



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 129 TO FACILITY OPERATING LICENSE NO. DPR-75

PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

DELMARVA POWER AND LIGHT COMPANY

ATLANTIC CITY ELECTRIC COMPANY

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated January 25, 1993, the Public Service Electric & Gas Company (the licensee) submitted a request for changes to the Salem Nuclear Generating Station, Unit No. 2, Technical Specifications (TS). The requested changes would revise the pressure-temperature (P-T) limits in the Salem Unit 2 Technical Specifications from 10 effective full power years (EFPY) to 15 EFPY. The P-T limit curves are revised to reflect the increase in the nil-ductility reference temperature of reactor vessel beltline materials.

To evaluate the P-T limits, the staff uses the following NRC regulations and guidance: 10 CFR 50.36(c)(2); Appendices G and H of 10 CFR Part 50; Generic Letter 88-11; Regulatory Guide (RG) 1.99, Rev. 2; and Standard Review Plan (SRP) Section 5.3.2.

Each licensee authorized to operate a nuclear power reactor is required by 10 CFR 50.36 to provide Technical Specifications for the operation of the plant. In particular, 10 CFR 50.36(c)(2) requires that limiting conditions of operation be included in the TS. The P-T limits are among the limiting conditions of operation in the TS for all commercial nuclear plants in the U.S.

Appendix G to 10 CFR Part 50 requires that "...pressure-temperature limits for the reactor vessel must be at least as conservative as those obtained by following the methods of analysis and the required margins of safety of Appendix G of the ASME Code..." Appendix G also imposes requirements on the minimum temperature for criticality, the closure head flange, and hydrostatic pressure tests or leak tests.

Appendix H of 10 CFR Part 50 requires the licensee to establish a surveillance program to monitor embrittlement of reactor vessel materials. The program includes capsules that contain test specimens made from plate, weld, and heat-

affected-zone (HAZ) materials of the reactor beltline. Appendix H refers to the ASTM Standards which, in turn, require that the capsules be installed in the vessel before startup and be removed from the reactor vessel periodically for testing. The test results may be used in calculating P-T limits.

Generic Letter 88-11 requires that licensees use the methods in RG 1.99, Rev. 2, to predict the effect of neutron irradiation on reactor vessel materials. This guide defines the ART as the sum of unirradiated reference temperature, the increase in reference temperature resulting from neutron irradiation, and a margin to account for uncertainties in the prediction method.

SRP 5.3.2 describes a step-by-step calculation of the P-T limits that is based on methodology specified in Appendix G to the ASME Code, Section III.

2.0 EVALUATION

The licensee calculated the ART for each beltline material in the Salem 2 reactor vessel in accordance with RG 1.99, Rev. 2. The licensee determined that, at 15 EFPY, lower shell longitudinal weld 3-442 is the limiting material for the 1/4T location and intermediate shell longitudinal weld 2-442 is the limiting material for the 3/4T location (T is the wall thickness at the beltline region of the vessel). The chemistry for weld 3-442 is 0.20% copper (Cu) and 0.86% nickel (Ni) with an initial RT_{ndt} of -56°F . The chemistry for weld 2-442 is 0.23% Cu and 0.73% Ni with an initial RT_{ndt} of -40°F . Based on the materials data of the limiting welds, the licensee calculated the limiting ARTs of 151°F at the 1/4T location and 102°F at the 3/4T location.

The licensee used the prediction method (i.e., Position C.1) to obtain the limiting ART values instead of using the surveillance data specified in Position C.2 of RG 1.99. The ART values derived from the prediction method are more conservative than the ART values derived from the surveillance data. The staff verified that the licensee's limiting ARTs are correct.

Substituting the limiting ARTs of 151°F and 102°F into equations in SRP 5.3.2, the staff verified that the proposed P-T limits for heatup, cooldown, and leak test meet the requirements in Paragraphs IV.A.2 & IV.A.3 of Appendix G of 10 CFR Part 50 to 15 EFPY.

In addition to beltline materials, Appendix G of 10 CFR Part 50 also imposes a minimum temperature at the closure head flange based on the reference temperature for the flange material. Section IV.A.2 of Appendix G states that when the pressure exceeds 20% of the preservice system hydrostatic test pressure, the temperature of the closure flange regions highly stressed by the bolt preload must exceed the reference temperature of the material in those regions by at least 120°F for normal operation and by 90°F for hydrostatic pressure tests and leak tests. Based on the flange reference temperature of 28°F , the staff has determined that the proposed P-T limits have included this requirement.

The licensee has removed surveillance capsules T, U, and X from Salem 2 and has performed required tests. The test results of capsules are published in reports by Westinghouse (Ref. 1, 2 & 3). The staff has determined that the surveillance program has satisfied Appendix H to 10 CFR Part 50.

The staff has performed an independent analysis of the P-T limits to verify the licensee's proposed limits. The staff concludes that the proposed P-T limits for heatup, cooldown, leak test, and criticality are valid through 15 EFPY because the limits conform to the requirements of Appendix G of 10 CFR Part 50 and Generic Letter 88-11. Therefore, the proposed P-T limits may be incorporated in the Salem 2 Technical Specifications.

By letter dated May 21, 1993, the State of New Jersey commented that on the revised heatup curve, Page 3/4 4-28, the area of acceptable operation is incorrectly shown to be above the criticality limit. By letter dated July 29, 1993, the licensee responded to the State of New Jersey's comment. The graph in question contains three limitation curves, a leak test limit, a heatup limit and a criticality limit. These curves are independent of each other. For all three curves, the area of acceptable operation is defined as below and to the right of the curves. Unacceptable operation is defined as above and to the left of the curves. The location of the "ACCEPTABLE OPERATION" label on the graph is below and to the right of all three curves. The staff finds the labeling of the graph acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendment. By letter dated May 21, 1993, the state official forwarded a comment. The comment was resolved in Section 2.0 above.

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 (59 FR 2871). 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.

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6.0 REFERENCES

1. "Analysis of Capsule T from the Public Service Electric and Gas Company Salem Unit 2 Reactor Vessel Radiation Surveillance Program," Westinghouse Electric Corporation, WCAP-10492, March 1984
2. "Analysis of Capsule U from the Public Service Electric and Gas Company Salem Unit 2 Reactor Vessel Radiation Surveillance Program," Westinghouse Electric Corporation, WCAP-11554, September 1987
3. "Analysis of Capsule X from the Public Service Electric and Gas Company Salem Unit 2 Reactor Vessel Radiation Surveillance Program," Westinghouse Electric Corporation, WCAP-13366, June 1992