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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 119 TO FACILITY OPERATING LICENSE NO. DPR-64

POWER AUTHORITY OF THE STATE OF NEW YORK

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3

DOCKET NO. 50-286

1.0 INTRODUCTION

By letter dated December 20, 1991, as supplemented January 14, 1992, the Power Authority of the State of New York (the licensee) submitted a request for changes to the Indian Point Nuclear Generating Unit No. 3 (IP-3), Technical Specifications (TS). The requested changes would revise TS Section 3.2 (Chemical and Volume Control System), Section 3.3.A (Safety Injection and Residual Heat Removal Systems), and Section 3.3.B (Containment Cooling and Iodine Removal Systems). These sections would be revised to provide for an increased boron concentration in the refueling water storage tank (RWST) and related changes. These changes are necessary because the licensee is planning to use higher enrichment cores to support 24-month cycles.

The licensee proposed the following specific changes: (1) minimum concentration of boric acid in the refueling water storage tank will be increased from 2000 ppm boron to 2400 ppm boron and a maximum concentration will be set at 2600 ppm boron, (2) liquid volume in each of the safety injection accumulators will be increased from 800 ft^3 to 815 ft^3 and the accumulator maximum boric acid concentration will be set at 2600 ppm boron, (3) total liquid volume in the boric acid storage tanks will be increased from 5000 gallons to 6100 gallons, and (4) minimum concentration of sodium hydroxide in the containment spray additive tank (SAT) will be increased from 30 w/o to 35 w/o and a maximum concentration will be set at 38 w/o.

2.0 EVALUATION

The licensee submitted an evaluation of the effects that these proposed modifications would have on performance of the plant during normal and accident conditions. The licensee's safety evaluation was performed by the Westinghouse Electric Corporation.

2.1 Loss-of-Coolant-Accident (LOCA) Analysis

The large break LOCA licensing basis analysis of record was performed with the 1981 BASH LOCA evaluation model. This analysis resulted in a peak cladding temperature (PCT) of 1978 °F for a double-ended cold leg guillotine break with a discharge coefficient of 0.4. This LOCA analysis has been supplemented by a number of safety evaluations and penalties which have increased the PCT value;

however, substantial margin is still maintained to the 2200 °F limit of 10 CFR 50.46 and 10 CFR Part 50, Appendix K.

The licensee assumed a safety injection accumulator volume range of 775 to 815 ft^3 in all recent analyses. The peak clad temperature (PCT) is not only sensitive to the amount of water, but also to the rate at which the water is introduced into the core. The increase in the accumulator water volume results in a decrease in the accumulator cover gas volume which reduces the rate at which the liquid volume of the accumulators is injected. Therefore, a 15 °F PCT penalty has been assigned to account for the increase in the accumulator liquid volume to 815 ft^3. The resulting calculated PCT is still well below the 2200 °F limit.

The small break LOCA licensing basis analysis of record was performed using the NOTRUMP evaluation model. This analysis resulted in a PCT of 1711 °F for a 6-inch diameter cold leg break. This small break LOCA analysis has been supplemented by a number of safety evaluations and penalties which have increased the PCT value; however, substantial margin is still maintained to the 2200 °F limit of 10 CFR 50.46 and 10 CFR Part 50, Appendix K.

Neither the large break LOCA model nor the small break LOCA model takes credit for the boron concentration of the safety injection water. In the large break LOCA analysis, the reactor is shutdown due to core voiding and in the small break analysis, the reactor is shutdown via control rod insertion. Therefore, the proposed boron concentration changes will have no adverse affect on the results of either the small break or large break LOCA analyses.

The NRC staff has reviewed the licensee's analysis regarding the effect that the proposed changes would have on the large break and small break LOCA analyses and the staff concludes that the effects are minimal and margin to the 2200 °F PCT limit is ensured.

2.2 Post-LOCA Analysis

The large break LOCA analysis does not take credit for borated safety injection water shutting down the reactor during the LOCA; however, post-LOCA, the reactor must be maintained shutdown by borated water. The borated water provided by the RWST and the accumulators must contain enough boron, when combined with other borated and non-borated sources of water, to maintain the reactor subcritical in the long term following a LOCA.

The licensee has recalculated the post-LOCA containment sump boron concentration versus the pre-trip RCS boron concentration curve for IP-3 based on the proposed boron concentration changes. The licensee has verified that sufficient boron will be available in the containment sump following a LOCA to maintain the core subcritical. The staff has reviewed the proposed changes and the licensee's analysis and concludes that sufficient boron will be available in the containment sump following a LOCA to ensure that the core remains subcritical.

After a LOCA, boric acid solution injected by the safety injection system will concentrate in the core region due to water boiloff. In order to prevent concentration buildup which would cause boric acid to precipitate, core cooling should be switched from cold leg to hot leg recirculation. The switchover time is dependent on the concentration of boric acid in the safety injection water. The licensee recalculated the switchover time for the RWST solution corresponding to the maximum boric acid concentration that would be permitted by the proposed changes. The new switchover time is 8.2 hours which is lower than 21 hours, calculated previously. This significant difference is due not only to the higher boron concentration used in the analysis, but also to a more conservative model which was used for the present analysis. The licensee will ensure that the appropriate facility procedures, including emergency operating procedure, are revised to reflect the modified hot leg switchover time. The staff has reviewed the licensee's analysis and concludes the analysis is conservative and the modified hot leg switchover time is acceptable.

The increase in boric acid concentration in the RWST and the increase in sodium hydroxide concentration in the containment SAT affect the pH values of the containment spray and containment sump water. The range of pH for spray solution changes from 9.3-9.6 to 9.0-10.0 and the minimum sump water pH changes from 8.3 to 7.9. These changes do not significantly affect the corrosion of steel components in containment. However, the resulting pH changes may have some effect on the corrosion of aluminum which would result in generation of hydrogen.

Since the corrosion rate of aluminum increases with pH, higher corrosion rates are expected due to the pH increase of the containment spray water. However, the licensee has demonstrated that the aluminum surfaces in the containment will be exposed to the higher pH water for a relatively short time during the injection phase only. Therefore, the increase in the corrosion rate should be minimal. In addition, aluminum paint, which was originally included in the FSAR analysis, was eliminated from the containment and this resulted in a 63 percent reduction of the aluminum bearing surface area, therefore, the licensee has concluded that the results of the FSAR analysis bound the present case. The staff has reviewed the licensee's analysis and concludes that the proposed changes present a minimal effect on the corrosion rates of materials in containment and the changes are acceptable.

A reason for maintaining the pH of the containment spray water alkaline is to control iodine removal from the containment atmosphere and its subsequent retention in the containment sump water. The pH change of spray and sump water could affect post-LOCA iodine control. The licensee has indicated that the FSAR analysis for iodine control was conservatively performed for a spray solution with a pH of 9.0. Therefore, the original FSAR analysis bounds the present case.

The licensee also evaluated the effect that a reduction in the pH value of the sump water would have on iodine retention in the sump. With a pH value of 7.9

and a sump solution temperature of 150 °F, the decontamination factor (DF) will be below the value of 100 which was the value assumed in the radioactive dose calculations. However, following a large break LOCA, the sump solution temperature will remain in excess of 212 °F for a number of hours. At this elevated temperature, the conversion of iodine from the volatile form to the non-volatile form takes place at a greater rate. Since the conversion to the non-volatile form is a non-reversible process, the iodine will remain in the sump even after the sump cools to lower temperatures. Based on this assumption, the licensee has demonstrated that the proposed changes will not affect the ability to maintain the DF for iodine at a value greater than 100. The staff has reviewed the assumptions and analyses presented by the licensee with regard to containment spray and sump pH changes and concludes the proposed changes are acceptable.

2.3 Non-LOCA Transient Analysis

The licensee states that the RWST provides borated safety injection water during a steamline break event to serve as a source of negative reactivity which offsets the positive reactivity inserted as a result of the transient cooldown. Therefore, increasing the RWST boron concentration would only provide a benefit for those steamline break events which result in a safety injection. The staff reviewed the analysis of the licensee and concludes that the proposed changes do not adversely impact the non-LOCA transient analyses and are, therefore, acceptable.

2.4 Boric Acid Solubility Analysis

The proposed changes will increase the boric acid concentration in the RWST, safety injection accumulators, and the associated piping. This increase in concentration will increase the minimum temperature at which the boric acid will precipitate. The licensee has verified that for a solution of 2600 ppm boron, the precipitation temperature is well below the temperatures to which the RWST, safety injection accumulators, or the associated piping will ever be exposed to. The staff has reviewed the licensee's analysis with regard to precipitation temperatures and concludes that the proposed changes are acceptable

3.0 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.

4.0 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 (57 FR 6039). 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.

5.0 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 Contributors:
K. Parczewski
K. Desai

Date: June 2, 1992

June 2, 1992

Docket No. 50-286

Mr. Ralph E. Beedle
Executive Vice President - Nuclear Generation
Power Authority of the State of New York
123 Main Street
White Plains, New York 10601

Dear Mr. Beedle:

SUBJECT: ISSUANCE OF AMENDMENT FOR INDIAN POINT NUCLEAR GENERATING UNIT NO. 3 (TAC NO. M82341)

The Commission has issued the enclosed Amendment No. 119 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 in response to your application transmitted by letter dated December 20, 1991, as supplemented January 14, 1992.

The amendment revises Technical Specifications Section 3.2 (Chemical and Volume Control System), Section 3.3.A (Safety Injection and Residual Heat Removal Systems), and Section 3.3.B (Containment Cooling and Iodine Removal Systems). These sections have been revised to provide for an increased boron concentration in the refueling water storage tank and related changes. These changes are necessary to support the use of higher enriched cores that are needed for the Indian Point Nuclear Generating Station Unit No. 3 to operate on a 24-month cycle.

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,
Original Signed By:
Nicola F. Conicella, Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 119 to DPR-64
2. Safety Evaluation
cc w/enclosures:
See next page

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