

October 15, 2004

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

SUBJECT: RELAXATION OF FIRST REVISED ORDER ON REACTOR VESSEL  
NOZZLES, INDIAN POINT NUCLEAR GENERATING UNIT NO. 2  
(TAC NO. MC3194)

Dear Mr. Kansler:

In a letter dated May 19, 2004, as supplemented on August 23, 2004, Entergy Nuclear Operations, Inc. (the licensee), submitted requests for relaxation regarding the inspection of reactor pressure vessel (RPV) head nozzles at Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and 3). The relaxations were requested from the interim inspection requirements in the Nuclear Regulatory Commission's (NRC's) First Revised Order Modifying Licenses, EA-03-009, dated February 20, 2004 (First Revised Order).

The NRC staff has reviewed the licensee's requested relaxation to implement an alternative to the requirements of Section IV.C.(5)(a) of the First Revised Order for RPV head penetration nozzles at IP2. The results are provided in the enclosed safety evaluation. The relaxation requests for IP3 will be evaluated in a separate letter.

The NRC staff has concluded that the proposed alternative examination of the RPV head provides reasonable assurance of the structural integrity of the RPV head, penetration nozzles, and welds. Further inspections of the RPV head, in accordance with Section IV, paragraph C.(5)(a) of the First Revised Order, would result in hardship without a compensating increase in the level of quality and safety. Therefore, pursuant to Section IV, paragraph F, of the First Revised Order, the NRC staff authorizes the proposed alternative inspection for all future bare-metal visual examinations performed per Section IV, paragraph C.(5)(a), of the First Revised Order, for the RPV head at IP2.

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

Sincerely,

*/RA/*

Cornelius F. Holden, Director  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-247

Enclosure: Safety Evaluation

cc w/encl: See next page

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Accession Number: ML042890389

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LETTER TO: Mr. Michael R. Kansler

FROM: Cornelius F. Holden, Jr.

SUBJECT: RELAXATION OF FIRST REVISED ORDER ON REACTOR VESSEL  
NOZZLES, INDIAN POINT NUCLEAR GENERATING UNIT NO. 2  
(TAC NO. MC3194)

DATE:

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELAXATION OF FIRST REVISED ORDER MODIFYING LICENSES, EA-O3-009

BARE-METAL VISUAL EXAMINATION COVERAGE

FOR REACTOR PRESSURE VESSEL HEAD

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-247

1.0 INTRODUCTION

The First Revised Order Modifying Licenses, EA-03-009 (Order), dated February 20, 2004 (ADAMS Accession No. ML040220181), requires specific examinations of the reactor pressure vessel (RPV) head and vessel head penetration (VHP) nozzles of all pressurized-water reactor (PWR) plants. Section IV, paragraph F, of the Order states that requests for relaxation of the Order associated with specific penetration nozzles will be evaluated by the Nuclear Regulatory Commission (NRC) staff using the procedure for evaluating proposed alternatives to the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code*, in accordance with Title 10 of the *Code of Federal Regulations*, Part 50, Section 55a(a)(3). Section IV, paragraph F, of the Order states that a request for relaxation regarding inspection of specific nozzles shall address the following criteria: (1) the proposed alternative(s) for inspection of specific nozzles will provide an acceptable level of quality and safety, or (2) compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

For Indian Point Nuclear Generating Unit No. 2 (IP2), and similar plants determined to have a moderate susceptibility to primary water stress corrosion cracking in accordance with Section IV, paragraphs A and B of the Order, the following inspections are required to be performed every refueling outage in accordance with Section IV, paragraph C.(5)(a) or paragraph C.(5)(b) of the Order.

- (a) Bare-metal visual (BMV) examination of 100% of the RPV head surface (including 360E around each RPV head penetration nozzle). For RPV heads with the surface obscured by support structure interferences which are located at RPV head elevations downslope from the outermost RPV head penetration, a BMV inspection of no less than 95% of the RPV head surface may be performed provided that the examination shall include those areas of the RPV head upslope and downslope from the support structure interference to identify any evidence of boron or corrosive product. Should any evidence of boron or

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corrosive product be identified, the licensee shall examine the RPV head surface under the support structure to ensure that the RPV head is not degraded.

- (b) For each penetration, perform a nonvisual NDE (nondestructive examination) in accordance with either (i), (ii), or (iii) below:
  - (i) Ultrasonic testing of the RPV head penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or bottom of the nozzle if less than 2 inches (see Figure IV-1 in the Order); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-2 in the Order). In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel.
  - (ii) Eddy-current testing or dye-penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches) (see Figure IV-3 in the Order); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4 in the Order).
  - (iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces, and leak paths of the RPV head penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:
    - 1. On nozzle material below the J-groove weld, both the outside diameter and inside diameter surfaces of the nozzle must be examined.
    - 2. On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted provided a surface examination of the J-groove weld is also performed.



In addition, the requirements of paragraph IV.C.(5)(a) and paragraph IV.C.(5)(b) shall be performed at least once over the course of every two refueling outages. Footnote 3 of the Order provides specific criteria for examination of repaired VHP nozzles.

By letter dated May 19, 2004, as supplemented on August 23, 2004, Entergy Nuclear Operations, Inc. (Entergy or the licensee), requested relaxation to implement an alternative to the requirements of Section IV.C.(5)(a) of the First Revised Order for RPV head penetration nozzles at IP2.

## 2.0 RELAXATION REQUEST FOR BMV EXAMINATION COVERAGE OF RPV HEAD

### 2.1 First Revised Order Requirements for Which Relaxation is Requested

The licensee has requested relaxation from Section IV, paragraph C.(5)(a), of the First Revised Order. The specific relaxation requested is identified below.

### 2.2 Licensee's Proposed Alternative

The licensee will perform a BMV examination of no less than 95% of the RPV head surface. The small area not being inspected is partially obscured by a reflective metal insulation (RMI) support ring located downslope from the outermost RPV head penetrations.

### 2.3 Licensee's Basis for Proposed Alternative

The licensee stated that the RPV head insulation package consists of RMI panels supported above the RPV head surface such that remote visual devices can be used to perform the BMV examination, without removing the RMI. The licensee stated that the outer wall of the RMI package, which includes the RMI support ring, rests on the RPV head downslope of the outermost penetration nozzles. Although this RMI support ring provides structural support for the other panels in the insulation package, the licensee stated it may not be considered as a "support structure" as intended in Section IV.C.(5)(a) of the First Revised Order, EA-03-009. The licensee is, therefore, requesting a relaxation of the requirement for BMV examination of 100% of the RPV head surface. Because of the interference from this insulation component, the licensee proposed to perform a BMV examination of no less than 95% of the RPV head surface.

The licensee stated that they will inspect the upslope and downslope of the interference, and if evidence of boron or corrosive product is identified, the examination will be expanded to cover the affected area under the interference. The RMI support ring does not prevent the inspection of 360E around the RPV head penetration nozzles.

The licensee stated that although the RMI support ring is removable, the other components of the insulation package supported by the support ring and the control rod drive mechanism cooling shroud would have to be removed first. The licensee stated that this is a significant labor-intensive task. The licensee estimated that the dose to personnel removing and reinstalling the shroud and insulation would be approximately 7 man-rem for IP2. The licensee stated that additional stay-times in the radiation field required to perform the removal and reinstallation task represents a hardship without a compensating increase in the effectiveness of the BMV examination.



## 2.4 Staff's Evaluation

The NRC staff's review of this relaxation request was based on criterion (2) of paragraph F of Section IV of the Order, which states:

Compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Within the context of the licensee's proposed alternative examination of the RPV head, the licensee has demonstrated the hardship that would result from implementing a BMV examination of 100% of the RPV head surface.

The licensee proposed to perform a BMV examination of no less than 95% of the RPV head surface. The small area not being inspected is partially obscured by the RMI package including the support ring located downslope from the outermost RPV head penetrations. The licensee stated that this RMI support ring provides structural support for the other panels in the insulation package. The licensee submitted a relaxation request because it was uncertain if the RMI support ring could be considered a "support structure" as intended in Section IV.C.(5)(a) of the Order. The licensee requested a relaxation of the requirement for BMV examination of 100% of the RPV head surface. Because of the interference from the insulation component, the licensee proposed to perform a BMV examination of no less than 95% of the RPV head surface.

The licensee stated that although the RMI support ring is removable, other components of the insulation package supported by the support ring and the control rod drive mechanism cooling shroud would have to be removed first. In response to a request for additional information (RAI) dated July 29, 2004, the licensee submitted a letter dated August 23, 2004, which provided the removal/reinstallation sequence of the insulation package. The licensee stated that the removal sequence is as follows:

1. Build scaffolding around the Reactor Pressure Vessel (RPV) Head
2. Unbolt control rod drive mechanism (CRDM) cooling shroud bolts (18 bolts at the base of the shroud support ring)
3. Install rigging
4. Lift the shroud approximately 4 feet high and maintain for the whole evolution
5. Establish laydown area for insulation panels
6. Remove D4 panel sections (total 18 panels)
7. Remove D3 panel sections (approx. 24 panels)
8. Remove D2 panel sections (approx. 24 panels)
9. Remove D1 panel sections (approx. 24 panels)
10. Reverse the sequence for reinstallation of the entire insulation support package.

The licensee estimates that the dose to personnel removing and reinstalling the shroud and insulation would be approximately 7 man-rem for IP2. The licensee stated in its response to the RAI that the RPV head surface that is obscured by the support ring is calculated at less than 5% with the inspection access from the upslope and downslope sides. Therefore, the planned inspection will cover at least 95% of the RPV head surface.

The licensee stated that they will inspect the upslope and downslope of the interference, and if evidence of boron or corrosive product is identified, the licensee will examine the RPV head surface under the support structure to ensure that the RPV head is not degraded. This is consistent with the requirements of Section IV.C.(5)(a) of the Order.

The licensee stated that during the prior BMV inspection (November 2002), the inspection coverage was 100% because a plant modification was implemented which replaced the originally installed Kaylo Block permanent insulation with the new RMI panels. The area under the new RMI support ring was previously cleaned and inspected with satisfactory results.

The safety issues that are addressed by the inspections mandated by the Order are degradation (corrosion) of the low-alloy steel RPV head, and reactor coolant pressure boundary integrity. Based upon the above information, the alternative BMV examination proposed by the licensee, provides reasonable assurance of the structural integrity of the RPV head, CRDM nozzles, and welds.

### 3.0 CONCLUSION

The NRC staff concludes that the licensee's proposed alternative examination of the RPV head provides reasonable assurance of the structural integrity of the RPV head, CRDM nozzles, and welds. Further inspections of the RPV head, in accordance with Section IV, paragraph C.(5)(a) of the First Revised Order, EA-03-009, dated February 20, 2004, would result in hardship without a compensating increase in the level of quality and safety. Therefore, pursuant to Section IV, paragraph F, of the First Revised Order, EA-03-009, the staff authorizes the proposed alternative inspection for all future BMV examinations performed per Section IV.C.(5)(a) of the First Revised Order for the RPV head at IP2.

Principal Contributor: E. Reichelt

Date: October 15, 2004