November 7, 2002

Mr. Michael R. Kansler
Senior Vice President and
Chief Operating Officer
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 - AMENDMENT RE: INDIVIDUAL CONTROL ROD POSITION INDICATION (TAC NO. MB5572)

Dear Mr. Kansler:

The Commission has issued the enclosed Amendment No. 234 to Facility Operating License No. DPR-26 for the Indian Point Nuclear Generating Unit No. 2. The amendment consists of changes to the Technical Specifications (TSs) in response to your application transmitted by letter dated July 9, 2002.

The amendment revises TS Sections 3.10.4, “Rod Insertion Limits,” 3.10.5, “Rod Misalignment Limitations,” and 3.10.6, “ Inoperable Rod Position Indicator Channels,” to remove the cycle-specific allowances on (1) rod insertion limits during individual rod position indicator channel calibrations and (2) rod position indicator channel accuracy for operation at or below 50 percent power. The amendment also revises the control rod indicated misalignment limits.

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/

Patrick D. Milano, Sr. Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-247

Enclosures: 1. Amendment No. 234 to DPR-26
2. Safety Evaluation

cc w/encls: See next page

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Accession Number: ML023160194 *See previous concurrence

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DATE	11/07/02	11/07/02	11/07/02	10/05/02	11/07/02

Official Record Copy

DATED: <u>November 7, 2002</u>

AMENDMENT NO. 234 TO FACILITY OPERATING LICENSE NO. DPR-26 INDIAN POINT UNIT 2

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ENTERGY NUCLEAR INDIAN POINT 2, LLC

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-247

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 234
License No. DPR-26

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Nuclear Operations, Inc. (the licensee) dated July 9, 2002, 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-26 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 234, are hereby incorporated in the license. The licensee 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 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 7, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 234

FACILITY OPERATING LICENSE NO. DPR-26

DOCKET NO. 50-247

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	Insert Pages
vii	vii
3.10-5	3.10-5
3.10-6	3.10-6
3.10-9	3.10-9
3.10-13	3.10-13
3.10-14	3.10-14
3.10-15	3.10-15
3.10-16	3.10-16
-----	Table 3.10-1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 234 TO FACILITY OPERATING LICENSE NO. DPR-26

ENTERGY NUCLEAR OPERATIONS, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

DOCKET NO. 50-247

1.0 INTRODUCTION

By letter dated July 9, 2002, Entergy Nuclear Operations, Inc. (ENO or the licensee) submitted a request for changes to the Indian Point Nuclear Generating Unit No. 2 (IP2) Technical Specifications (TSs). The requested changes would revise TS Sections 3.10.4, “Rod Insertion Limits,” 3.10.5, “Rod Misalignment Limitations,” and 3.10.6, “Inoperable Rod Position Indicator Channels,” to remove the cycle-specific allowances on (1) rod insertion limits during individual rod position indicator channel calibrations and (2) rod position indicator channel accuracy for operation at or below 50 percent power. The proposed amendment also would revise the control rod indicated misalignment limits and make changes to the applicable TS Basis section.

2.0 REGULATORY EVALUATION

The regulatory requirements on which the staff based its review are as follows:

Title 10 of the *Code of Federal Regulations* (10 CFR) establishes the fundamental regulatory requirements with respect to the reactivity control systems. Specifically, several General Design Criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," establish these requirements.

a. GDC-13, "Instrumentation and control," states, in part, that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables that can affect the fission process and the integrity of the reactor core.

b. GDC-26, “Reactivity control system redundancy and capability,” states, in part, that the control rods shall be capable of reliably controlling reactivity changes to assure that specified acceptable fuel design limits are not exceeded.

The U.S. Nuclear Regulatory Commission (NRC) staff finds that ENO in its July 9, 2002, application addressed the applicable regulatory requirements.

3.0 TECHNICAL EVALUATION

3.1 Proposed TS Changes

By letter dated July 9, 2002 (Reference 1), the licensee proposed revisions to TS Sections 3.10.4, “Rod Insertion Limits,” 3.10.5, “Rod Misalignment Limitations,” and 3.10.6, “Inoperable Rod Position Indicator Channels,” and the applicable TS section bases. The proposed amendment would increase the indicated control rod misalignment from the current limit of ±12 steps to an indicated misalignment of ±24 steps when the core power is less than or equal to 85 percent of rated thermal power (RTP). Above 85 percent of RTP, the indicated misalignment will remain at ± 12 steps, with the following considerations: (1) when the group step counter (GSC) demand position exceeds the top of active fuel (TAF) at about 221 steps, the acceptable deviation on the negative side (i.e., when the analog rod position indicator is below the GSC demand position) may increase by 1 step for every additional step of GSC demand position; and (2) when the GSC demand position is below the TAF by no more than 12 steps, the acceptable deviation on the positive side may be further increased by up to 6 steps as a function of measured peaking factor margin. The proposed change was based on an evaluation performed by Westinghouse documented in its report WCAP-15902-P, “Conditional Extension of the Rod Misalignment Technical Specification for Indian Point Unit 2,” dated June 2002 (Enclosure to Ref. 1).

3.2 Background

The TSs for Westinghouse-designed reactors typically require the position of all control rods, as indicated by the position indicators (actual position), to be in agreement with the GSC demand positions within ± 12 steps. There are a total of 225 steps of rod withdrawal movement. (A step is 5/8 inch of rod movement.) The ± 12 step requirement reflects the accident analysis assumption that the rods can be misaligned by 24 steps, which consists of an indicated 12-step misalignment and a 12-step uncertainty. There has been a long history of problems with the ±12 step requirement, particularly in the shutdown modes and during power ascension. The difficulty lies in the characteristics of the analog individual rod position indication (AIRPI) system, which has a non-linear steady-state response and a time-dependent response which is the result of temperature. The licensee's experience with the AIRPI system shows that indicated misalignment may be greater than ±12 steps. The root cause of this phenomenon is the AIRPI varies with temperature, most often after a recent power level change.

Changing the TSs to allow ±24 steps misalignment when core power is less than or equal to 85 percent, will reduce the use of the flux mapping system to verify the rod positions. Frequent use of the flux mapping system may lead to more maintenance work required on the system, and an "As Low as is Reasonably Achievable" (ALARA) concern.

In WCAP-15902-P, Westinghouse analyzed the effects of increasing the allowed control rod indicated misalignment from ±12 steps to an indicated misalignment of up to ±24 steps when the core power is less than or equal to 85 percent of RTP. Westinghouse also determined that an additional ±6 steps of misalignment could be qualified to increase the allowable indicated misalignment to ±18 steps above 85 percent of RTP. However at this time, the licensee does not seek to take advantage of the additional ±6 steps available to it through this analysis, but instead will retain the ±12 steps misalignment, with certain exceptions detailed in TS Table 3.10-1 for rod positions above the TAF, to maintain additional conservatism.

3.3 Staff Evaluation

The current Westinghouse licensing basis supports an indicated rod misalignment of ±12 steps from a GSC demand position for any rod(s) within a control rod bank. In order to assume a rod misalignment of less than +24 steps (12 steps misalignment + 12 steps for AIRPI uncertainty), the individual AIRPI readings must be no larger than 12 steps from the GSC demand position. In order to justify changing the misalignment limit to ±24 steps, the licensee evaluated the effect from misalignments of up to ±36 steps when the core power is less than or equal to 85 percent RTP, and ±12 steps above 85 percent RTP with the following considerations:

- When the GSC demand position exceeds the TAF, the acceptable deviation on the negative side may increase by 1 step for every additional step of GSC demand position. The acceptable deviation may be further increased by up to 6 steps as a function of measured peaking factor margin.

- When the GSC demand position is below the TAF by no more than 12 steps, the acceptable deviation on the positive side may extend to the fully withdrawn position; the acceptable deviation may be further increased by up to 6 steps as a function of measured peaking factor margin.

The principal tool used in the analysis was the Westinghouse Advanced Nodal Computer Code (ANC), (WCAP-10965-P-A, December 1985) in the three dimensional mode. Full core and quarter core models were used in the analyses. The calculations were performed by Westinghouse and documented in report WCAP-15902-P, as part of the submittal.

3.3.1 Core Models Used and Misalignment Cases Analyzed

To perform the analysis of the possible rod misalignments, Westinghouse used two different ANC models of the IP2 core. The first model represented the planned design for 24-month cycle operation in the future. The second model represented an upcoming 18-month transition cycle.

The number and type of rod failure mechanisms are listed in WCAP-15902-P. The evaluation was limited to single failures. Multiple failures were not considered as reasonable precursors of rod misalignment since there is frequent surveillance of rod position to eliminate such occurrences.

3.3.1.1 Reactivity Control

To demonstrate that reactivity control was acceptable with the additional allowed misalignment, Westinghouse calculated the reactivity of a misaligned bank by 24 steps past the insertion limit and then showed that the calculated reactivity was substantially less than the excess shutdown margin available.

The calculation was performed at end of cycle since it represents the point in cycle with the least available shutdown margin.

3.3.1.2 Rod Cluster Control Assembly (RCCA) Mis-operation Events

The RCCA mis-operation events (dropped RCCAs and statistically misaligned RCCAs), are events initiated by the movement or displacement of one RCCA rod or bank from its normal position. These events result in reactivity and power distribution anomalies. Each reload is analyzed for these events to ensure that the Departure from Nucleate Boiling (DNB) acceptance criteria are met.

3.3.1.3 Rod Ejection

The rod ejection analysis is performed at hot zero power (HZP). Control rod misalignment will affect the rod ejection event. The physics parameters of interest are the ejected rod worth, $\Delta\rho_{EJ}$, and the post-ejection heat flux hot channel factor (F_q). Misalignment of individual rods and entire banks were considered by Westinghouse to determine the limiting effects on F_Q and $\Delta\rho_{EJ}$. Calculations were performed for an 18-month transition cycle and the planned 24-month cycle.

3.3.2 Misalignment Calculations

3.3.2.1 Analysis Results for Power $\leq$85% and > 85% RTP

To determine power levels at which peaking factors increase due to RCCA misalignment, the licensee assumed misalignment of 24 steps for calculations from the power dependent insertion limit. The licensee analyzed misalignment of groups of RCCAs in the control bank since it is more probable that the RCCAs in one group would mis-step rather than different RCCAs from different groups would mis-step. However, single RCCA misalignment calculations were also performed.

Analysis conducted by Westinghouse at or below 85 percent RTP showed that individual rod misalignments up to ±24 steps between the GSC demand position and the AIRPI may be allowed based on the magnitude of the peaking factor margin that is introduced by the reduction in the power level. The same analysis showed that for a rod misalignment of ±24 steps indicated, the values of the peaking factors increased by approximately 4.0% for the enthalpy rise hot channel factor ($F_{\Delta H}$), and approximately 6.0% for the core average axial peaking factor ($F_q(Z)$) at the 95/95 value. Calculated limits, provided by the equations of TS 3.10.2.1 for $F_{\Delta H}$ and F_q, exceed these values prior to operation at or below 85 percent of RTP. Therefore, the increase in allowed indicated misalignment is acceptable. Based on the above analysis, the NRC staff finds this conclusion satisfactory.

Above 85 percent RTP, the resultant evaluation shows that the degree of indicated misalignment is a function of the peaking factor margin present. The margin is determined by comparing the measured $F_Q(Z)$ and $F_{\Delta H}$ from the most recent, current cycle, full power incore flux map with their corresponding limits. For all hot full-power (HFP) ±6 step rod misalignment cases, the 95/95 confidence band increases in $F_{\Delta H}$ and F_Q were determined to be approximately 1.0% and 2.0% respectively, and the maximum increases in $F_{\Delta H}$ and F_Q were calculated to be approximately 1.4% and 2.6%, respectively. These results can be conservatively bounded by the calculated limits, calculated by using the equations of TS 3.10.2.1 for $F_{\Delta H}$ and F_Q. These calculated margins are an increase of more than 79 percent and 19 percent respectively over the 95/95 values and an increase of more than 30 percent and 9 percent respectively over the observed maximum values for all HFP ± 6 step cases. For this submittal, the licensee will not take advantage of the Westinghouse analysis for RTP greater than 85 percent, but will continue to assume a control misalignment of ± 12 steps indicated with the exceptions above TAF noted in TS Table 3.10-1.

3.3.3 Safety Analyses Parameters

The safety analyses parameters that are expected to be affected by the increase in the rod misalignment are the rod insertion allowance, the ejected rod $F_q(Z)$ and the ejected rod worth (delta Rho_{EJ}). Analysis of the results showed that one does not need to assume an increase in the rod insertion allowance due to one misalignment and a worst stuck rod due to another misalignment. Consequently, the proposed changes to the rod misalignment TS do not have an adverse impact on the available reactor trip reactivity.

Rod ejection was also analyzed subject to misalignment of individual rods, groups and entire banks of rods. The subsequent effects on $F_q(z)$ and delta Rho_{EJ} were determined. Results of the analysis indicated an increase of approximately 1.7% in $F_q(z)$ and 4.0% in delta Rho_{EJ} for the current cycle, and the licencee calculated a bounding increase in these quantities of approximately 2.0% and 4.0% for future cycles. These bounds are set forth in the TSs. The staff finds this acceptable.

3.4 Summary

RCCA misalignments up to 36 steps (24 steps indicated + 12 steps for AIRPI uncertainty) have been evaluated for impact on peaking factors and reactivity worth. The results of the analysis showed that the incremental increases in the peaking factors were only a small fraction of the increase in the peaking factor limits for power levels of 85 percent or less. The change in reactivity worth was also shown to be well within the excess margin available. Thus, it has been shown that the increase in peaking factors will be accommodated at or below 85 percent of RTP and the change to the TS to allow misalignment of up to 24 steps is acceptable. For operation above 85 percent power, the licensee will restrict the misalignment deviations to the current ± 12 steps indicated within the exceptions as defined in TS Table 3.10-1. Thus, the NRC staff finds the proposed changes to be acceptable.

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. 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, and there has been no public comment on such finding (67 FR 62500). 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.

7.0 REFERENCE

Entergy letter, Fred Dacimo, Vice President of Operation, to NRC dated July 9, 2002, License Amendment Request (LAR No. 02-010).

Principal Contributor: A. Attard

Date: November 7, 2002