



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 165 TO FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

By letter dated July 14, 1995, as supplemented by letters dated September 12 and December 8, 1995, Boston Edison Company, the licensee for Pilgrim Nuclear Power Station (PNPS), submitted a request for amendment to the Technical Specifications (TSs) and the Bases for TS Section 2.1.1, "Fuel Cladding Integrity," are revised to define the valid range of conditions for the General Electric Critical Quality (X) - Boiling Length (L) (GEXL) correlation for GE11 9x9 fuel. Section 3.3.C of TS, "Scram Insertion Times," is revised to include notch-based scram time limits and eliminate the current percentage-based limits. The bases for TS Section 3/4.3.C are modified to reflect the conversion to notch-based limits. Surveillance Requirement 4.11.C, "Minimum Critical Power Ratio," is also modified to reflect the use of notch-based scram time information, and the use of the ODYN Option B/GEMINI methodology.

In a request for additional information dated August 15, 1995, the NRC staff asked the licensee questions related to the revised valid range of conditions for the GEXL correlation for GE11 9x9 fuel, calculation of uncertainties and adjustment factors used in notch-based scram time limits and the calculation of operating limit minimum critical power ratio (OLMCPR). Additional information and clarifications were provided by the licensee in the letter dated September 12, 1995. By letter dated December 8, 1995, the licensee submitted a revised TS Bases for TS Section 2.1.1 which contained a more complete list of parameters for the GEXL correlation.

From a systems viewpoint, the staff review focused on whether the revised scram times are at least as conservative as the current percentage-based scram times and are developed using approved methodology, which accounts for uncertainties in the measurement and uses the proper adjustment factors, if required. The licensee was also asked to reexamine the most limiting transients in order to provide assurance that plant parameters do not exceed GEXL limitations.

## 2.0 EVALUATION

### Technical Specification 2.1.1, "Fuel Cladding Integrity," Bases

TS 2.1.1, Bases provides a description of the valid range of parameters for which the GEXL correlation can be used in determining the OLMCPR. The valid range of parameters has been updated to reflect the use of GE11 9x9 fuel in the Pilgrim fuel cycle. The licensee has indicated that the GE11 arrays are the limiting fuel assemblies, and that the cycle 11 operating limit MCPR is based on the GE11 fuel design. The version of the GEXL correlation and valid range of parameters developed for the GE11 fuel design were evaluated during an audit review by the staff. The staff's findings are documented in a letter to General Electric dated March 25, 1992. The purpose of the audit review was to determine whether the GE11 fuel design complies with the criteria provided in Amendment No. 22 of the GESTAR report. The review determined that reference to GEXL for GE11 fuel is acceptable. Therefore, reference to the correlation in TS Bases is acceptable.

The range of parameters that have been modified include reducing the range of inlet subcooling from 0-100 BTU/lb to 0-70 BTU/lb and reducing the range of reactor pressure from 800-1400 psig to 800-1300 psia. The upper limit of 1300 psia for the GE11 critical power correlation was chosen by General Electric to bound pressures expected during periods of minimum CPR for anticipated operational occurrences (AOOs). Local and axial peaking factors were also removed. The licensee has stated that these peaking factors do not limit the applicability of the GEXL correlation. The licensee states that the limiting AOOs for pressurization include the generator load rejection without bypass event and the feedwater controller failure event at maximum demand. For the generator load rejection without bypass event the peak pressure is less than 1210 psia and inlet subcooling is less than 48 BTU/lb in the time frame which the minimum CPR occurs. For the feedwater controller failure event the peak pressure is less than 1190 psia and less than 52 BTU/lb. These values are within the valid range of conditions for the GE11 critical power correlation.

Based on its review, the staff has determined that the changes to TS 2.1.1 Bases are acceptable because the GEXL correlation as applied to GE11 fuel was developed based on criteria previously approved by the NRC staff in Amendment No. 22 of the GESTAR report. The staff conducted an audit review to confirm that the GE11 fuel was in compliance with the criteria. The licensee has also provided assurance that the range of valid conditions for the GEXL correlation will bound the expected range of conditions of Pilgrim Final Safety Analysis Report anticipated operational occurrences.

### Technical Specification 3.3.C, "Scram Insertion Times"

The percent-based limits have been replaced with notch-based limits in TS 3.3.C.1 (average scram insertion time for all operable control rods), TS 3.3.C.2 (average scram insertion time for the three fastest operable control rods in each group of four control rods in all two-by-two arrays) and

TS 3.3.C.3 (maximum scram-time limit for control rods to be considered operable). The current insertion percentages are 10%, 30%, 50% and 90% for TS 3.3.C.1 and TS 3.3.C.2. These percentages correspond to non-integer control rod notch positions, so that after measurement of actual scram times, an adjustment factor is used to determine the percent-based limit from measured data taken at integral notch locations. The licensee states that the proposed changes make scram insertion time tests easier by eliminating the need to adjust the measured response. The notch-based limits are taken from General Electric analyses previously used as the basis for the percent-based limits. TS Section 3.3.C.3 is intended to identify control rods with severely degraded scram performance by limiting the scram 90% insertion time for any operable control rod to 7.00 seconds. The 90% limit will be changed to notch 04, which is conservative. Textual information in TSs 3.3.C.2 and 3.3.C.3, indicating that scram timing begins upon de-energization of the scram solenoid pilot valves, has been included for clarity and consistency with TS 3.3.C.1.

The conversion to notch-based scram limits requires that the licensee account for sources of uncertainty and adjustment factors for the notch-based limits. The current percentage-based limits account for uncertainties in the location of the position indicating probes and uncertainty in the position of the control rods when "drop out" of the reed switch occurs. Information provided in the September 12, 1995, RAI response indicates that the notch-based scram times account for these uncertainties. The licensee has added information to TS Bases, section 3/4.3.C detailing inclusion of these uncertainties. The RAI response states that no new adjustment factors are required for the conversion to the notch based limits.

Based on its review, the staff has determined that the licensee's conversion to the notch-based scram times is acceptable because the limits are based on General Electric analyses previously used as the basis for the percent-based limits. The text added for clarification in TSs 3.3.C.2 and 3.3.C.3 does not represent a change from current scram time testing methods and is acceptable. The change in TS 3.3.C.3 from using a 7.0 second limit at 90% insertion to a 7.0 second limit at notch 04 is conservative and is acceptable.

#### Technical Specification 4.11.C, "Minimum Critical Power Ratio"

The changes to TS 4.11.C reflect the licensee's use of the GEMINI methodology to determine the operating limit MC2R. The GEMINI methodology was previously approved by the staff. Within TS 4.11.C, the equation used for calculation of  $\tau$  has been updated by replacing the 30% insertion limit of 1.275s with the proposed notch 34 limit of 1.252s. The definition of  $\tau_{ave}$ ,  $\tau_i$ ,  $\mu$  and  $\sigma$  also have been updated to reflect conversion from the 30% insertion to dropout of notch 34. The GEMINI methodology is used in the calculation of the  $\mu$  and  $\sigma$  values.

Based on its review, the changes made to TS 4.11.C are acceptable. The change in the calculation of  $\tau$  is consistent with the conversion to notch-based limits. The change in the definition of  $\tau_{ave}$ ,  $\tau_i$ ,  $\mu$  and  $\sigma$  is also consistent with the conversion to notch-based limits. The previously approved GEMINI

methodology is used in the calculation of the revised  $\mu$  and  $\sigma$  values and is acceptable.

### 3.0 TECHNICAL EVALUATION CONCLUSION

TS 2.1.1, Bases has been changed to reflect the use of GE11 9x9 fuel. The GEXL correlation as applied to GE11 fuel was developed based on criteria previously approved by the NRC staff in Amendment No. 22 of the GESTAR report. The staff conducted an audit review to confirm that the GE11 fuel was in compliance with the criteria. The licensee has also provided assurance that the range of anticipated conditions for ADOs will be bounded by the range of valid conditions for the GEXL correlation. On these bases, the changes to TS Bases 2.1.1 are acceptable.

TSs 3.3.C.1, 3.3.C.2 and 3.3.C.3 were updated to reflect the use of notch-based scram time limits. The notch-based limits are taken from GE analysis which is used as the basis for the current percent-based limits. Text added for clarification in TSs 3.3.C.2 and 3.3.C.3 does not represent a change from current scram time testing methods. The change in TS 3.3.C.3 from using a 7.0 second limit at 90% insertion to a 7.0 second limit at notch 04 is a conservative change, and is consistent with the conversion to notch-based limits. On these bases, the changes to TSs 3.3.C.1, 3.3.C.2, 3.3.C.3 and 3/4.3.C are acceptable.

TS 4.11.C has been updated to reflect the use of the GEMINI methodology in the calculation of the operating limit MCPR. The changes are consistent with the incorporation of the notch-based limits, and are consistent with the approved methodology. On these bases, the changes to TS 4.11.C are acceptable.

### 4.0 REFERENCES

1. NEDE-24011-P-A-10 and NEDE-24011-P-A-10-US, "General Electric Standard Application for Reactor Fuel," February and March 1991.
2. Letter to J. S. Charnley from G. C. Lainas dated March 22, 1986; Subject: Acceptance for Referencing of Licensing Topical Report NEDE-24011-P-A, Rev. 6, Amendment 11, "General Electric Standard Application for Reactor Fuel" (GESTAR II)

### 5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Massachusetts 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 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 (60 FR 39433). 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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