January 29, 1991

Docket No. 50-293

Mr. George W. Davis
Senior Vice President - Nuclear
Boston Edison Company
Pilgrim Nuclear Power Station
RFD #1 Rocky Hill Road
Plymouth, Massachusetts 02360

Dear Mr. Davis:

SUBJECT: ISSUANCE OF AMENDMENT NO. 134 TO FACILITY OPERATING LICENSE NO. DPR-35 - PILGRIM NUCLEAR POWER STATION (TAC NO. 60939)

The Commission has issued the enclosed Amendment No. 134 to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station.

In response to your application, dated February 28, 1986, this amendment extends the expiration date of the license from August 26, 2008, to June 9, 2012. This change adds 3 years and 9-1/2 months to the licensed term which results in a forty (40) year license from the time of issuance of the operating license instead of from the time of issuance of the construction permit.

A copy of our Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register Notice.

Sincerely,

/S/

Ronald Eaton, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 134 to License No. DPR-35
2. Safety Evaluation

cc w/enclosures:
See next page

*See previous concurrence

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

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cc w/enclosures:
See next page

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AMENDMENT NO. 134 TO DPR-35 PILGRIM NUCLEAR POWER STATION DATED January 29, 1991

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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. 134
License No. DPR-35

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

   A. The application for amendment filed by the Boston Edison Company (the licensee) dated February 28, 1986, 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 set forth in 10 CFR Chapter I;

   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, Facility Operating License No. DPR-35 is hereby amended to read as follows:

   Change paragraph 7 to read as follows:

   This license is effective as of the date of issuance and shall expire June 8, 2012.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Richard H. Wessman, Director
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Date of Issuance: January 29, 1991

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 134 TO FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

INTRODUCTION

By application dated February 28, 1986, the Boston Edison Company (the licensee) requested an amendment to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station (PNPS). The proposed amendment would change the expiration date for the license from August 26, 2008 to June 8, 2012, an extension of 3 years, 9-1/2 months.

Additional information relevant to the environmental impact and addressing the provisions of the National Historic Preservation Act was provided by letter dated July 13, 1989.

DISCUSSION

Section 103.c of the Atomic Energy Act (Act) of 1954 provides that a license is to be issued for a specified period not exceeding 40 years. The Commission's regulation in 10 CFR 50.51 specifies that each license will be issued for a fixed period of time, to be specified in the license not to exceed 40 years from date of issuance. 10 CFR 50.57 allows the issuance of an operating license pursuant to 10 CFR 50.56 for the full term specified in 10 CFR 50.51 in conformity with the construction permit (CP) and when other provisions specified in 10 CFR 50.57 are met. The current term of the license for the PNPS is 40 years commencing with the issuance of the CP. This represents an effective operating term of 36 years and 2-1/2 months, not 40 years. Consistent with the Act and our rules, as noted above, the licensee seeks an extension of the OL term for PNPS such that the fixed period of the license would be 40 years from the date of issuance of the OL.

Current NRC policy is to issue operating licenses for a 40-year term commencing with the date of issuance of the OL. For PNPS this date was September 15, 1972. Thus, a 40-year term would change the expiration date from August 26, 2008, for an extension of 3 years, 9-1/2 months, the interval between issuance of the CP and OL.

EVALUATION

The NRC staff has evaluated the environmental impact and safety issues associated with issuance of the proposed license amendment which would allow approximately four additional years of operation. In addressing the environmental impact the following was considered: the need for proposed action; radiological impact;

nonradiological impact; alternatives; alternative use of resources; other agencies and persons contacted; and the basis for not preparing an environmental impact statement. This information is provided in the NRC staff's Environmental Assessment dated November 27, 1990. The following addresses the safety issues associated with the proposed amendment.

Mechanical Equipment

The components of the reactor coolant pressure boundary of the Pilgrim Nuclear Power Station were designed, built and tested to the appropriate ASME Boiler and Pressure Vessel Codes, regulatory standards, and supplemental criteria in compliance with the requirements of 10 CFR Part 50, Section 50.55a, "Codes and Standards." The inservice inspection program was described in the Technical Specifications and complied with the requirements of Section 50.55a(g), except where specific relief was granted by the Commission pursuant to paragraph 50.55(g)(6)(i).

The inspections conducted at several boiling water reactors (BWRs) indicated intergranular stress corrosion cracking (IGSCC) in large-diameter stainless steel pipes. The staff considered this a generic problem and, as a result, the Commission issued Generic Letter 84-11 requiring a reinspection program to all BWRs, involving stainless steel welds in pipes greater than 4-in. diameter, in systems that are part of or connected to the reactor coolant pressure boundary, out to the second isolation valve. If IGSCC is discovered, repair, analysis and additional surveillance may be required to ensure the continued integrity of the affected pipe.

The Pilgrim Nuclear Power Station was shut down on December 10, 1983, in compliance with the Commission's confirmatory order issued on August 15, 1983, to inspect stainless steel piping systems that were susceptible to IGSCC. When IGSCC was observed in the reactor coolant system, pursuant to 10 CFR 50.59, the Boston Edison Company elected to replace Type 304 stainless steel piping with the more resistant Type 316 NG stainless steel piping in the following systems:

a. Recirculation system,
b. Residual heat removal system, inside containment,
c. Core spray system, inside containment plus pipe section containing weld No. 14-B-21 outside containment, and
d. Reactor water clean-up system, suction pipe.

After the repairs were completed Region I personnel concluded that the replacement was properly made, and that all applicable staff and Sections III, IX and XI ASME Boiler and Pressure Vessel Code requirements were met. The staff reviewed the reports and other information provided by Boston Edison Company and found that the actions required by the confirmatory order were satisfactorily completed. The staff prepared a Safety Evaluation Report which was forwarded to the licensee in a letter dated December 4, 1984, to William D. Harrington from H. R. Denton, authorizing the Pilgrim Station to return to full power.

Further, the staff concluded that crack growth in the unrepaired recirculation nozzle thermal sleeves would not affect the integrity of the reactor coolant pressure boundary during the next eighteen (18) month operating period. In addition, the staff required that a plan for either mitigation or repair of the thermal sleeves be submitted for review at least one month prior to the start of the next refueling outage.

In a letter dated January 2, 1987, Boston Edison provided the NRC with the results of this thermal sleeve study that indicated IGSCC as the most likely cracking mechanism and that hydrogen water chemistry was planned as the method to mitigate IGSCC at Pilgrim.

On January 25, 1988, the Commission issued Generic Letter 88-01 "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," which enclosed Revision 2 to NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Piping." NUREG-0313, Revision 2, contains the relevant recommendations of the Piping Review Committee Task Group on Pipe Cracking issued as NUREG-1061, Volume 1.

NUREG-0313, Revision 2, describes methods acceptable to the staff to control the susceptibility of BWR ASME Boiler and Pressure Vessel Code Class 1, 2, and 3 pressure boundary piping and safe ends to intergranular stress corrosion cracking. The revision describes the technical bases for the staff's position on the following items: material of construction; process to minimize or control IGSCC; water chemistry; reinforcement by weld overlay; replacement of piping; stress improvements; clamping devices; crack characterization and repair criteria; inspection methods, schedules, and personnel; and limits on the staff positions. Varying degrees of inservice inspection is required to ensure structural integrity of the pressure boundary piping system, pursuant to paragraph 50.55(g)(6)(ii) of 10 CFR Part 50.

Revision 3 to the Inservice Inspection Program for the Pilgrim Station for the second ten-year interval was submitted by the Boston Edison Company to the Commission in a letter dated December 12, 1986, and amended in a letter dated March 2, 1988. The Commission, in a letter dated September 28, 1988, granted the requirements of Section XI of the ASME Boiler and pressure Vessel Code, 1980 Edition, including Winter 1980 Addendum.

The ISI Program for Pilgrim is supplemented by augmented inspections requires by the NRC and by inspections recommended by engineering judgement based on industry experience.

For example, the program includes the following inspections:

a. Visual examination of the core spray sparger,
b. Ultrasonic examination of the shroud head bolts,
c. Visual examination of SRM and IRM dry tubes, and
d. Examinations pursuant to Generic Letter 88-01.

The Inservice Test Program for pumps and valves was submitted for review on July 11, 1983. A Safety Evaluation Report was prepared on the program by EG&G Idaho, Inc., in February 1985. The major portion of the program was in compliance

with the requirements of Section XI of the ASME Boiler and Pressure Vessel Code. However, there were a number of open relief requests which are under discussion with Boston Edison Company pending their resolution.

Following a number of meetings to resolve the Commission's concerns, a revised IST program was submitted by BECo on January 4, 1990. In a July 20, 1990, letter to BECo, the NRC provided comments on the revised program. These comments were resolved and final revisions to the program were sent to the NRC on October 25, 1990. This revision is now in NRC review.

We conclude from our evaluation that compliance with the codes, standards, and regulatory requirements to which the mechanical equipment for the Pilgrim Station was analyzed, constructed, repaired and inspected, including the inservice inspection programs in compliance with Section XI of the ASME Boiler and Pressure Vessel Code, and the augmented inspections of austenitic stainless steel piping required by the Commission, provide adequate assurance that the structural integrity of components important to safety will be maintained. Any significant degradation by an active mechanism would be discovered and the mechanical equipment or component restored to an acceptable condition. Therefore, the age of the mechanical equipment or component should not be a consideration in the extension of the operating license for the Pilgrim Nuclear Power Station.

Electric Equipment

Aging analysis has been performed for safety-related electrical equipment in accordance with 10 CFR 50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants." Qualified lifetimes have been identified for the equipment as part of this analysis. Since electrical equipment and components can be replaced, these lifetimes will be incorporated into the Pilgrim Station maintenance and replacement procedures to ensure that all safety-related equipment remains qualified for the life of the plant regardless of the overall age of the plant.

We conclude from our evaluation that all issues associated with safety-related electrical equipment aging have been adequately addressed. Therefore, the age of electrical equipment or components should not be a consideration in the extension of the operating license for the Pilgrim Nuclear Power Station.

Structures

In evaluating the design of Category I structures for the Pilgrim Station, the staff considered the a) geology and nature of the foundation, b) criteria for design loads, load combinations and design stresses, and c) seismic design criteria and method of analysis.

The general requirements for the design of the Category I structures and equipment include provisions for resisting dead, live and operating combination loads within the allowable stress requirements of local and state building codes, the Uniform Building Code, the ASME Boiler and Pressure Vessel Code, the U.S. Standards B31.1.0 Piping Code, the American Institute of Steel Construction Code and the American Concrete Institute Code. Industrial experience with Category I structures constructed to the appropriate standards confirm that a service life in excess of forty (40) years may be anticipated.

The use of the indicated codes, standards, and specifications in the design, analysis, and construction, Appendix B of 10 CFR Part 50 for quality assurance, and the identified testing and inservice surveillance requirements provide reasonable assurance that the Category I structures will withstand continued service without loss of function for an extended period of 3 years, 9-1/2 months at the Pilgrim Nuclear Power Station.

Reactor Vessel

The Final Safety Analysis Report (FSAR) states that the reactor vessel for the Pilgrim Nuclear Power Station was designed and fabricated for a service life of 40 years at 80% plant capacity. The vessel was designed, fabricated, inspected and tested in accordance with Section III of the ASME Boiler and Pressure Vessel Code, 1965 Edition, including Winter 1966 Addenda, and applicable requirements for the Class A pressure vessels at the time of purchase. Operation limitations on temperature and pressure are established using Appendix G of Section III of the ASME Boiler and Pressure Vessel Code and Appendix G of 10 CFR Part 50. The inservice inspection program is periodically upgraded to comply with the recommendations of Section 50.55a(g) of 10 CFR Part 50, which incorporates Section XI of the ASME Boiler and Pressure Vessel Code.

The integrity and performance capability of the ferritic materials in the reactor vessel for the Pilgrim Nuclear Power Station is assured because the fracture toughness is monitored with a surveillance program in conformance to the extent practical with the recommendations of Appendix H, 10 CFR Part 50, "Reactor Vessel Materials Surveillance Program Requirements," and ASTM E185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels." The ferritic materials must meet the fracture toughness properties of Section III of the Boiler and Pressure Vessel Code and Appendix G, 10 CFR Part 50, "Fracture Toughness Properties."

By letter dated February 28, 1986, the Boston Edison Company proposed that the pressure and temperature limits in the Technical Specifications for the Pilgrim Nuclear Power Station be changed to account for the insertion of a low-leakage core at the start of Fuel Cycle 5. The operating pressure and temperature limit curves were developed using neutron flux values obtained from dosimetry measurements from the surveillance capsule taken from the reactor vessel after Fuel Cycle 4. Rigorous radiation transport calculations by the licensee showed that the low-leakage core significantly reduced the neutron fluence at the wall of the reactor pressure vessel. Thus, the irradiation damage had been over-estimated in the current pressure temperature limit curves. The Commission approved the proposed change in Amendment No. 94 to Facility Operating License No. DPR-35 for the station by letter, dated May 28, 1986.

Generic Letter 88-11 "NRC Position on Radiation Embrittlement of Reactor Vessel Materials and Its Impact on Plant Operations," dated July 12, 1988, informed all licensees that the methods described in Revision 2 to Regulatory Guide 1.99 should be used to predict the effect of neutron radiation on reactor vessel materials as required by paragraph V.A. of Appendix G to 10 CFR Part 50, unless the use of other methods can be justified.

In its response to GL 88-11, dated December 2, 1988, Boston Edison stated they had analyzed the regulatory guide for impact on the Pilgrim Nuclear Power Station and determined that compliance with its guidelines will require a license amendment to revise the reactor pressure vessel presure-temperature limits.

We conclude that there are no special considerations to indicate reactor vessel degradation for the Pilgrim Nuclear Power Station by increasing the duration of useful life for an additional three years, 9-1/2 months. The structural integrity of the reactor vessel is assured because it was originally designed and constructed for 32 EFPY usage at a minimum. As of October 16, 1990, the reactor vessel has seen only 8.58 EFPY which represents approximately 27% of the minimum design usage. The reactor vessel is monitored, inspected and tested to detect degradation processes at an early stage of their development; and it is operated with procedures to assure that design conditions are not exceeded.

Summary and Findings

The NRC staff concluded in the Environmental Assessment that the annual radiological effects during the additional years of operation that would be authorized by the proposed license amendments are not more than were previously estimated in the Final Environmental Statement, and are acceptable.

The staff concludes from its considerations of the design, operation, testing and monitoring of the mechanical equipment, electrical equipment, structures, and the reactor vessel that an extension of the operating license for the Pilgrim Nuclear Power Station to a 40-year service life is consistent with the FSAR, NRC Safety Evaluations supporting amendments, and submittals made by the licensee. Therefore, there is reasonable assurance that the unit will be able to continue to operate safely for the additional period authorized by this amendment. The plant is operated in compliance with the Commission's regulations, and issues associated with plant degradation and aging have been adequately addressed.

In summary, we find that extension of the operating license for the Pilgrim Nuclear Power Station to allow a 40-year service life is consistent with the Final Environmental Statement and Safety Analysis Report for the Pilgrim Nuclear Power Station and that the Commission's previous findings are not changed.

ENVIRONMENTAL CONSIDERATION

A notice of Issuance of Environmental Assessment and Finding of No Significant Impact relating to the proposed extension of the Facility Operating License termination date for the Pilgrim Nuclear Power Station was published in the Federal Register on November 27, 1990 (55 FR 49351).

CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register on April 23, 1986, (51 FR 15393). No public comments were received, and the Commonwealth of Massachusetts did not have any comments.

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 (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.

Principal Contributors: D. McDonald
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H. Li

Dated: January 29, 1991