRC staff determined that it is impractical for the licensee to perform volumetric examinations of the inside radius sections for the pressurizer spray (24IR), relief (23IR), safety (20IR, 21IR and 22IR), and surge (25IR) nozzles to the Code requirements. The outside geometry, as-cast surface of the inner radius, and physical restrictions preclude volumetric examination to the extent required by Code. It would be a significant burden on the licensee to perform the Code required examinations, because the subject components would be required to be redesigned.

The licensee has proposed performing a remote visual (VT-1) examination on the inside surface of the inner radius sections of these pressurizer nozzles, with the exception of surge nozzle 25IR, which has a retaining basket covering the outlet. The licensee's proposed alternative has been identified as an enhanced VT-1 (EVT-1) visual examination. Enhanced in

this case refers to the 1 mil-wide wire or crack standard that is to be demonstrated by the examiners to assure acceptable resolution sensitivity. This EVT-1 is consistent with the requirements found in the latest revision of 10 CFR 50.55a(b)(2)(xxi)(A).

The primary degradation mode in the inner radius of the subject pressurizer nozzles is thermal fatigue, which would typically produce a network of hairline surface indications along the circumference of the nozzle in the inner radius section. Given the resolution capability of the EVT-1 visual examination, the licensee would be able to detect such flaws if they are located on the accessible surface areas of the nozzle inner radius sections. Industry service history for these integrally-cast components has not shown any significant degradation. Since the Code-required 100% volumetric examination coverage is impractical for the licensee to perform, the EVT-1 being proposed to examine the subject nozzle inside radius sections should detect any general patterns of degradation that may occur in the areas examined, providing reasonable assurance of continued structural integrity of the subject components.

4.0 CONCLUSION

The NRC staff concludes that the Code examination coverage requirements are impractical for the components listed in RR 3-14 (Revision 2) and RR 3-16 (Revision 3). Furthermore, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that are being performed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year interval which is until July 20, 2009. All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

The NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Attachment: Technical Letter Report

Principal Contributor: T. McLellan

Date: April 22, 2003

TECHNICAL LETTER REPORT
ON THIRD 10-YEAR INSERVICE INSPECTION INTERVAL
REVISED REQUESTS FOR RELIEF
FOR
ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT 3
DOCKET NUMBER 50-286

1. INTRODUCTION

By letter dated April 3, 2002, the licensee, Entergy Nuclear Operations, Inc., submitted requests for relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, for Indian Point Nuclear Generating Unit 3 (IP3). In response to an NRC request for additional information, the licensee withdrew Requests for Relief RR 3-12 and RR 3-17 by letter dated August 23, 2002. The remaining requests for relief, RR 3-14 and RR 3-16, were revised and submitted as part of the third 10-year inservice inspection (ISI) interval, which covers the time period from July 21, 2000 to July 20, 2009. Additional information concerning the visual alternative proposed in RR 3-16 was provided in a letter dated February 3, 2003. Pacific Northwest National Laboratory (PNNL) has evaluated the revised requests for relief and supporting information submitted by the licensee in the following section.

2.0 EVALUATION

The information provided by Entergy Nuclear Operations, Inc. in support of the requests for relief from Code requirements has been evaluated and the bases for disposition are documented below. The Code of record for Indian Point Unit 3, third 10-year interval, is the 1989 Edition of ASME Section XI, with no addenda.

2.1 **Request for Relief RR 3-12, Rev. 1, Examination Category B-A, Pressure Retaining Welds in Reactor Pressure Vessel**

Note: As a result of an NRC request for additional information, Request for Relief RR 3-12, Rev. 1 was withdrawn by the licensee in a letter dated August 23, 2002.

2.2 **Request for Relief RR 3-14, Rev. 2, Examination Category B-B, Pressure Retaining Welds in Vessels Other than the Reactor Pressure Vessel**

Code Requirement: Examination Category B-B, Items B2.11 and B2.12 require essentially 100% volumetric examination, as defined by Figures IWB-2500-1 and -2, of the pressurizer upper and lower head circumferential welds, and one foot of adjoining longitudinal welds.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required 100% volumetric examination of circumferential shell-to-head welds #17 and the intersecting foot of welds #2 and #16.

Licensee Basis for Relief (as stated):

Pursuant to 10CFR50.55a(g)(5)(iii), relief is requested on the basis that compliance with the specified Code requirement is impractical due to accessibility limitations. The pressurizer was designed and fabricated to Codes in effect during the late 1960's. The Codes used did not provide for full access for inservice inspection as required by later Codes. The upper circumferential and longitudinal welds are enclosed in a biological and missile shield (see attached drawings 9321-F-25453 and 9321-F-25463¹). Insulation details can be seen on attached drawing 9321-LL-53253².

While the insulation drawing indicates that the insulation in the area of circumferential weld #17 is removable, the pressurizer safety relief piping and the proximity to the missile shield makes removal of the insulation and inspection of the weld impractical. The longitudinal weld #16 is just below weld #17 and is even more restricted by the missile shield.

Longitudinal Weld #2 for the lower head had been examined in the past, but the required coverage could not be achieved due to access limitations. A similar relief was granted for the second 10-Year interval (reference SER dated November 7, 1991, TAC No. 72247). The first 15" of the section of the weld adjoining circumferential weld #1 is covered by permanent insulation. One foot of the weld above the first 15" was scanned in the last interval through an "access window" section of removable insulation, but the insulation near the weld limits the 45-degree and 60-degree scans as indicated in the attached "Limitation to Examination" sheets. The access window cannot be adjusted to increase the inspection area.

Licensee's Proposed Alternative Examination (as stated):

Visual examination (VT-2) will be performed of the upper head welds (#s 16 and 17) for evidence of leakage during system pressure tests in accordance with IWB-2500, Category B-P, and Code Case N-498-1 [*Alternative Requirements for 10-Year System Hydrostatic testing for Class 1, 2, and 3 Systems, Section XI, Division 1*]. It is expected that any through wall defects would be detected by this examination prior to the failure of the pressurizer based on the expectation that the component will experience leakage before a catastrophic failure. A similar request for relief was approved in the Second 10-Year interval (Reference SER dated November 7, 1991, TAC NO. 72247).

Volumetric examination of the lower longitudinal welds (#2) will be performed, but only to the extent practical as indicated above in this relief request. In lieu of the adjoining one foot of weld #2, an accessible foot of the weld will be examined to the extent practical.

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1. Drawings 9321-F-25453 and 9321-F-25463 are contained in the licensee's letter dated April 3, 2002 and are not included in this report.
 2. Drawing 9321-F-25463 is contained in the licensee's letter dated April 3, 2002 and is not included in this report.

Evaluation: The Code requires essentially 100% volumetric examination of the accessible length of the subject pressurizer welds. However, complete examinations as required by Code are restricted by several factors, including the biological and missile shield, proximity of pressurizer safety relief piping, permanently installed insulation and welded pads. These conditions make 100% volumetric examinations impractical to perform for these welds. To gain access for examination, the vessel and insulation structure would require design modifications. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% volumetric examinations are impractical.

Drawings and descriptions included in the licensee's submittal clearly show that volumetric examinations of circumferential weld #17 and the required one foot of intersecting longitudinal weld #16 cannot be performed due to the proximity of pressurizer safety relief piping and the missile shield. The intersecting foot of longitudinal weld #2 is being examined to the extent practical, however, access limitations prevent full coverage.

The licensee is examining other similar welds on the pressurizer to the full extent of the Code and no problems or indications have been detected during these examinations. Further, no known degradation mechanisms or industry failures have been experienced for the subject pressurizer welds. Based upon the volumetric coverage that the licensee has completed, any significant patterns of degradation should have been detected in the areas examined, providing reasonable assurance of continued structural integrity of these welds. Due to the impracticality of examining 100% of the subject welds, and the examination coverages obtained by the licensee, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.3 **Request for Relief RR 3-16, Rev.3, Examination Category B-D, Full Penetration Welded Nozzles in Vessels, Nozzle Inner Radius Sections**

Code Requirement: Examination Category B-D, Item B3.120, requires 100% volumetric examination of nozzle inner radius sections, as defined by Figure IWB-2500-7, of Class 1 full penetration nozzle welds in the pressurizer.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the volumetric examination of inside radius sections for pressurizer spray, relief, safety and surge nozzles, licensee designations 20IR, 21IR, 22IR, 23IR, 24IR and 25IR.

Licensee Basis for Relief (as stated):

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that the nozzle design makes it impractical to perform the examination. The pressurizer was designed and fabricated to Codes in effect during the late 1960s. The Codes used did not provide for full access for inservice inspection nor did they require a surface finish in the nozzle area suitable for UT examination. The design of the nozzles, utilizing a gradual inside radius section, is specifically intended to reduce stress in this area and minimize the conditions that might lead to cracking.

The nozzles on the pressurizer are cast with the vessel heads. The identification numbers for these nozzles are 20IR, 21IR, 22IR, 23IR, 24IR, and 25IR as shown on sketch INT-1-2100. The as-cast surface of the heads, combined with the geometry of this area, makes ultrasonic examination of the nozzle inner radii impractical. Entergy has consulted with EPRI on other inspection techniques, such as the phased array. Although phased array could cover a larger inspection volume, it is also limited by the requirement of a relatively smooth inspection surface. Because of the casting, the pressurizer nozzle surface is quite uneven and therefore not suitable for either the UT or the phased array inspection techniques. An uneven surface will change the direction of the beam, resulting in an amplified deviation. Additionally, to perform an effective inspection, a transducer matching the curvature of the nozzle area is also required. The varying curvature of the nozzles thus prevents an effective inspection of this area as well. The geometry and size of the nozzles are such that a radiographic examination is not feasible. Specifically, the radiographic test film cannot be placed properly from the I.D. due to a lack of interior structure. Placement of the source will not allow proper film to source distance, resulting in greatly reduced sharpness. Access to the exterior nozzle inspection area is also limited due to the following physical restrictions: 1) the relief valves, piping, the platform at elevation 123'-3" that is used for valve inspection and removal; 2) the plate and channel assembly at elevation 120'-11"; 3) insulation and the missile shield wall, as shown in attached drawings 9321-F-25453, 9321-F-25463 and 9321-F53253³. As result, any surface or visual examination would be significantly restricted, especially considering the anticipated high radiation levels on the outside and the as-clad surface on the interior.

A similar relief to perform only the visual, VT-2 examination was initially requested for the 2nd ISI Interval, but was granted with an additional condition to perform a remote video examination of the pressurizer nozzle inside radius sections, with the exception of the pressurizer surge nozzle (25IR), which has a retaining basket covering the outlet, thus precluding remote visual examination (Reference SER dated December 21, 1994, TAC No. M8269 for Relief Request No. 9). These pressurizer nozzles inside radius sections were remote visually inspected during the Second ISI Interval (Refueling Outage 10 in 1999). No evidence of cracking was found.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the code-required volumetric examination, all nozzles (with the exception of Pressurizer Surge Nozzle 25IR) will be examined visually (VT-1) using a remote color video camera. The camera equipment will have enhanced magnification with a resolution sensitivity to detect a 1-mil width wire or crack. This visual (VT-1) examination for all accessible nozzles will be performed at the same time during an outage when the Pressurizer manway cover is removed for maintenance activities or by the end of the 10-Year interval for ISI inspection. In addition, all nozzles will be visually examined (VT-2) at each refueling outage during system pressure tests in accordance with IWB-2500, Category B-P, and Code Case N-498-1. It is expected that any through

3. Drawings 9321-F-25453, 9321-F-25463 and 9321-F53253 are contained in the licensee's letter dated April 3, 2002 and are not included in this report.

wall defects would be detected by the proposed alternate examinations prior to failure of the component. This is based on the expectation that the component will experience leakage before a catastrophic failure.

Evaluation: The Code requires a volumetric examination of the inner radius sections of pressurizer nozzles designated 20IR, 21IR, 22IR, 23IR, 24IR, and 25IR. However, the outside geometry, as-cast surface of the inner radius, and physical restrictions preclude volumetric examination to the extent required by code. For the licensee to achieve 100% volumetric coverage of the subject nozzle inside radius sections, which are part of the integrally cast nozzles in the pressurizer, redesign and replacement of the pressurizer, or substantial surface preparation, would be required. This would place a significant burden on the licensee, therefore, the Code-required 100% volumetric examination is impractical.

As shown on the sketches and technical descriptions provided by the licensee, the following physical restrictions preclude examination of the inner radius from the outside surface of the nozzle: 1) the relief valves, piping, and platform structure at elevation 123'-3" that is used for valve inspection and removal; 2) the plate and channel assembly at elevation 120'-11"; and 3) permanent insulation and the missile shield wall. In addition, the nozzle as-cast surface is too uneven to permit coupling for ultrasonic scans from the outside surface of the nozzle. The licensee has evaluated the possibility of using either radiography or state of the art phased array technology to achieve better coverage and found that neither of these alternatives are viable. Specifically, a radiographic test cannot be performed because film can not be placed properly from the I.D. due to a lack of interior structure, further, access and component geometry do not allow placement of the source for proper film to source distance. Phased array ultrasonic examination is also not possible because of the as-cast uneven outside surface of the integral nozzles.

The licensee has proposed performing a remote visual (VT-1) examination on the inside surface of the inner radius sections of these pressurizer nozzles, with the exception of surge nozzle 25IR, which has a retaining basket covering the outlet. The visual (VT-1) examination will be performed when the pressurizer man-way cover is removed, or by the end of the interval. The licensee proposed to perform what has been identified as an *enhanced* VT-1 (EVT) visual examination. Enhanced in this case refers to the 1-mil wide wire or crack standard that is to be demonstrated by the examiners to assure acceptable resolution sensitivity. This EVT is consistent with the requirements found in the latest revision of 10 CFR 50.55a(b)(2)(xxi)(A).

The primary degradation mode in the inner radius of the subject pressurizer nozzles is thermal fatigue, which would typically produce a network of hairline surface indications along the circumference of the nozzle in the inner radius section. Given the resolution capability of the EVT-1 visual examination, it is expected that the licensee would detect such flaws if they are located on the accessible surface areas of the nozzle inner radius sections. Further, the industry service history for these integrally-cast components has not shown any significant degradation. While the licensee cannot meet the Code-required 100% volumetric examination coverage, the enhanced visual examination being conducted on the subject nozzle inside radius sections should detect any general

patterns of degradation that may occur in the areas examined, providing reasonable assurance of continued structural integrity. Therefore, pursuant to 10CFR50.55a(g)(6)(i), it is recommended that relief be granted.

2.4 **Request for Relief RR 3-17, Rev. 2, Repairs of Class 3 Moderate Energy Service Water Piping**

Note: As a result of an NRC request for additional information, Request for Relief RR 3-17, Rev. 2 was withdrawn by the licensee in a letter dated August 23, 2002.

3.0 **CONCLUSIONS**

Pacific Northwest National Laboratory has reviewed the licensee's submittal and concludes that the Code examination coverage requirements are impractical for the subject components listed in Requests for Relief RR 3-14, Rev. 2 and RR 3-16, Rev. 3. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that are being performed. Therefore, for these requests, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i). Requests for Relief RR 3-12, Rev. 1 and RR 3-17, Rev. 2 were withdrawn in a letter dated August 23, 2002.