



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 88 TO FACILITY OPERATING LICENSE NO. NPF-57

PUBLIC SERVICE ELECTRIC & GAS COMPANY

ATLANTIC CITY ELECTRIC COMPANY

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated July 27, 1995, the Public Service Electric & Gas Company (the licensee) submitted a request for a change to the Hope Creek Generating Station (HCGS), Technical Specifications (TSs). The proposed Technical Specification (TS) revision would incorporate updated pressure vs. temperature operating limit curves contained in TS Figure 3.4.6.1-1. The revision would also change TS Surveillance Requirement 4.4.6.1.3 based upon implementation of Regulatory Guide 1.99, Revision 2, in accordance with Generic Letter 88-11, for reactor vessel material surveillance specimens.

2.0 BACKGROUND

The new pressure and temperature (P/T) limits are a result of data obtained from the first set of specimen capsules removed during refueling outage 5. The new peak surface fluence estimate is about 14% greater than the previous estimate. Since this is the first set of specimen capsules removed, only the flux wire test results are factored into the beltline adjusted reference temperature (ART) calculations. The flux wire test results and the lead factor from the last fuel cycle were used to estimate the new 32 effective full power years (EFPY) fluence. The chemistry factor values described in Regulatory Guide (RG) 1.99, Revision 2, can be modified when two or more sets of credible surveillance capsule data, as defined in the RG, become available. The report supporting these changes was submitted to the NRC in Letter LR-N95071 dated June 9, 1995.

The staff evaluates the P/T limits based on the following NRC regulations and guidance: Appendix G to 10 CFR Part 50; Generic Letters 88-11 and 92-01; RG 1.99, Revision 2; and Standard Review Plan (SRP) Section 5.3.2. Appendix G to 10 CFR Part 50 requires that P/T limits for the reactor vessel must be at least as conservative as those obtained by Appendix G to Section III of the American Society of Mechanical Engineers (ASME) Code. GL 88-11 requests that licensees use the methods in RG 1.99, Revision 2, to predict the effect of neutron irradiation by calculating the ART of reactor vessel materials. The ART is defined as the sum of initial nil-ductility transition reference temperature ( $RT_{NDT}$ ) of the material, the increase in  $RT_{NDT}$  caused by neutron irradiation, and a margin to account for uncertainties in the prediction method. The increase in  $RT_{NDT}$  is calculated from the product of a chemistry

factor and a fluence factor. The chemistry factor is dependent upon the amount of copper and nickel in the vessel material. GL 92-01 requests licensees to submit reactor vessel materials data, which the staff will use in the review of the P/T limits submittals.

SRP 5.3.2 provides guidance on calculation of the P/T limits using linear elastic fracture mechanics methodology specified in Appendix G to Section III of the ASME Code. The linear elastic fracture mechanics methodology postulates sharp surface defects that are normal to the direction of maximum stress and have a depth of one-fourth of the reactor vessel beltline thickness (1/4T) and a length of 1-1/2 the beltline thickness. The critical locations in the vessel for this methodology is the 1/4T and 3/4T locations, which correspond to the maximum depth of the postulated inside surface and outside surface defects, respectively.

### 3.0 DISCUSSION

For the Hope Creek reactor vessel, the licensee determined that the intermediate plate (I.D. #3, Heat 5K3025), with 0.15% Cu, 0.71% Ni, and initial  $RT_{NDT}$  of 19°F is the limiting material for the 1/4T location. The licensee calculated an ART of 72.5°F.

The staff verified that copper and nickel contents and initial  $RT_{NDT}$  of the reactor vessel beltline materials agreed with those in the licensee's updated responses to GL 92-01 for Hope Creek. The staff used the material properties to perform independent calculations of the ART values for the beltline materials using RG 1.99, Revision 2. Based on the calculations, the staff verified that the licensee's calculated ART value for the limiting material is acceptable.

Substituting the ART of the limiting material into equations in SRP 5.3.2, the staff verified that the proposed P/T limits for (1) hydrostatic or leak testing, (2) heatup by non-nuclear means, cooldown following a nuclear shutdown and low power physics tests, and (3) operations with a critical core other than low power physics tests satisfy the requirements in Paragraphs IV.A.2 and IV.A.3 of Appendix G of 10 CFR Part 50.

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  $RT_{NDT}$  of 10°F provided by the licensee, the staff has determined that the proposed P/T limits have satisfied the requirement for the closure flange region during normal operation, hydrostatic pressure test and leak test.

#### 4.0 EVALUATION

The staff has performed an independent analysis to verify the licensee's proposed P/T limits. The staff concludes that the proposed P/T limits for (1) hydrostatic or leak testing, (2) heatup by non-nuclear means, cooldown following a nuclear shutdown and low power physics tests, and (3) operations with a critical core other than low power physics tests are valid for 32 EFPY, because: 1) the limits conform to the requirements of Appendix G of 10 CFR Part 50 and GL 88-11, and 2) the material properties and chemistry used in calculating the P/T limits are consistent with or conservative compared to data submitted under GL 92-01; hence, the proposed P/T limits may be incorporated in the Hope Creek Generating Station TS 3/4.4.6.1. The licensee has also proposed deletion of the specific material surveillance methodology of TS 4.4.6.1.3a and b. Deletion of TS surveillance requirement 4.4.6.1.3a and b is acceptable because the licensee will utilize the calculation methodology in RG 1.99, Revision 2 to calculate embrittlement. The deletion does not affect the surveillance program. Hence, the licensee's surveillance program must still comply with 10 CFR Part 50, Appendix H. In addition, the proposed changes in the Bases section of the TS are consistent with the P/T limits changes and, therefore, are acceptable. ✓

#### 5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State Official was notified of the proposed issuance of the amendment. The State official had no comments.

#### 6.0 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 effluent 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 (60 FR 47624). 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.

#### 7.0 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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Date: November 28, 1995

## 8.0 REFERENCES

1. Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials, Revision 2, May 1988
2. NUREG-0800, Standard Review Plan, Section 5.3.2, Pressure-Temperature Limits
3. Code of Federal Regulations, Title 10, Part 50, Appendix G, Fracture Toughness Requirements
4. Generic Letter 88-11, NRC Position on Radiation Embrittlement of Reactor Vessel Materials and its Impact on Plant Operations, July 12, 1988
5. ASME Boiler and Pressure Vessel Code, Section III, Appendix G for Nuclear Power Plant Components, Division 1, "Protection Against Nonductile Failure"
6. July 27, 1995, Letter from J. J. Hagan to USNRC Document Control Desk, Request for License Amendment Hope Creek Generating Station
7. R. G. Carey, Hope Creek 1 Generating Station RPV Surveillance Materials Testing and Fracture Toughness Analysis, GE-NE-523-A164-1294, General Electric Company, April 1995