UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 168 TO FACILITY OPERATING LICENSE NO. DPR-26

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

DOCKET NO. 50-247

1.0 INTRODUCTION

By letter dated August 9, 1991, as supplemented by letters dated February 12, 1992, November 8, 1993, and January 25, 1994, the Consolidated Edison Company of New York (the licensee) submitted a request for changes to the Indian Point Nuclear Generating Unit No. 2 (IP2) Technical Specifications (TS). The requested changes would revise the TS to delete the surveillance requirements and limiting operating conditions for the independent electrical turbine overspeed protection system (IEOPS), and to extend the surveillance test interval for the turbine stop and control valves from one month to an interval of not greater than one year. The turbine stop and governor valve surveillance interval will be based on a comparison of an analysis of turbine missile generation probability using the methodology presented in WCAP-11525, "Probabilistic Evaluation of Reduction in Turbine Valve Test Frequency," dated June 1987. The February 12, 1991, November 8, 1993, and January 25, 1994, letters provided clarifying information that did not change the initial proposed no significant hazards consideration determination and were not outside the scope of the original Federal Register notice.

2.0 EVALUATION

IP2 is equipped with a Westinghouse designed turbine generator and turbine overspeed protection system. Steam from the steam generators enters the high pressure turbine through four high-pressure steam lines. Each line contains one turbine stop valve and one turbine control valve in series to isolate the turbine from the steam supply following a turbine trip. During operation, these valves are held open against closing springs by hydraulic fluid pressure. Actuation of the emergency trip system releases hydraulic fluid pressure in the valve actuators, allowing springs to close the valves. Air operated steam dump valves in the steam lines from the high pressure turbine to the moisture separator/reheater are actuated by the drop in hydraulic fluid pressure and release steam contained within the turbine generator to the condenser following a turbine trip. The mechanical overspeed trip device and the IEOPS independently release the hydraulic fluid pressure to trip the turbine if an overspeed condition is sensed. The turbine auxiliary governor also performs an overspeed protection function.

A turbine overspeed condition significantly increases the probability of turbine missile generation relative to operation at normal speed due to the increased stress in the turbine rotor at higher operating speeds. Because of the design of the low pressure turbine rotor, it is most likely to produce large missiles that penetrate the turbine casing. Destructive overspeed due to failure of the steam admission valves or overspeed protection system components is the dominant contributor to turbine missile generation. Regular testing and inspection of the steam admission valves and the remainder of the turbine overspeed protection system reduce the probability of turbine overspeed.

In a letter to the Westinghouse Electric Corporation dated February 2, 1987, the NRC staff stated that maintaining a small probability of turbine missile generation through testing and inspection is a reliable means of ensuring safety-related structures, systems, and components are adequately protected from such missiles. This approach simplifies and improves procedures for evaluation of turbine missile risks by eliminating from consideration factors such as missile trajectory and damage probability. In the letter to Westinghouse, the staff proposed generic guidelines for total turbine missile generation probabilities of less than $1x10^{-4}$ per year for a favorably oriented turbine and less than $1x10^{-5}$ per year for an unfavorably oriented turbine.

Westinghouse performed an analysis of the effects of extending the test interval of turbine steam admission valves and changing the turbine rotor inspection interval on the probability of turbine missile generation. The methodology and assumptions used in the analysis are documented in the Westinghouse report WCAP-11525, "Probabilistic Evaluation of Reduction in Turbine Valve Test Frequency," dated June 1987. The staff accepted the use of the WCAP-11525 methodology in recalculating the probability of turbine missile generation to account for factors which may affect the potential for turbine overspeed or missile generation. Staff acceptance of the methodology is documented in a supplemental safety evaluation, which was issued under a letter dated November 2, 1989, to Mr. D. M. Musolf of Northern States Power Company.

The licensee's letter dated November 8, 1993, provided justification for the proposed TS changes based on a summary of the Westinghouse Owners Group Turbine Valve Test Frequency Evaluation Subgroup (TVTFE) final report, "Update of BB-95/96 Turbine Valve Failure Rates and Effects on Destructive Overspeed Probabilities," which used the WCAP-11525 methodology. The TVTFE report used revised valve failure rates and a revised probability of generator load separation for nuclear power plants with BB-95/96 turbines, which were calculated based on data collected from January 1, 1986, through May 31, 1992. The turbine overspeed protection system fault tree was also updated to model recent solenoid valve common-mode failure experience. In addition, the TVTFE report reflects test intervals for the turbine overspeed protection system

that are consistent with the licensee's surveillance program for this system, and the higher observed failure rates for solenoid operated valves. The staff finds these revisions to the assumptions and data base in the original WCAP-11525 report acceptable.

The TVTFE final report calculates the destructive overspeed probability for a BB-95/96 turbine with four stop valves and four control valves arranged in a one-on-one configuration and an electro-hydraulic control system, without crediting the IEOPS. Destructive overspeed occurs when a steam path exists from the steam generators through one or more pairs of open stop and control valves to the turbine, and the resulting high rotational speed and tensile stress causes the turbine rotor to burst. Because the fully integral rotor construction used at IP2 greatly reduces the probability of missile generation at speeds less than destructive overspeed, the licensee concluded that the total probability of turbine missile generation at IP2 is accurately estimated by the probability of destructive overspeed. The staff agrees that the probability of destructive overspeed will closely approximate the probability of turbine missile generation for fully integral low pressure turbine rotors.

There are some differences between the turbine overspeed protection system configuration analyzed for the TVTFE final report and the actual IP2 configuration. The stop and control valve configuration used in the analysis is identical to the configuration at IP2, but the IP2 turbine has a 300 psi turbine control oil system instead of the electro-hydraulic control system assumed in the development of the fault tree. However, the licensee concluded that the calculated probabilities of destructive overspeed presented in the report are applicable to and conservative for both types of control systems. This conclusion is based on: the similar degree of redundancy and diversity in the design of the turbine overspeed protection systems; the use of conservatively high common cause and individual solenoid valve failure probabilities, which assures that the impact of electro-hydraulic control system failures is maximized; and a quantification of importance factors that indicates that stop and control valve failures remain the dominant contributors to destructive overspeed probability. The staff accepts this justification.

Based on the results of the report, the recommended turbine valve test interval of 1 to 6 months results in a value for the probability of destructive overspeed that satisfies the NRC staff acceptance criteria. Therefore, based on the licensee's existing turbine test and inspection program, turbine valve test intervals of 1 to 6 months can be used. Future changes in valve failure rates or turbine test and inspection intervals for other components may permit the licensee to extend the test interval to 1 year without further staff approval, providing that the staff acceptance criteria for turbine missile generation can be met with a revised analysis using the WCAP-11525 methodology. The NRC staff acceptance criteria are derived from the established threshold probability for staff analysis of postulated initiating events, based on the assumed probability of a turbine missile

damaging a system or component important to safety. In that way, the acceptance criteria ensure that the requirements of General Design Criterion (GDC) 4 of Appendix A to 10 CFR Part 50 are satisfied with regard to the protection of structures, systems, and components important to safety from the effects of turbine missiles.

Based on the above review, the probability of turbine missile generation with extended turbine valve test intervals at IP2 satisfies the NRC acceptance criterion of $1x10^{-5}$ per year for an unfavorably oriented turbine without crediting IEOPS. In addition, the licensee has committed to review and reevaluate the turbine valve testing frequency probabilistic analysis any time major changes in the turbine system have been made or a significant upward trend in the valve failure rate is identified. Therefore, the proposed TS revisions are acceptable.

The licensee has adequately demonstrated by analysis that the requirements of GDC 4 of Appendix A to 10 CFR Part 50 are satisfied with regard to the protection of structures, systems, and components important to safety from the effects of turbine missiles. Therefore, the proposed TS revisions deleting the surveillance requirements and limiting operating conditions for the independent electrical turbine overspeed protection system, and extending the surveillance test interval for the turbine stop and control valves from one month to an interval of not greater than one year, based on an evaluation using the methodology presented in WCAP-11525, 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 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, and there has been no public comment on such finding (57 FR 51922). 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 Contributor: S. Jones

Date: February 8, 1994

Docket No. 50-247

February 8, 1994

Mr. Stephen B. Bram
Vice President, Nuclear Power
Consolidated Edison Company
of New York, Inc.
Broadway and Bleakley Avenue
Buchanan, New York 10511

Dear Mr. Bram:

SUBJECT: ISSUANCE OF AMENDMENT FOR INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 (TAC NO. M81587)

The Commission has issued the enclosed Amendment No. 168 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 August 9, 1991, as supplemented by letters dated February 12, 1992, November 8, 1993, and January 25, 1994.

The amendment revises the TS to delete the surveillance requirements and limiting operating conditions for the independent electrical turbine overspeed protection system and to extend the surveillance test interval for the turbine stop and control valves from monthly to an interval of not greater than yearly. Also included is a minor correction to a typographical error.

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:
Francis J. Williams, Jr., Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 168 to DPR-26
2. Safety Evaluation

cc w/enclosures:
See next page

*See previous concurrence

LA:PDI-1	PM:PDI-1	*OGC	D:PDI-1		
CVogan cw	FWilliams:smm		RACapra RAC		
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