

NOV 4 1977

Docket No. 50-293

Boston Edison Company
M/C NUCLEAR
ATTN: Mr. G. Carl Andognini
800 Boylston Street
Boston, Massachusetts 02199

Gentlemen:

The Commission has issued the enclosed Amendment No. 28 to Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment consists of changes to the Technical Specifications in response to your request dated June 18, 1976.

This amendment makes revisions to the Pilgrim Technical Specifications and ensures compliance with the fracture toughness requirements of Appendix G to 10 CFR Part 50 during heatup and cooldown operations, system hydrostatic tests and reactor core criticality.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,

151 Don K. Davis

Don K. Davis, Acting Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosures:

1. Amendment No. 28 to DPR-35
2. Safety Evaluation
3. Notice

cc w/encl:
See next page

Verbal concurrence received from H. Harman and B. Smith

OFFICE	DOOR/ORB#2	OELD	DR:ORB#2			
SURNAME	RDiggs		DDavis			
DATE	P.O. Connor:lb 11/04/77	11/04/77	11/4/77			



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

November 4, 1977

Docket No. 50-293

Boston Edison Company
M/C NUCLEAR
ATTN: Mr. G. Carl Andognini
800 Boylston Street
Boston, Massachusetts 02199

Gentlemen:

The Commission has issued the enclosed Amendment No. 28 to Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment consists of changes to the Technical Specifications in response to your request dated June 18, 1976.

This amendment makes revisions to the Pilgrim Technical Specifications and ensures compliance with the fracture toughness requirements of Appendix G to 10 CFR Part 50 during heatup and cooldown operations, system hydrostatic tests and reactor core criticality.

Copies of the Safety Evaluation and Notice of Issuance are also enclosed.

Sincerely,

A handwritten signature in dark ink, appearing to read "Don K. Davis".

Don K. Davis, Acting Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosures:

1. Amendment No. 28 to DPR-35
2. Safety Evaluation
3. Notice

cc w/encl;
See next page

Boston Edison Company

- 2 -

November 4, 1977

cc w/enclosures:

Mr. Paul J. McGuire
Pilgrim Station Acting Manager
Boston Edison Company
RFD #1, Rocky Hill Road
Plymouth, Massachusetts 02360

U. S. Environmental Protection Agency
Region I Office
ATTN: EIS COORDINATOR
JFK Federal Building
Boston, Massachusetts 02203

Anthony Z. Roisman, Esquire
Sheldon, Harmon & Roisman
1025 15th Street, N. W., 5th Floor
Washington, D. C. 20005

Henry Herrmann, Esquire
Massachusetts Wildlife Federation
151 Tremont Street
Boston, Massachusetts 02111

Plymouth Public Library
North Street
Plymouth, Massachusetts 02360

Massachusetts Department of Public Health (and cy of BECo
ATTN: Commissioner of Public Health filing dtd. 6/18/76)
600 Washington Street
Boston, Massachusetts 02111

Water Quality & Environmental Commissioner
Department of Environmental Quality
Engineering
100 Cambridge Street
Boston, Massachusetts 02202

Mr. David F. Tarantino
Chairman, Board of Selectmen
11 Lincoln Street
Plymouth, Massachusetts 02360

Chief, Energy Systems Analyses
Branch (AW-459)
Office of Radiation Programs
U. S. Environmental Protection Agency
Room 645, East Tower
401 M Street, S. W.
Washington, D. C. 20460



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

BOSTON EDISON COMPANY

DOCKET NO. 50-293

PILGRIM NUCLEAR POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 28
License No. DPR-35

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Boston Edison Company (the licensee) dated June 18, 1976, 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 License No. DPR-35 is hereby amended to read as follows:

"3.B Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 28 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



Don K. Davis, Acting Chief
Operating Reactors Branch #2
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 4, 1977

ATTACHMENT TO LICENSE AMENDMENT NO. 28

FACILITY OPERATING LICENSE NO. DPR-35

DOCKET NO. 50-293

The following changes relate to the Appendix A portion of the Pilgrim Unit No. 1 Technical Specifications. The changed areas on the revised pages are shown by a marginal line.

Remove Pages

123
124
125
128

138
139

Insert Pages

123
124
125
128
128A
138
139

3.6 PRIMARY SYSTEM BOUNDARYApplicability:

Applies to the operating status of the reactor coolant system.

Objective:

To assure the integrity and safe operation of the reactor coolant system.

Specification:A. Thermal and Pressurization Limitations

1. The average rate of reactor coolant temperature change during normal heatup or cooldown shall not exceed 100°F/hr when averaged over a one-hour period except when the vessel temperatures are above 450°F . The shell flange to shell temperature differential shall not exceed 145°F .
2. The reactor vessel shall not be pressurized, hydrostatic and/or leakage tests shall not be performed, and critical core operation shall not be conducted unless the reactor vessel temperature is above that defined by the appropriate curve on Figure 3.6.1. For integrated fast neutron exposure greater than approximately 2.5×10^{17} NVT, the curves of Figure 3.6.1 shall be adjusted upward by an amount as shown on Figure 3.6.2.

4.6 PRIMARY SYSTEM BOUNDARYApplicability:

Applies to the periodic examination and testing requirements for the reactor cooling system.

Objective:

To determine the condition of the reactor coolant system and the operation of the safety devices related to it.

Specification:A. Thermal and Pressurization Limitations

1. During heatups and cooldowns, the following temperatures shall be permanently logged at least every 15 minutes until the difference between any two readings taken over a 45 minute period is less than 5°F .
 - a. Reactor vessel shell adjacent to shell flange
 - b. Reactor vessel shell flange
 - c. Recirculation loops A and B
2. Reactor vessel shell temperature and reactor coolant pressure shall be permanently logged at least every 15 minutes whenever the shell temperature is below 220°F and the reactor vessel is not vented.

Test specimens of the reactor vessel base, weld and heat affected zone metal subjected to the highest fluence of greater than 1 Mev neutrons shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The specimens and sample program shall conform to the requirements of ASTM E 185-66. Selected

3.6.A Thermal and Pressurization Limitations (Cont'd)

3. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel head flange and the head is greater than 50°F.
4. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50°F of each other.
5. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145°F.

6. Thermal-hydraulic Stability

Core thermal power shall not exceed 25% of rated thermal power without forced recirculation.

B. Coolant Chemistry

1. The reactor coolant system radioactivity concentration in water shall not exceed 20 microcuries of total iodine per ml of water.
2. The reactor coolant water shall not exceed the following limits with steaming rates less than 100,000 pounds per hour, except as specified in 3.6.B.3:

Conductivity...2 umho/cm

Chloride ion...0.1 ppm

4.6.A Thermal and Pressurization Limitations (Cont'd)

neutron flux specimens shall be removed at the frequency required by 10CFR50 Appendix H and tested to experimentally verify or adjust the calculated values of integrated neutron flux that are used to determine the NDTT for Figure 3.6.2.

3. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.
4. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.
5. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

B. Coolant Chemistry

1.
 - a. A reactor coolant sample shall be taken at least every 96 hours and analyzed for radioactivity content.
 - b. Isotopic analysis of a reactor coolant sample shall be made at least once per month.
2. During startups and at steaming rates less than 100,000 pounds per hour, a sample of reactor coolant shall be taken every four hours and analyzed for conductivity and chloride content.

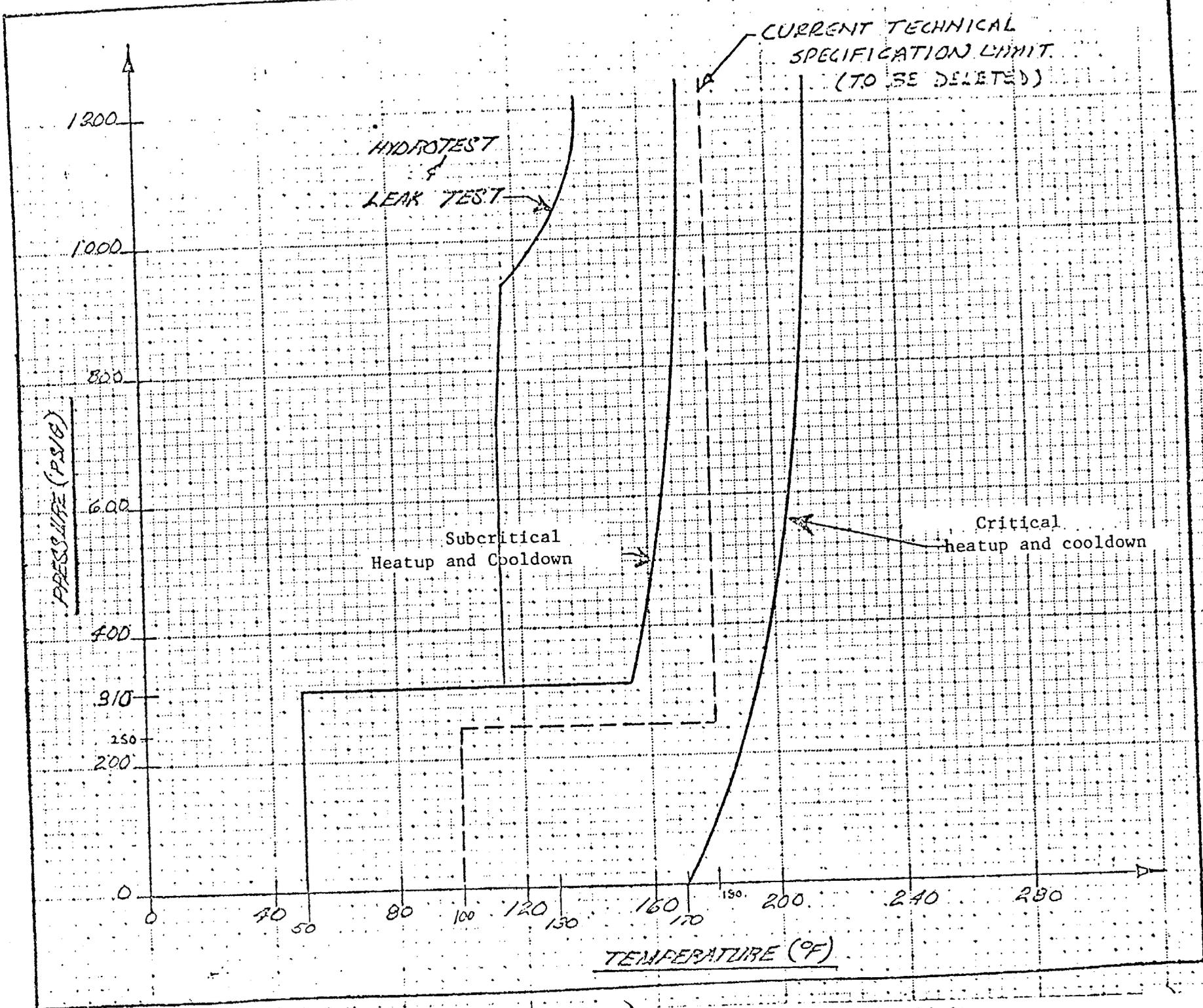


Figure 3.6.1 Vessel Temperature-Pressurization Limits

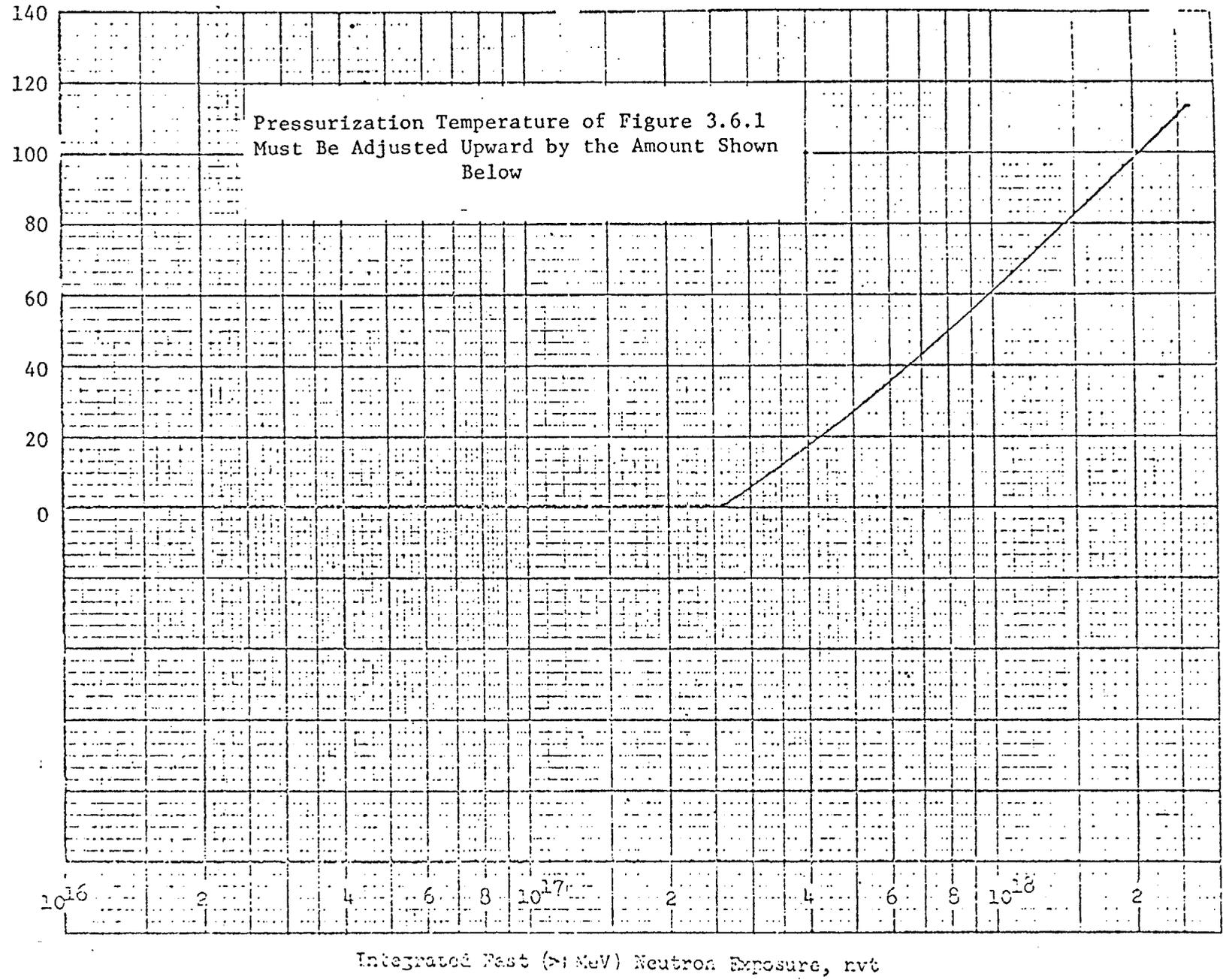


Figure 3.6.2 Reactor Pressurization Temperature Adjustment

BASES:

3.6.A and 4.6.A

Thermal and Pressurization Limitations

The allowable rate of heatup and cooldown for the reactor vessel contained fluid is 100°F per hour averaged over a period of one hour. This rate has been chosen based on past experience with operating power plants. The associated time periods for heatup and cooldown cycles when the 100°F per hour rate is limiting provides for efficient, but safe, plant operation.

Specific analyses were made based on a heating and cooling rate of 100°F/hour applied continuously over a temperature range of 100°F to 546°F. Calculated stresses were within ASME Boiler and Pressure Vessel Code Section III stress intensity and fatigue limits even at the flange area where maximum stress occurs.

The manufacturer performed detailed stress analysis as shown in Amendment 17 of the FSAR. This analysis includes more severe thermal conditions than those which would be encountered during normal heating and cooling operations.

The permissible flange to adjacent shell temperature differential of 145°F is the maximum calculated for 100°F/hour heating and cooling rate applied continuously over a 100°F to 550°F range. The differential is due to the sluggish temperature response of the flange metal and its value decreases for any lower heating rate or the same rate applied over a narrower range.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

BASES:

3.6.A and 4.6.A

Thermal and Pressurization Limitations (Cont'd)

The reactor coolant system is a primary barrier against the release of fission products to the environs. In order to provide assurance that this barrier is maintained at a high degree of integrity, restrictions have been placed on the operating conditions to which it can be subjected.

The nil-ductility transition (NDT) temperature is defined as the temperature below which ferritic steel breaks in a brittle rather than ductile manner. Radiation exposure from fast neutrons (>1 mev) above about 10^{17} nvt may shift the NDT temperature of the vessel base metal above the initial value. Extensive tests have established the magnitude of changes as a function of the integrated neutron exposure. These changes are presented in Figure 3.6.2 based on an initial maximum NDTT of the reactor vessel shell and head of 40°F . Test results as indicated in Amendment 17 of the FSAR show that the initial NDTT is less than this value.

Appendix G to 10CFR50 defines the temperature-pressurization restrictions for hydrostatic and leak tests, pressurization, and critical operation. These limits have been calculated for Pilgrim I and are contained in Figure 3.6.1. For the limiting location, an $R_{t\text{NDT}}$ equal to $(-)10^{\circ}\text{F}$ is used based upon materials data. Section III of the ASME Boiler and Pressure Vessel Code requires that pressurization and stud tensioning be performed at 60°F above this reference temperature, thereby requiring the temperature to be above 50°F prior to performing these activities.

Neutron flux wires and samples of vessel material are installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The wires and samples will be removed and tested to experimentally verify the values used for Figure 3.6.1.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 28 TO FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

PILGRIM UNIT 1

DOCKET NO. 50-293

Introduction

By letter dated June 18, 1976, Boston Edison Company (the licensee) requested changes to the Technical Specifications appended to Provisional Operating License No. DPR-35, for operation of the Pilgrim Nuclear Power Station in Plymouth, Massachusetts. The requested changes relate to heatup and cooldown operation, system hydrostatic tests and reactor core criticality.

Discussion

By letter dated February 23, 1976, we requested that the licensee review the reactor coolant system pressure temperature limits in the Pilgrim Technical Specifications to determine if they are in full compliance with Appendix G to 10 CFR Part 50. The review was to include the pressure-temperature limits for heatup and cooldown operation, system hydrostatic tests and reactor core criticality. By letter dated June 18, 1976, the licensee advised us that the existing Pilgrim Technical Specifications pressure-temperature limits for subcritical heatup and cooldown and hydrostatic/leak tests are conservative, but that an additional temperature-pressurization limit for reactor criticality was needed to comply with Appendix G. The licensee also proposed to change the date of removal of the first Pilgrim surveillance capsule from third refueling outage to the date required by Appendix H to 10 CFR 50 "Reactor Vessel Material Surveillance Program Requirements."

Evaluation

The licensee's proposed pressure-temperature operating limits for hydrostatic leak testing, subcritical heatup and cooldown, and critical heatup and cooldown have been calculated in accordance with Appendix G to 10 CFR Part 50 and Appendix G to ASME Code Section III. These limits are based upon an analysis by Teledyne Materials Research Engineers entitled - Evaluation of Pilgrim Unit No. 1 Reactor Vessel Pressure Boundary to Appendix G ASME Code Section III (TR-2318, Rev. 1).

The NRC Staff has reviewed Boston Edison's proposed changes to the pressure-temperature limits for the Pilgrim Unit No. 1 vessel. These pressure-temperature limits are based on updated techniques which are detailed in the Summer 1972 Addenda to the ASME Boiler and Pressure Vessel Code, Section III. The techniques are presently required in Appendix G to 10 CFR Part 50. The techniques involve the use of the RT_{NDT} (i.e., reference RT_{NDT} plus any radiation induced shift) which is in turn used to index the material to a reference stress intensity factor curve which appears in Appendix G of the ASME Code. The curve in the Code provides the stress intensity factor for the material and this stress intensity factor serves as an allowable upper limit in the analysis. Actual stress intensity factors are then determined by combining the effects of pressure stress and thermal gradient stress. The allowable stress intensity factor must then be larger than the actual stress intensity factors with appropriate safety margins included. The analysis then consists of determining limiting conditions within these guidelines for the allowable combination of vessel pressure and temperature. For the Pilgrim Unit No. 1 vessel, the initial value of RT_{NDT} is $-10^{\circ}F$ for the limiting region of the vessel, the upper shell adjacent to the shell flange.

We have concluded, based upon our review of Boston Edison's submittal, that they have properly applied Appendices G and H of 10 CFR 50 and are acceptable. Limits comply with Appendices G and H of 10 CFR 50 and are acceptable.

The initial schedule for removal of the Pilgrim vessel surveillance specimen required the removal during the third refueling outage. The licensee has reviewed the requirements of 10 CFR 50 Appendix H and has determined that the third refueling outage has occurred earlier than the point in time required by Appendix H and has requested that the Pilgrim specifications be changed to require removal in accordance with Appendix H.

Compliance with Appendices G and H ensures that adequate safety margins exist during testing, operation, maintenance and postulated accident conditions and constitutes an acceptable basis for satisfying the requirements of General Design Criteria 31 of Appendix A to 10 CFR Part 50.

Environmental Considerations

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR 51.5(d)(4) that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) 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.

Date: November 4, 1977

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NO. 50-293BOSTON EDISON COMPANYNOTICE OF ISSUANCE OF AMENDMENT TO FACILITY
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 28 to Facility Operating License No. DPR-35, issued to Boston Edison Company (the licensee), which revised Technical Specifications for operation of the Pilgrim Nuclear Power Station (the facility) located near Plymouth, Massachusetts. The amendment is effective as of its date of issuance.

This amendment makes revisions to the Pilgrim Nuclear Power Station Technical Specifications to include requirements for compliance with the fracture toughness requirements of Appendix G to 10 CFR Part 50 during heatup and cooldown operations, system hydrostatic tests and reactor core criticality.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant

to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated June 18, 1976, (2) Amendment No. 28 to License No. DPR-35, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C., and at the Plymouth Public Library on North Street in Plymouth, Massachusetts 02360. A single copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland this fourth day of November, 1977.

FOR THE NUCLEAR REGULATORY COMMISSION



Don K. Davis, Acting Chief
Operating Reactors Branch #2
Division of Operating Reactors