



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 185 TO FACILITY OPERATING LICENSE NO. DPR-71
AND AMENDMENT NO. 216 TO FACILITY OPERATING LICENSE NO. DPR-62

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 AND 50-324

1.0 INTRODUCTION

By letter dated March 5, 1997, as supplemented May 9, 1997, the Carolina Power & Light Company (the licensee) submitted a request for changes to the Brunswick Steam Electric Plant (BSEP), Units 1 and 2, Technical Specifications (TS). The requested changes would incorporate new TS for instrumentation associated with a reinstated automatic isolation of a pathway for release of non-condensable gases from the main condenser in the event of a control rod drop accident (CRDA). At power levels of 5 percent or less, mechanical vacuum pumps are used to remove non-condensable gases from the condenser using a pathway to the release stack that bypasses the normal holdup and filter train. The proposed TS will require that four channels of the main steam line radiation - high radiation function be capable of tripping the mechanical vacuum pumps and closing an isolation valve for each pump in the release pathway. Surveillance Requirements are included in the TS to ensure the isolation instrumentation will perform its intended function.

By letter dated September 30, 1994, and supplemented March 24, 1995, the licensee requested elimination of the main steam line radiation monitor trip signal to the condenser vacuum pumps and closure of the associated isolation valves. This request was based on the General Electric Company Licensing Topical Report NEDO-31400 which was approved by the NRC staff by the Safety Evaluation dated May 15, 1991. Further, a plant-specific calculation by NUS (NUS Calculation 8T12-M-02) demonstrated that in the event of a CRDA the radiation level in the control room would be below the permissible levels of General Design Criterion 19 and Standard Review Plan (SRP), Section 6.4. By letter dated March 31, 1995, the NRC approved the change request for BSEP, eliminating the above signal.

On December 19, 1996, the licensee determined that the NUS calculation was in error, and in the event of a CRDA without isolation of the condenser vacuum pumps, the doses in the main control room would exceed the SRP, Section 6.4 guidance. To resolve this deficiency, the licensee proposes to restore to the original plant design and reinstall the main steam high radiation signal to trip the condenser vacuum pumps and close the isolation valve associated with each pump.

The May 9, 1997, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 EVALUATION

In the March 5, 1997, letter the licensee stated that with the proposed changes, the probability of the vacuum pumps discharging contaminated steam into the main stack is very low for several reasons. First, the condenser vacuum pumps are used for a limited time period when the plant is below 5 percent power in Operational Condition 1 and 2. When a condenser vacuum pump is not in operation, fission product release through this path would not occur. Second, the isolation of the vacuum pump system is required only when there is a CRDA. The licensee stated that a highly improbable combination of events have to happen for a CRDA to occur. These events include erroneous selection and withdrawal of an out-of-sequence rod by an operator, a failure of the rod worth minimizer to block withdrawal of the out-of-sequence rod, and failure of the rod-to-drive coupling. The licensee probabilistic safety analysis indicates that the probability of a CRDA is below $1E-6$ per reactor year over a 40-year time period. Third, in the event of a CRDA, the high radiation monitors in the main steam lines are designed to trip the condenser vacuum pumps in 5 seconds and close the associated isolation valves. In other words, the condenser vacuum pumps can discharge contaminants only for 5 seconds. Fourth, the safety-related main steam line radiation monitors provide a highly reliable means to automatically trip the respective condenser vacuum pump and close the associated isolation valve. The main steam line radiation-high logic consists of two independent trip systems, each with two channels operating on one-out-of-two logic. Furthermore, both trip systems must operate to generate the isolation signal. This logic design is consistent with the original approved plant design.

The licensee's submittal includes a calculation of main control room doses in the event of a CRDA, assuming that the main steam line radiation monitors isolate the condenser vacuum pumps in conformance to the SRP, Section 15.4.9. The calculation indicates that the operator doses from a postulated CRDA are 23.2 rem thyroid and 0.05 rem whole body in the main control room area. General Design Criterion (GDC) 19/SRP Section 6.4 permits 30 rem thyroid and 5 rem whole body. Doses of 0.16 rem thyroid and 0.015 rem whole body were calculated in the 2-hour exclusion area, and 1 rem thyroid in the low population zone. The calculated control room doses meet the indicated acceptance criteria, and the offsite doses are well below the acceptance criteria in the SRP and 10 CFR Part 100.

The amendment proposes a 12-hour time limit for the following Actions in new proposed TS 3/4.3.8, Condenser Vacuum Pump Isolation Instrumentation:

- a. With one or more channels of the Main Steam Line Radiation-High Function for condenser vacuum pumps inoperable, restore the inoperable channel to operable status or place the inoperable channel or associated trip system in trip or isolate the condenser vacuum pumps or isolate the main steam lines or be in hot shutdown.

- b. With condenser vacuum pump isolation capability not maintained, isolate the condenser vacuum pumps or isolate the main steam lines or be in hot shutdown.

It further states that when a channel is placed in an inoperable status solely for the surveillance tests, entry into associated actions may be delayed for up to 6 hours provided the condenser vacuum pump isolation capability is maintained.

The amendment also proposed Surveillance Requirements which state that each channel of the Main Steam Line Radiation-High Function for condenser vacuum pump isolation shall be demonstrated operable by:

- a. Performance of a channel check at least once per 24 hours
- b. Performance of a channel functional test at least once per 92 days
- c. Performance of a channel calibration and logic system functional test at least once per 18 months

These requirements are in conformance with the original plant design for BSEP, Units 1 and 2, which included the condenser vacuum pump trip, and NEDC-30851P-A, Supplement 2, "Technical Specifications Improvement Analysis for BWR Isolation Instrumentation Common to Reactor Protection System and Emergency Core Cooling System Instrumentation," dated March 1989, which was previously approved by the NRC staff.

The staff performed an independent analysis to determine plant conformance with the criteria that the CRDA results in consequences less than 10% of the 10 CFR Part 100 guidelines even with conservative assumptions. In its analysis, the staff utilized the assumptions contained in SRP Section 15.4.9. The staff computed the offsite doses and the control room operator doses for BSEP, Units 1 and 2, using the assumptions described in Table 1 of this safety evaluation and the NRC's ACTICODE computer code. The staff computed that offsite and control room doses are within the acceptance criteria given in SRP Section 15.7.4 and GDC-19. The resulting CRDA calculated values are listed in Table 1.

Table 1

INPUT PARAMETERS AND RESULTS FOR BRUNSWICK UNITS 1 AND 2

EVALUATION OF A CONTROL ROD DROP ACCIDENT

Parameters

Power Level	2550
Number of Rods Perforated	850
Number of Rods Melted	0
Number of Rods In-Core	33600
Power Peaking Factor	1.5
Condenser Leak Rates (%) day	1.0
Fraction of fission product inventory release to coolant:	
Iodines, percent	50
Noble gases, percent	100

Receptor Point Variables¹

Exclusion Area Boundary (EAB)

Atmosphere Relative Concentration, X/Q (sec/m ³)	
0-2 hours	1.0E-3

Low Population Zone (LPZ)

Atmosphere Relative Concentration, X/Q (sec/m ³)	
0-8 hours	2.8E-4

Control Room (CR)

Atmosphere Relative Concentration, X/Q (sec/m ³)	
0-2 hours	1.5E-2

Thyroid Doses

EAB-	1.3 rem
LPZ-	1.4 rem
CR-	13.0 rem

In summary, the staff has reviewed the licensee's evaluation and justification for reinstating the main steam line radiation monitor signal to isolate the condenser vacuum pumps and close the associated isolation valves. Based on that review, the staff concludes that the licensee has performed a plant-specific calculation that confirms that the reestablishment of the original plant design, which includes the above feature, will maintain the worst-case plant CRDA release below the acceptance criteria in the SRP, 10 CFR Part 50, Appendix A, GDC-19, and 10 CFR Part 100. The staff further concludes that the proposed TS changes for the condenser vacuum pump trip and isolation are consistent with BWR Improved Standard IS and are, therefore, acceptable.

¹ Reference for EAB and LPZ, " Safety Evaluation of the Brunswick Steam Electric Station Units 1 and 2," November 1973.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of North Carolina official was notified of the proposed issuance of the amendments. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change 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 the Surveillance Requirements. The NRC staff has determined that the amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (62 FR 17224). Accordingly, the amendments meet 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 amendments.

The NRC staff has reviewed the licensee's evaluation and justification for reinstating the main steam radiation monitor signal to isolate the condenser vacuum pump and to close the associated isolation valves. Based on that review, the staff concludes that the licensee has performed a plant-specific calculation which confirms that reestablishment of the original plant design, which includes the above feature, will maintain the worst-case plant CRDA release below the acceptance criteria in the SRP and 10 CFR Part 100. The NRC staff further concludes that the proposed TS changes for the condenser vacuum pump trip and isolation are consistent with the BWR improved Standard TS and are, therefore, acceptable.

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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: S. Mazumdar and J. Minns

Date: July 8, 1997

REVISED SAFETY EVALUATION FOR AMENDMENT NO. 185 TO FACILITY OPERATING LICENSE
NO. DPR-71 - BRUNSWICK, UNIT 1
REVISED SAFETY EVALUATION FOR AMENDMENT NO. 216 TO FACILITY OPERATING LICENSE
NO. DPR-62 - BRUNSWICK, UNIT 2

DISTRIBUTION:

~~Docket File~~

PUBLIC

PD II-1 Reading File

B. Bogert

OGC

G. Hill (4)

J. Wermiel

W. Beckner, DOPS/OTSB

S. Mazumdar

R. Emch

J. Minns

J. Lyons

ACRS

OPA

OC/LFDCB

J. Johnson, R-II

cc: Brunswick Service List