

June 9, 2008

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 - ISSUANCE OF
AMENDMENT RE: CHANGES TO TECHNICAL SPECIFICATIONS TO
REPLACE SODIUM HYDROXIDE BUFFER WITH SODIUM TETRABORATE
(TAC NO. MD8206)

Dear Sir or Madam:

The Commission has issued the enclosed Amendment No. 236 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Unit No. 3. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated February 28, 2008.

The amendment revises TS 3.6.7 "Recirculation pH Control System" to replace the sodium hydroxide buffer with sodium tetraborate to minimize the potential for sump screen blockage under post-loss-of-coolant accident conditions.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

/ra/

John P. Boska, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-286

Enclosures:

1. Amendment No. 236 to DPR-64
2. Safety Evaluation

cc w/encls: See next page

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cc w/encls: See next page

DISTRIBUTION:

See next page

Package No.: ML081140171

Amendment No.: ML081140142

Tech Spec No.: ML081140177

* See memo dated 4/18/08

OFFICE	LPL1-1\PM	LPL1-1\LA	CSGB/BC	ITSB/BC	SSIB/BC	OGC	LPL1-1\BC
NAME	JBoska	SLittle	AHiser*	RElliott	MScott	STurk	MKowal
DATE	4/28/08	4/28/08	4/18/08	5/5/08	5/6/08	5/16/08	6/9/08

Official Record Copy

DATED:

AMENDMENT NO. 236 TO FACILITY OPERATING LICENSE NO. DPR-64 INDIAN POINT
UNIT 3

PUBLIC

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ENTERGY NUCLEAR INDIAN POINT 3, LLC

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-286

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 236
License No. DPR-64

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Entergy Nuclear Operations, Inc. (the licensee) dated February 28, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-64 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 236, are hereby incorporated in the license. ENO shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/ra/

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

Attachment:
Changes to the License and
Technical Specifications

Date of Issuance: June 9, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 236

FACILITY OPERATING LICENSE NO. DPR-64

DOCKET NO. 50-286

Replace the following page of the License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove Page

3

Insert Page

3

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

ii

3.6.7-1

3.6.7-2

Insert Pages

ii

3.6.7-1

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 236 TO FACILITY OPERATING LICENSE NO. DPR-64
ENERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286

1.0 INTRODUCTION

By letter dated February 28, 2008, Agencywide Documents Access and Management System (ADAMS) Accession No. ML080670211, Entergy Nuclear Operations, Inc. (the licensee) submitted a request for changes to the Indian Point Nuclear Generating Unit No. 3 (IP3) Technical Specifications (TS). The proposed change would replace the containment building sump buffer, currently sodium hydroxide (NaOH), with sodium tetraborate (STB). TS section 3.6.7 is currently named "Spray Additive System," but will be renamed "Recirculation pH Control."

2.0 REGULATORY EVALUATION

The Nuclear Regulatory Commission (NRC) staff review addresses the impact of the proposed change from NaOH to STB on the containment sump performance, especially potential chemical effect impact on sump screen blockage and head loss during the recirculation phase of a loss-of-coolant accident (LOCA).

There are two sumps in the containment building at IP3, known as the recirculation sump and the containment sump. In this document, they will be referred to as containment sumps. Both sumps are part of the emergency core cooling system (ECCS). Every nuclear power plant is required by Section 50.46 of Title 10 of the *Code of Federal Regulations* (10 CFR) to have an ECCS to mitigate a design-basis accident (DBA). 10 CFR 50.46(a)(1)(i) states in part, that each "pressurized light-water nuclear power reactor ... must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section." 10 CFR 50.46(b)(5), "Long-term cooling," states "After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core."

The NRC staff utilized the following regulatory guidance in performing this review:

- NUREG-0800, Section 6.5.2, "Containment Spray as a Fission Product Cleanup System," which states, in part, that long-term iodine retention may be assumed only when

the equilibrium sump solution pH, after mixing and dilution with the primary coolant and ECCS injection, is above 7.

- Regulatory Guide 1.82, Revision 3, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," Section 1.1.2, which states, in part, that debris that could accumulate on the sump screen should be minimized.

3.0 TECHNICAL EVALUATION

Post-LOCA containment pool buffering is primarily required to control the radiological consequences of the accident by reducing the release of radioactive iodine fission products from the pool to the containment atmosphere as molecular iodine. Maintaining a pH above 7 prevents significant amounts of iodine, released from failed fuel and dissolved in the recirculation water, from converting to a volatile molecular iodine form and evolving into the containment atmosphere. The pH of the sump water at IP3 is currently controlled by the addition of NaOH buffer to the boric acid solution of the ECCS injection water that becomes a portion of the sump water after a LOCA. However, research into certain aspects of the sump chemistry has indicated that NaOH reacts with certain insulation materials forming insoluble aluminum-based precipitates. These precipitates, when generated in significant quantities, may impede the flow of fluid through the strainers in the sump. This flow is needed during the large-break LOCA recirculation phase, to provide cooling water to the reactor core. To reduce the potential for strainer blockage by chemical precipitates, the licensee proposes to change the buffer in the sump water from NaOH to STB. The STB will be stored in baskets and dissolved when the post-LOCA sump water reaches the basket elevation.

The method of introducing the buffer material to the post-LOCA environment is different for STB than for NaOH. NaOH is currently added as a liquid to the containment spray water, which sprays into the containment building during a LOCA to reduce the pressure. STB is in solid form and is placed in the containment building in a location where it will dissolve as the lower level of containment fills with water from the LOCA and the ECCS injection. IP3 will install 8 wire baskets to hold the STB. The licensee confirmed that the baskets are adequately sized to hold the required amount of STB. The minimum amount of STB, 8,096 pounds (lbs), was determined by the licensee. The licensee's analyses included consideration of minimum and maximum quantities of boron and borated water and the time-dependent post-LOCA sump temperature. The analyses also included radiolysis of air and water, radiolysis of chloride-bearing electrical cable insulation and jacketing, and spilled reactor core inventory. The licensee determined that the minimum amount of STB required to maintain the minimum sump pH of 7.0 is greater than or equal to 8,096 lbs. The NRC staff performed a detailed evaluation to confirm the licensee's pH calculations from IP-CALC-07-00238. The NRC staff reviewed the licensee's methodology, assumptions, and performed hand calculations to verify the resulting pH value after 30 days. The NRC staff's independent verification demonstrated the containment sump pH would remain above 7 for at least 30 days with the quantities of STB described above.

The NRC staff reviewed the licensee's regulatory and technical analyses related to the impact of the proposed change from NaOH to STB on containment sump performance, particularly the potential impact from chemical effects on sump screen blockage and head-loss aspects of DBAs. The licensee's evaluation determined that STB is an acceptable alternative to NaOH based on the "Integrated Chemical Effects Test Project: Test #5 Data Report," on industry testing of buffers outlined in the technical report WCAP-16596-NP, "Evaluation of Alternative

Emergency Core Cooling System Buffering Agents,” and through plant-specific application of the chemical model developed in WCAP-16530-NP, “Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support [Generic Safety Issue] GSI-191.” Under the existing NaOH conditions, the WCAP-16350-NP model predicts approximately 180 lbs of chemical precipitates. For the proposed STB condition using conservative values for pH, temperature, and quantities of contributing materials, the model predicts approximately 110 lbs of chemical precipitates. Based on the WCAP-16530-NP model, the switch from NaOH to STB results in a reduction in the mass of predicted chemical precipitates of approximately 70 lbs. Additionally, after the calculations had been completed, IP3 removed some insulation, and aluminum quantities were reduced. The revised calculations predict a precipitate mass of approximately 90 lbs, resulting in an overall reduction in precipitate mass of approximately 90 lbs.

Based on verification calculations, the NRC staff finds that replacing the NaOH containment sump buffer with STB in the quantities specified by the licensee will provide acceptable containment sump buffering such that the sump pH will be maintained in an acceptable range under LOCA conditions.

Although potential chemical effects exist with the use of STB in the IP3 containment, the NRC staff determined that the quantity of chemical effects at IP3 will be lower with STB compared to NaOH. Based on the proper buffering to be provided by STB in the quantities specified and the relative reduction in the mass of chemical precipitates in the case of a LOCA, the NRC staff finds that the replacement of NaOH with STB in the quantities specified is acceptable. Revising the title of TS 3.6.7 to “Recirculation pH Control System” from “Spray Additive System” is also acceptable, as the chemical buffer will no longer be added to the containment building spray system.

The NRC staff finds that changing buffer materials from NaOH to STB at IP3 will result in an improved situation from a chemical effects standpoint. However, despite the significant reduction in the total amount of chemical precipitates, the WCAP-16530-NP model still predicts approximately 90 lbs of precipitate under STB conditions. The staff notes that the licensee will still need to demonstrate acceptable ECCS performance under the proposed STB conditions in order to fully resolve GSI-191, “Assessment of Debris Accumulation on PWR Sump Performance,” for IP3.

The NRC staff will be reviewing the licensee’s approach to resolving potential chemical effects associated with STB as part of the resolution process for NRC Generic Letter 2004-02, “Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors.”

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New York State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no

significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, 73 FR 19109 (April 8, 2008), and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: E. Wong

Date: June 9, 2008