September 4, 1984

Docket No. 50-293

Mr. William D. Harrington
Senior Vice President, Nuclear
Boston Edison Company
800 Boylston Street
Boston, Massachusetts 02199

Dear Mr. Harrington:

The Commission has issued the enclosed Amendment No. 78 to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated December 28, 1983, as supplemented by your submittals dated February 21, 1984, and July 12, 1984.

The amendment authorizes Cycle 7 operation of the reactor with 160 new fuel bundles identical to some of the partially used fuel from Cycle 6 and with 32 new fuel bundles with barrier type fuel. The latter is similar to the other new fuel except that a thin Zirconium liner has been added to the inner surface of the cladding to reduce cladding failures due to pellet-clad interaction.

The changes in the Technical Specifications are as follows:

- A slight reduction (about 2%) in the operating limit minimum critical power ratio (MCPR) values to allow added operational flexibility;
- Addition to references to indicate that the MCPR values and the maximum average planar linear heat generation rate (MAPLHGR) versus planar average exposure curves apply to the barrier type fuel as well as non-barrier fuel; and
- Identification of the barrier fuel to be used in the reactor.

A copy of the Safety Evaluation of your proposal is also enclosed.

Sincerely,

Original signed by/

Paul H. Leech, Project Manager
Operating Reactors Branch #2
Division of Licensing

Enclosures:
1. Amendment No. 78 to
   License No. DPR-35
2. Safety Evaluation

cc w/enclosures:
See next page

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Mr. William D. Harrington
Boston Edison Company
Pilgrim Nuclear Power Station

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

BOSTON EDISON COMPANY

DOCKET NO. 50-293

PILGRIM NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 78
License No. DPR-35

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Boston Edison Company (the licensee) dated December 28, 1983, as supplemented February 21, and July 12, 1984, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-35 is hereby amended to read as follows:

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PDR ADOCK 05000293
P PDR

B <u>Technical Specifications</u>

The Technical Specifications contained in Appendix A, as revised through Amendment No. 78 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 4, 1984

ATTACHMENT TO LICENSE AMENDMENT NO. 78

FACILITY OPERATING LICENSE NO. DPR-35

DOCKET NO. 50-293

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

Remove	Insert
205B-2	205B-2
205E-4	205E-4
205E-5	205E-5
205E-6	205E-6
206m	206m

TABLE 3.11-1
OPERATING LIMIT MCPR VALUES

A. MCPR Operating Limit from Beginning of Cycle (BOC) to BOC + 6000 MWD/T.

	8 x 8	P8 x 8R/BP8x8R
For all values of τ	1.36	1.40

B. MCPR Operating Limit from BOC + 6000 MWD/T to End of Cycle.

τ	8 x 8	P8x8R/BP8x8R
$\tau \leq 0$	1.38	1.40
$0.0 < \tau \leq 0.1$	1.39	1.41
$0.1 < \tau \leq 0.2$	1.39	1.41
$0.2 < \tau \leq 0.3$	1.40	1.42
$0.3 < \tau \leq 0.4$	1.40	1.42
$0.4 < \tau \leq 0.5$	1.41	1.43
$0.5 < \tau \leq 0.6$	1.41	1.43
$0.6 < \tau \leq 0.7$	1.42	1.44
$0.7 < \tau \leq 0.8$	1.42	1.44
$0.8 < \tau \leq 0.9$	1.43	1.45
$0.9 < \tau \leq 1.0$	1.43	1.45

FIGURE 3.11-4
MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE VERSUS PLANAR AVERAGE EXPOSURE

FUEL TYPES P8DRB265L and BPDRB265L

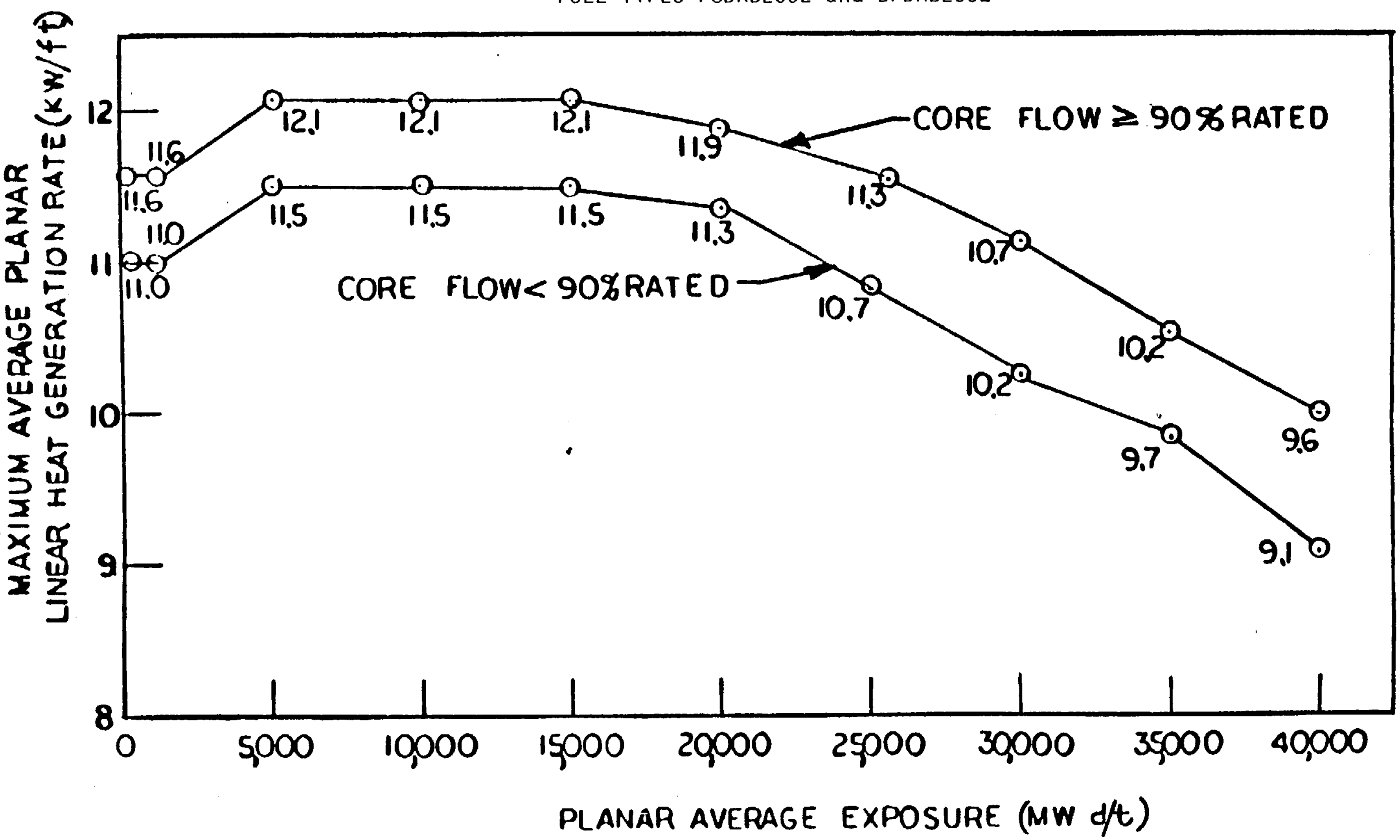


FIGURE 3.11-5

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
PLANAR AVERAGE EXPOSURE

FUEL TYPES P8DRB282 and BP8DRB282

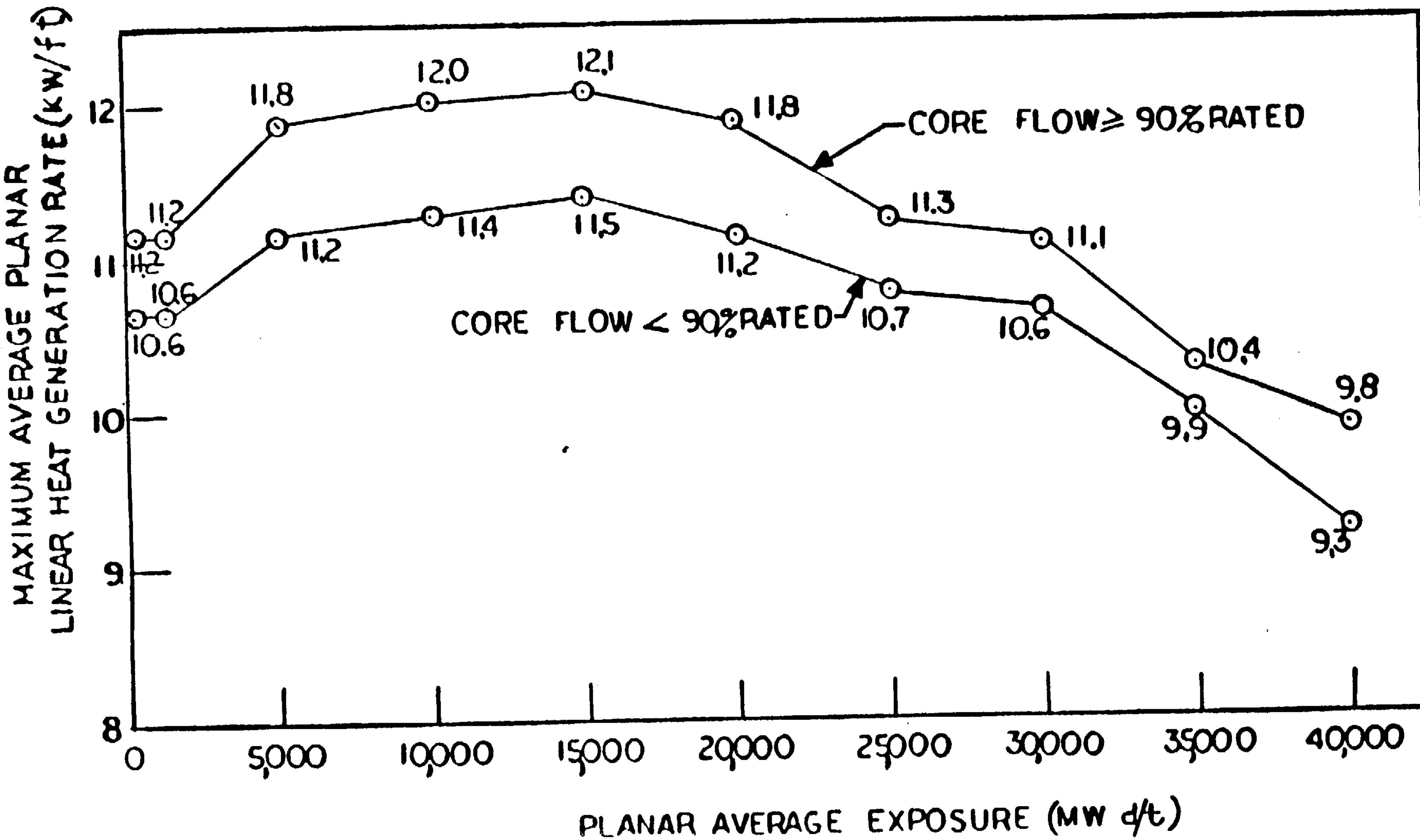
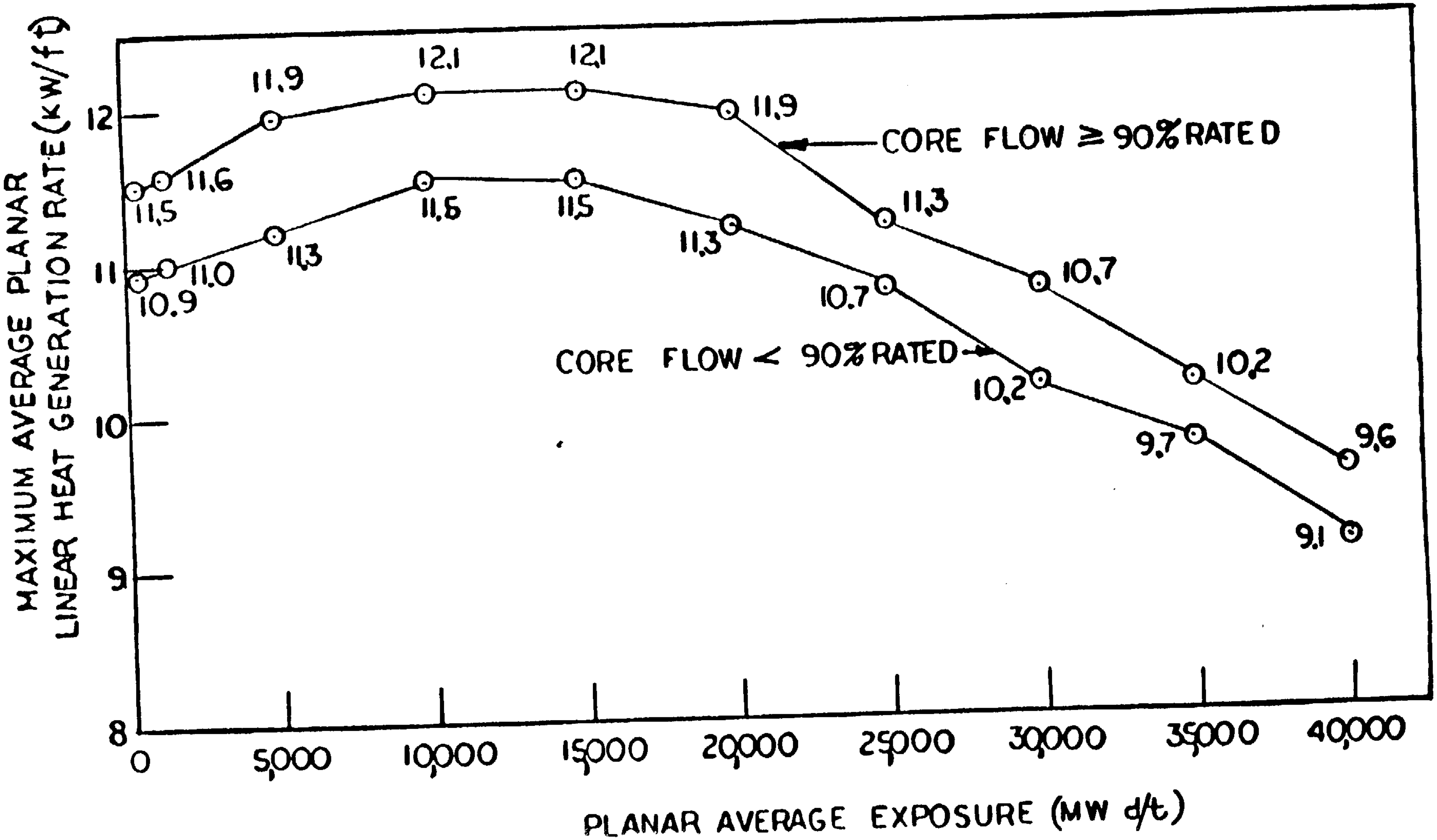


FIGURE 3.11-6

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE VERSUS PLANAR AVERAGE EXPOSURE

FUEL TYPES P8DRB265H and BP8DRB265H



5.0 MAJOR DESIGN FEATURES

5.1 SITE FEATURES

Pilgrim Nuclear Power Station is located on the Western Shore of Cape Cod Bay in the Town of Plymouth, Plymouth County, Massachusetts. The site is located at approximately 41°51' north latitude and 70°35' west longitude on the Manomet Quadrangle, Massachusetts, Plymouth County 7.5 Minute Series (topographic) map issued by U.S. Geological Survey. UTM coordinates are 19-46446N-3692E.

The reactor (center line) is located approximately 1800 feet from the nearest property boundary.

5.2 REACTOR

A. The core shall consist of not more than 580 fuel assemblies of 8x8 (63 fuel rods), P8x8R (62 fuel rods), and BP8x8R (62 fuel rods).

B. The reactor core shall contain 145 cruciform-shaped control rods. The control material shall be boron carbide powder (B_4C) compacted to approximately 70% of theoretical density.

5.3 REACTOR VESSEL

The reactor vessel shall be as described in Table 4.2.2 of the FSAR. The applicable design codes shall be as described in Table 4.2.1 of the FSAR.

5.4 CONTAINMENT

A. The principal design parameters for the primary containment shall be as given in Table 5.2.1 of the FSAR. The applicable design codes shall be as described in Section 12.2.2.8 of the FSAR.

B. The secondary containment shall be as described in Section 5.3.2 of the FSAR.

C. Penetrations to the primary containment and piping passing through such penetrations shall be designed in accordance with standards set forth in Section 5.2.3.4 of the FSAR.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 78 TO FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

By letter from W. D. Harrington to D. B. Vassallo, dated December 28, 1983, Boston Edison Company submitted the reload report (Ref. 1) and proposed changes to the Technical Specifications (Ref. 2) for the Pilgrim Station Cycle 7 reload review. The proposed changes reflect the use of some barrier-type fuel as fresh fuel for Cycle 7. A revision to the report was submitted (Ref. 3 and 4) to correct an error in the labeling of one of the figures. Another revision (Ref. 9) was submitted to change the identification number on the report.

2.0 EVALUATION

The objective of this review is to confirm that the design of the reload core has been accomplished using acceptable methods and provides an acceptable margin of safety from conditions which could lead to fuel damage during normal and anticipated operational transients.

FUEL MECHANICAL DESIGN

The Cycle 7 core consists of 32 non-pressurized 8x8D fuel assemblies and 516 pressurized 8x8DR assemblies of previously-approved design, and 32 barrier-type pressurized 8x8DR assemblies. The barrier-type fuel provides a zirconium liner on the inner surface of the Zircaloy-2 cladding and was designed by General Electric to eliminate cladding failures due to pellet clad interaction (PCI). The NRC has evaluated General Electric's Barrier Fuel Amendment to NEDE-24011-P-A-4 (GESTAR-II) and has concluded that there is reasonable assurance that the use of zirconium liner barrier fuel will not result in unacceptable hazards to the public (Ref. 5). The barrier fuel amendment was approved as a generic reference and approved for inclusion in NEDE-24011-P-A. Therefore, the fuel mechanical design is acceptable.

NUCLEAR DESIGN

The nuclear design and analysis were performed with the methods and procedures described in Reference 6 which has been approved by the staff for use in reload applications. The nuclear parameters for Cycle 7 are within the range of those normally obtained and are acceptable.

THERMAL HYDRAULIC DESIGN

An objective of the review is to confirm that the thermal-hydraulic design of the core has been accomplished using acceptable methods, that it provides an acceptable margin of safety from conditions which could lead to fuel damage during normal operation and anticipated operational transients, and that it is not susceptible to theraml-hydraulic instability. The review included the following areas: (1) safety limit minimum critical power ratio (MCPR), (2) operating limit MCPR, and (3) thermal-hydraulic stability.

Safety Limit MCPR

The safety limit (MCPR) has been imposed to assure that at least 99.9% of the fuel rods in the core will maintain nucleate boiling and avoid a transition to film boiling during the most moderate frequency transient events. As stated in Reference 6, the safety limit MCPR is 1.07. There has been no change in the safety limit MCPR for Pilgrim from the previous cycle.

Operating Limit MCPR

Various transients could reduce the MCPR below the intended safety limit MCPR during Cycle 7 operation. The most limiting operational transients have been analyzed by the licensee to determine which event could potentially induce the largest reduction in the initial critical power ratio (Δ CPR).

The Δ CPR values given in Section 10 of Reference 1 are plant-specific values calculated by using the approved ODYN methods. The maximum values of Δ CPRs for the non-pressuized (8x8) and prepressurized (BP8x8R and P8x8R) fuel for Cycle 7 are 0.30 and 0.32 compared to 0.30 and 0.33 for Cycle 6. The calculated Δ CPRs were adjusted to reflect either Option A or Option B Δ CPRs by employing the conversion methods described in Reference 8. The MCPR values were determined by adding the adjusted Δ CPRs to the safety limit MCPR. Section 12 of Reference 1 presents the cycle MCPR values of both the pressurization and non-pressurization transients. The maximum cycle MCPR values (Options A and B) in Section 12 are specified as the operating limits MCPRs for incorporation into the Technical Specifications. The analyses included core flows throughout the cycle which are greater than 100% rated. The justification for this increased core flow was previously submitted (Refs. 7 and 8) and approved by the staff for Pilgrim. At these increased core flows, the rod withdrawal error becomes the limiting transient. However, by installing a constant 107% power rod block trip at flows greater than 100% rated, the dependence of the rod block trip on flow is removed and the effects of this transient are mitigated. We find that the approved method was used to determine the operating limit MCPRs to avoid violation of the safety limit

MCPR in the event of any anticipated transients. We, therefore, conclude that these limits are acceptable.

Thermal-Hydraulic Stability

The results of the thermal-hydraulic analysis (Ref. 1) show that the maximum thermal-hydraulic stability decay ratio is 0.63 for Cycle 7 as compared to 0.59 for Cycle 6. Since the calculated maximum core stability decay ratio is less than that accepted for some of the operating plants (for example, Peach Bottom Units 2 and 3 have a decay ratio of 0.98) and since additional stability margin is assured by Technical Specification restrictions which prevent operation in the natural circulation mode, we conclude that the thermal-hydraulic stability results remain acceptable for Cycle 7 operation.

TRANSIENT AND ACCIDENT ANALYSES

Rod Withdrawal Error

The licensee has elected to use the generic bounding analysis described in Reference 4 for this event. That analysis has been accepted by the staff and its use is acceptable for Pilgrim. The Rod Block Monitor (RBM) output is signal clipped at 107% power in order to permit operation at more than 100% rated core flow, as discussed above.

Fuel Loading Error

This event has been analyzed by the methods described in Reference 4, which have been approved by the staff and are acceptable for Pilgrim. This event is not limiting for Cycle 7.

TECHNICAL SPECIFICATION CHANGES

The operating limit MCPR (OLMCPR) values are being altered to conform to the results of the safety analysis for Cycle 7. The OLMCPR must be greater than 1.36 for 8x8 fuel and greater than 1.40 for P8x8R and BP8x8R fuel at exposures from Beginning of Cycle (BOC) to BOC + 6000 MWD/T. For exposures from BOC + 6000 MWD/T to End of Cycle (EOC), OLMCPR values are given as a function of the scram time dependent function τ. The proposed changes also include references to the barrier-type fuel to be used in Pilgrim Cycle 7. These changes are in conformance with the Cycle 7 safety analyses which were performed with approved methods and provide an acceptable margin of safety from conditions which could lead to fuel damage during normal and anticipated operational transients. These are, therefore, acceptable Technical Specification changes (page 205B-2).

The maximum average planar linear heat generation rate (MAPLHGR) versus planar average exposure curves in Technical Specification Figures 3.11-4, 5, and 6 are being modified to include reference to the barrier-type fuel that will be used in Pilgrim Cycle 7. The staff has found the use of the barrier-type fuel acceptable (Ref. 5); therefore, these are acceptable Technical Specification changes (pages 205E-4, 205E-5, and 205E-6).

The major design features of the reactor are being modified to include reference to the barrer-type fuel. This change is acceptable for the reasons stated previously (page 206m).

3.0 SUMMARY

We conclude that the licensee's analysis of the Cycle 7 reload (Reload 6) for Pilgrim is acceptable and that the reactor may be reloaded and operated for Cycle 7 without undue risk to the public health and safety. This conclusion is based on the following:

1. The fuel mechanical design is the current standard design for GE reactors and has been previously reviewed and accepted.

2. The nuclear and thermal-hydraulic design analyses have been performed by previously approved methods and the design parameters are within the range expected for GE reactors.

3. The results of the cycle specific transients and accident analyses meet applicable criteria.

4. The proposed Technical Specifications are consistent with the reloaded core and with the results of the analyses.

4.0 ENVIRONMENTAL CONSIDERATIONS

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The 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 this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this 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 this amendment.

5.0 CONCLUSIONS

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 REFERENCES

1. General Electric Boiling Water Reactor Supplemental Reload Licensing Submittal for Pilgrim Nuclear Power Station, Unit 1, Reload 6, 22A1694, October 1983.

2. Letter from W. D. Harrington, Boston Edison Company, to D. B. Vassallo, NRC, Reload 6 Submittal and Proposed Changes to Technical Specifications for Reload 6 for Pilgrim Unit 1, December 28, 1983.

3. Letter from W. D. Harrington, Boston Edison Company, to D. B. Vassallo, NRC, dated February 21, 1984, submitting Revision 1 to Reload 6 Licensing Submittal.

4. General Electric Boiling Water Reactors Supplemental Reload Licensing Submittal for Pilgrim Nuclear Power Station, Unit 1, Reload 6, 22A1694, Revision 1, December 1983.

5. Letter from C. O. Thomas, NRC, to J. S. Charnley, General Electric, dated April 13, 1983, submitting NRC evaluation of General Electric's Barrier Fuel Amendment to NEDE-24011-P-A-4.

6. General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A (US), GESTAR-II, January 1982.

7. "Safety Review of Pilgrim Nuclear Power Station, Unit No. 1 at Core Flow Conditions Above Rated Flow Throughout Cycle 6," NEDO-30242, August 1983.

8. "Safety Review of Pilgrim Nuclear Power Station, Unit No. 1 at Core Flow Conditions Above Rated Flow for End-of-Cycle 6," NEDO-30242, Supplement 1, September 1983.

9. Letter from W. D. Harrington, Boston Edison Company, to D. B. Vassallo, NRC, dated July 12, 1984, resubmitting Reference 4 renumbered 23A1694 and dated March 1984.

Principal Contributor: L. Kopp

Dated: September 4, 1984