Mr. E. Thomas Boulette n.D
Senior Vice President - Nuclear
Boston Edison Company
Pilgrim Nuclear Power Station
RFD #1 Rocky Hill Road
Plymouth, MA 02360

Dece r 27, 1996

SUBJECT: ISSUANCE OF AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. DPR-35, PILGRIM NUCLEAR POWER STATION (TAC NO. M95324)

Dear Mr. Boulette:

The Commission has issued the enclosed Amendment No. 169 to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment is in response to your application dated May 1, 1996 and supplemented on November 26, 1996.

The proposed amendment will modify Table 3.1.1, "Reactor Protection System (SCRAM) Instrumentation Requirement," Table 3.2.C.1, "Instrumentation That Initiates Rod Blocks," and Technical Specification 3/4.4, "Standby Liquid Control."

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

Sincerely,

/S/

Alan B. Wang, Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosures: 1. Amendment No. 169 to License No. DPR-35
2. Safety Evaluation

cc w/encls: See next page

DISTRIBUTION: See attached sheet

DOCUMENT NAME: G:\PILGRIM\M95324.AMD *See Previous Concurrence

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

December 27, 1996

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Senior Vice President - Nuclear
Boston Edison Company
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DATED: December 27, 1996

AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. DPR-35-PILGRIM NUCLEAR POWER STATION

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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BOSTON EDISON COMPANY

DOCKET NO. 50-293

PILGRIM NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 169
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 May 1, 1996 as supplemented on November 26, 1996, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations;

   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 2.C.(2) of Facility Operating License No. DPR-35 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 169, 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 its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

S. Singh Bajwa, Acting Director
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: December 27, 1996

ATTACHMENT TO LICENSE AMENDMENT NO. 169

FACILITY OPERATING LICENSE NO. DPR-35

DOCKET NO. 50-293

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

Remove	Insert
3/4.1-2	3/4.1-2
3/4.1-4	3/4.1-4
3/4.2-19	3/4.2-19
3/4.2-20	3/4.2-20
3/4.2-21	3/4.2-21
3/4.2-22	3/4.2-22
3/4.2-23	3/4.2-23
3/4.2-35	3/4.2-35
3/4.4-1	3/4.4-1
3/4.4-2	3/4.4-2
B3/4.4-1	B3/4.4-1
B3/4.4-2	B3/4.4-2
	B3/4.4-3
	B3/4.4-4
	B3/4.4-5
6-17	6-17

PNPS Table 3.1.1 REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENT

Operable Inst. Channels per Trip System (1) Minimum	Avail.	Trip Function	Trip Level Setting	Modes in which Function Must Be Operable: Refuel	Startup/Hot Standby	Run	Action[(1)]
1	1	Mode Switch in Shutdown		X(7)	X		A
1	1	Manual Scram		X(7)	X	X	A
		IRM					
3	4	High Flux	≤ 120/125 of full scale	X(7)	X	(5)	A
3	4	Inoperative		X(7)	X	(5)	A
		APRM					
2	3	High Flux	(15)	(17)	(17)	X	A or B
2	3	Inoperative	(13)	X(7)	X(9)	X	A or B
2	3	High Flux (15%	≤ 15% of Design Power	X(7)	X	(16)	A or B
2	2	High Reactor Pressure	≤ 1063.5 psig	X(10)	X	X	A
2	2	High Drywell Pressure	≤ 2.22 psig	X(8)	X(8)	X	A
2	2	Reactor Low Water Level	≥ 11.6 In. Indicated Level	X(10)	X	X	A
		SDIV High Water Level:	≤ 38 Gallons	X(2)(7)	X	X	A
2	2	East					
2	2	West					
4	4	Main Steam Line Isolation Valve Closure	≤ 10%Valve Closure	X(3)(6)	X(3)(6)	X(6)	A or C
2	2	Turbine Control Valve Fast Closure	≥ 150 psit Control Oil Pressure at Acceleration Relay	X(4)	X(4)	X(4)	A or D
4	4	Turbine Stop Valve Closure	≤ 10% Valve Closure	X(4)	X(4)	X(4)	A or D

NOTES FOR TABLE 3.1.1 (Cont)

2. Permissible to bypass, with control rod block, for reactor protection system reset in refuel and shutdown positions of the reactor mode switch.
3. Permissible to bypass when reactor pressure is <576 psig.
4. Permissible to bypass when turbine first stage pressure is less than ≤ 112 psig.
5. IRM's are bypassed when APRM's are onscale and the reactor mode switch is in the run position.
6. The design permits closure of any two lines without a scram being initiated.
7. When the reactor mode switch is in the Refuel position, the reactor vessel head is removed, and control rods are inserted in all core cells containing one or more fuel assemblies, these scram functions are not required.
8. Not required to be operable when primary containment integrity is not required.
9. Not required while performing low power physics tests at atmospheric pressure during or after refueling at power levels not to exceed 5 MW(t).
10. Not required to be operable when the reactor pressure vessel head is not bolted to the vessel.
11. Deleted
12. Deleted
13. An APRM will be considered inoperable if there are less than 2 LPRM inputs per level or there is less than 50% of the normal complement of LPRM's to an APRM.
14. Deleted
15. The APRM high flux trip level setting shall be as specified in the CORE OPERATING LIMITS REPORT, but shall in no case exceed 120% of rated thermal power.
16. The APRM (15%) high flux scram is bypassed when in the run mode.
17. The APRM flow biased high flux scram is bypassed when in the refuel or startup/hot standby modes.
18. Deleted.

TABLE 3.2.C.1

INSTRUMENTATION THAT INITIATES ROD BLOCKS

Trip Function	Operable Channels per Trip Function Minimum	Operable Channels per Trip Function Available	Required Operational Conditions	Notes
APRM Upscale (Flow Biased)	4	6	Run	(1)
APRM Upscale	4	6	Startup/Refuel	(1)(6)
APRM Inoperative	4	6	Run/Startup/Refuel	(1)(6)
APRM Downscale	4	6	Run	(1)
Rod Block Monitor(Power Dependent)	2	2	Run, with limiting control rod pattern, and reactor power > LPSP	(2)(5)
Rod Block Monitor Inoperative	2	2	Run, with limiting control rod pattern, and reactor power > LPSP	(2)(5)
Rod Block Monitor Downscale	2	2	Run, with limiting control rod pattern, and reactor power > LPSP	(2)(5)
IRM Downscale	6	8	Startup/Refuel, except trip is bypassed when IRM is on its lowest range	(1)(6)
IRM Detector not in Startup Position	6	8	Startup/Refuel, trip is bypassed when mode switch is placed in run	(1)(6)
IRM Upscale	6	8	Startup/Refuel	(1)(6)
IRM Inoperative	6	8	Startup/Refuel	(1)(6)

TABLE 3.2.C.1 (Cont)

INSTRUMENTATION THAT INITIATES ROD BLOCKS

Trip Function	Operable Channels per Trip Function Minimum	Operable Channels per Trip Function Available	Required Operational Conditions	Notes
SRM Detector not in Startup Position	3	4	Startup/Refuel, except trip is bypassed when SRM count rate is ≥ 100 counts/second or IRMs on Range 3 or above	(1)(4)(6)
SRM Downscale	3	4	Startup/Refuel, except trip is bypassed when IRMs on Range 3 or above	(1)(4)(6)
SRM Upscale	3	4	Startup/Refuel, except trip is by- passed when the IRM range switches are on Range 8 or above (4)	(1)(4)(6)
SRM Inoperative	3	4	Startup/Refuel, except trip is by- passed when the IRM range switches are on Range 8 or above (4)	(1)(4)(6)
Scram Discharge Instrument Volume Water Level - High	2	2	Run/Startup/Refuel	(3)(6)
Scram Discharge Instrument Volume-Scram Trip Bypassed	1	1	Refuel/Shutdown	(3)(6)
Mode Switch in Shutdown	1	1	Shutdown	(7)

PNPS
TABLE 3.2.C.1 (Cont)

INSTRUMENTATION THAT INITIATES ROD BLOCKS

Trip Function	Operable Instrument Channels per Trip Function Minimum	Available	Required Operational Conditions	Notes
Recirculation Flow Converter - Upscale	2	2	Run	(1)
Recirculation Flow Converter - Inoperative	2	2	Run	(1)
Recirculation Flow Converter - Comparator Mismatch	2	2	Run	(1)
Reactor Mode Switch In Shutdown	2	2	Shutdown	(7)

NOTES FOR TABLE 3.2.C

1. With the number of operable channels:

   a. One less than required by the minimum operable channels per trip function requirement, restore an inoperable channel to operable status within 7 days or place an inoperable channel in the tripped condition within the next hour.

   b. Two or more less than required by the minimum operable channels per trip function requirement, place at least one inoperable channel in the tripped condition within one hour.

2. a. With one RBM Channel inoperable:

      (1) restore the inoperable RBM channel to operable status within 24 hours; otherwise place one rod block monitor channel in the tripped condition within the next hour, and;

      (2) prior to control rod withdrawal, perform an instrument function test of the operable RBM channel.

   b. With both RBM channels inoperable, place at least one inoperable rod block monitor channel in the tripped condition within one hour.

3. If the number of operable channels is less than required by the minimum operable channels per trip function requirement, place the inoperable channel in the tripped condition within one hour.

4. SRM operability requirements during core alterations are given in Technical Specification 3.10.

5. RBM operability is required in the run mode in the presence of a limiting rod pattern with reactor power greater than the RBM low power setpoint (LPSP). A limiting rod pattern exists when:

   MCPR < 1.40 for reactor power > 90%

   MCPR < 1.70 for reactor power < 90%

   The allowable value for the LPSP is < 29% of rated core thermal power.

6. When the reactor mode switch is in the Refuel position, the reactor vessel head is removed, and control rods are inserted in all core cells containing one or more fuel assemblies, these Rod Block functions are not required.

7. With one or more Reactor Mode Switch - Shutdown Position channels inoperable, suspend control rod withdrawal and initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies immediately.

TABLE 3.2.C-2

CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS

Trip Function	Trip Setpoint
APRM Upscale	(1) (2)
APRM Inoperative	Not Applicable
APRM Downscale	≥ 2.5 Indicated on Scale
Rod Block Monitor (Power Dependent)	(1) (3)
Rod Block Monitor Inoperative	Not Applicable
Rod Block Monitor Downscale	(1) (3)
IRM Downscale	≥ 5/125 of Full Scale
IRM Detector not in Startup Position	Not Applicable
IRM Upscale	≤ 108/125 of Full Scale
IRM Inoperative	Not Applicable
SRM Detector not in Startup Position	Not Applicable
SRM Downscale	≥ 3 counts/second
SRM Upscale	≤ 10^5 counts/second
SRM Inoperative	Not Applicable
Scram Discharge Instrument Volume Water Level - High	≤ 17 gallons
Scram Discharge Instrument Volume - Scram Trip Bypassed	Not Applicable
Recirculation Flow Converter - Upscale	≤ 120/125 of Full Scale
Recirculation Flow Converter - Inoperative	Not Applicable
Recirculation Flow Converter - Comparator Mismatch	≤ 8% Flow Deviation
Mode Switch in Shutdown	Not Applicable

(1) The trip level setting shall be as specified in the CORE OPERATING LIMITS REPORT.

(2) When the reactor mode switch is in the refuel or startup positions, the APRM rod block trip setpoint shall be less than or equal to 13% of rated thermal power, but always less than the APRM flux scram trip setting.

(3) The RBM bypass time delay (t_{d2}) shall be < 2.0 seconds.

PNPS
TABLE 4.2.C

MINIMUM TEST AND CALIBRATION FREQUENCY FOR CONTROL ROD BLOCKS ACTUATION

Instrument Channel	Instrument Functional Test	Calibration	Instrument Check
APRM - Downscale	Once/3 Months	Once/3 Months	Once/Day
APRM - Upscale	Once/3 Months	Once/3 Months	Once/Day
APRM - Inoperative	Once/3 Months	Not Applicable	Once/Day
IRM - Upscale	(2) (3)	Startup or Control Shutdown	(2)
IRM - Downscale	(2) (3)	Startup or Control Shutdown	(2)
IRM - Inoperative	(2) (3)	Not Applicable	(2)
RBM - Upscale	Once/3 Months	Once/6 Months	Once/Day
RBM - Downscale	Once/3 Months	Once/6 Months	Once/Day
RBM - Inoperative	Once/3 Months	Not Applicable	Once/Day
SRM - Upscale	(2) (3)	Startup or Control Shutdown	(2)
SRM - Inoperative	(2) (3)	Not Applicable	(2)
SRM - Detector Not in Startup Position	(2) (3)	Not Applicable	(2)
SRM - Downscale	(2) (3)	Startup or Control Shutdown	(2)
IRM - Detector Not in Startup Position	(2) (3)	Not Applicable	(2)
Scram Discharge Instrument Volume Water Level-High	Once/3 Months	Refuel	Not Applicable
Scram Discharge Instrument Volume-Scram Trip Bypassed	Once/Operating Cycle	Not Applicable	Not Applicable
Recirculation Flow Converter	Not Applicable	Once/Operating Cycle	Once/Day
Recirculation Flow Converter-Upscale	Once/3 Months	Once/3 Months	Once/Day
Recirculation Flow Converter-Inoperative	Once/3 Months	Not Applicable	Once/Day
Recirculation Flow Converter-Comparator Off Limits	Once/3 Months	Once/3 Months	Once/Day
Recirculation Flow Process Instruments	Not Applicable	Once/Operating Cycle	Once/Day
Mode Switch in Shutdown	Once/Operating Cycle	Not Applicable	Not Applicable

Logic System Functional Test (4) (6)

System Logic Check	Once/Operating Cycle

3.4 STANDBY LIQUID CONTROL SYSTEM

Specification:

Two SLC subsystems shall be OPERABLE.

Applicability:

Run and Startup MODES

Operation with Inoperable Equipment

A. With concentration of boron in solution not within limits but > 8%, restore concentration of boron in solution to within limits within 72 hours AND 10 days from discovery of failure to meet the LCO.

B. With one SLC subsystem inoperable for reasons other than Condition A, restore SLC subsystem to OPERABLE status within 7 days AND 10 days from discovery of failure to meet the LCO.

C. With two SLC subsystems inoperable for reasons other than Condition A, restore one SLC subsystem to OPERABLE status within 8 hours.

D. Required Action and associated Completion Time not met, be in Hot Shutdown within 12 hours.

4.4 STANDBY LIQUID CONTROL SYSTEM

1. When tested as specified in 3.13 verify that each pump delivers at least 39 GPM against a system head of 1275 psig.
2. Manually initiate one of the Standby Liquid Control System loops and pump demineralized water into the reactor vessel every 24 months on a STAGGERED TEST BASIS.
3. Verify continuity of explosive charge every 31 days
4. Verify available volume of sodium pentaborate solution is within the limits of Figure 3.4–1 or ≥ 4000 gallons every 24 hours
5. Verify temperature of sodium pentaborate solution is > 48° F every 24 hours
6. Verify the concentration of boron in solution is ≤ 9.22 % weight and within the limits of Figure 3.4–1 every 31 days;

   AND

   Once within 24 hours after water or boron is added to solution;

   AND

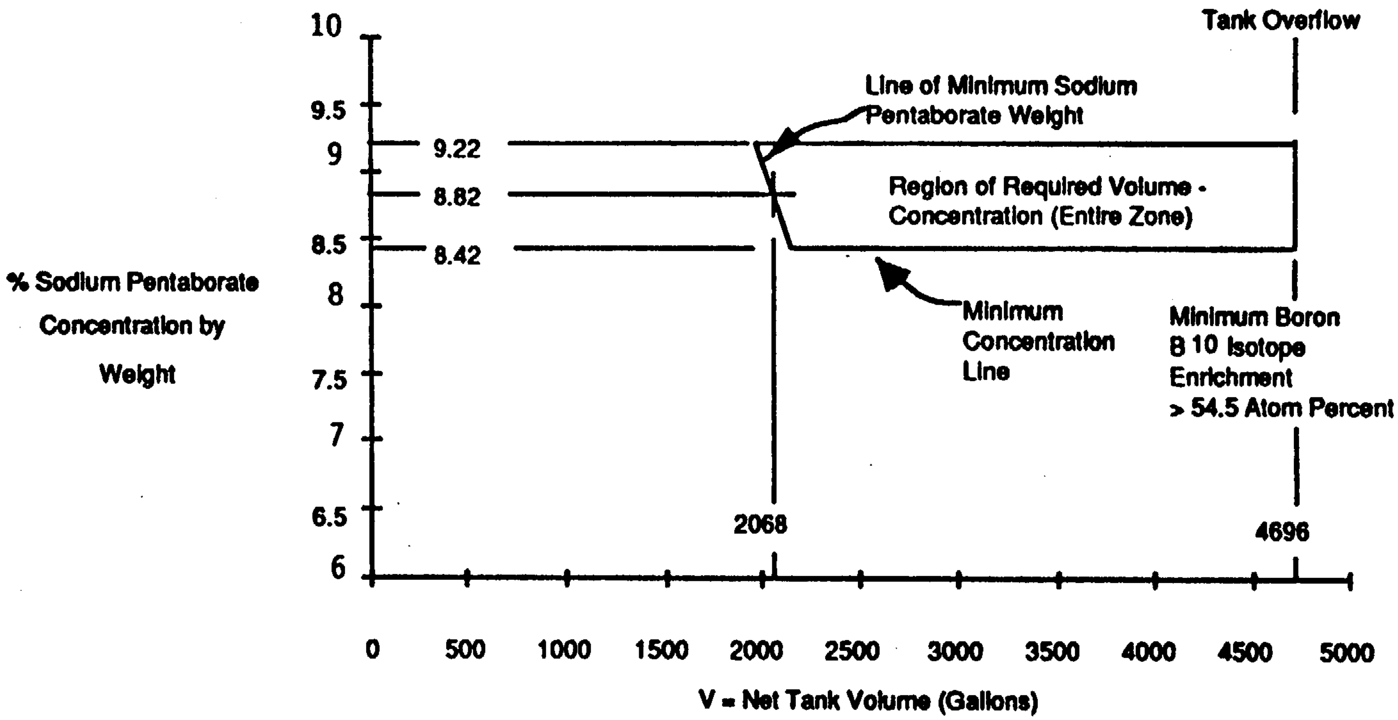
   Once within 24 hours after solution temperature is restored to > 48° F.
7. Verify sodium pentaborate enrichment is ≥ 54.5 atom percent B-10 prior to addition to SLC tank
8. Verify all heat traced piping between storage tank and pump suction is unblocked every 24 months

   AND

   Once within 24 hours after solution temperature is restored to > 48° F.
9. Verify temperature of pump suction piping is > 48° F every 24 hours

PNPS
Figure 3.4-1

<u>Sodium Pentaborate Solution</u>
<u>Volume and Concentration Requirements</u>



3/4.4 STANDBY LIQUID CONTROL SYSTEM

Background

The design objective of the standby liquid control system is to provide the capability of bringing the reactor from full power to a cold, xenon-free shutdown condition assuming that none of the withdrawn control rods can be inserted. The Standby Liquid Control system satisfies 10 CFR 50.62, "Anticipated Transients Without Scram (ATWS)".

The SLC System consists of a boron solution storage tank, two positive displacement pumps, two explosive valves that are provided in parallel for redundancy, and associated piping and valves used to transfer borated water from the storage tank to the reactor pressure vessel (RPV). The borated solution is discharged near the bottom of the core shroud, where it then mixes with the cooling water rising through the core. A smaller tank containing demineralized water is provided for testing purposes.

Applicable Safety Analysis

The requirements for SLC capability to shutdown the reactor are identified via the station Nuclear Safety Operational Analysis (Appendix G to the FSAR, Special Event 45 - Shutdown Without Control Rods) . If no more than one operable control rod is withdrawn, the basic shutdown reactivity requirement for the core is satisfied and the Standby Liquid Control system is not required.

The SLC System is used in the event that enough control rods cannot be inserted to accomplish shutdown and cooldown in the normal manner. To meet this objective, the SLC system is designed to inject a quantity of boron that produces a minimum concentration equivalent to 675 ppm of natural boron in the reactor core. The 675 ppm equivalent concentration in the reactor core is required to bring the reactor from full power to at least a three percent Δk subcritical condition, considering the hot to cold reactivity difference, xenon poisoning, etc. The system will inject this boron solution in less than 125 minutes. The maximum time requirement for inserting the boron solution was selected to override the rate of reactivity insertion caused by cooldown of the reactor following the xenon poison peak.

The Standby Liquid Control system must have the equivalent control capacity (injection rate) of 86 gpm at l3 percent by wt. natural sodium pentaborate for a 251" diameter reactor pressure vessel in order to satisfy 10 CFR 50.62 requirements. This equivalency requirement is fulfilled by a combination of concentration, B–10 enrichment and flow rate of sodium pentaborate solution. A minimum 8.42% concentration and 54.5% enrichment of B–10 isotope at a 39 GPM pump flow rate satisfies the ATWS Rule (10 CFR 50.62) equivalency requirement.

The quantity of B–10 stored in the Standby Liquid Control System Storage Tank is sufficient to bring the concentration of B–10 in the reactor to the point where the reactor will be shutdown and to provide a minimum 25 percent margin beyond the amount needed to shutdown the reactor to allow for possible imperfect mixing of the chemical solution in the reactor water. The volume versus concentration limits in Figure 3.4-1 are calculated such that the required concentration is achieved accounting for dilution in the RPV with normal water level and including the water volume in the residual heat removal (RHR) shutdown cooling piping and in the recirculation loop piping. This quantity of borated solution is the amount that is above the pump suction shutoff level in the borated solution storage tank. No credit is taken for the portion of the tank volume that cannot be injected.

3/4.4 STANDBY LIQUID CONTROL SYSTEM

Specification

The OPERABILITY of the SLC System provides backup capability for reactivity control independent of normal reactivity control provisions provided by the control rods. The OPERABILITY of the SLC System is based on the conditions of the borated solution in the storage tank and the availability of a flow path to the RPV, including the OPERABILITY of the pumps and valves. Two SLC subsystems are required to be OPERABLE; each contains an OPERABLE pump, an explosive valve, and associated piping, valves, and instruments and controls to ensure an OPERABLE flow path.

Applicability:

In the Run and Startup MODES, shutdown capability is required. In the Hot Shutdown and Cold Shutdown MODES, control rods are not able to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate controls to ensure that the reactor remains subcritical. In the Refuel Mode, only a single control rod can be withdrawn from a core cell containing fuel assemblies. Demonstration of adequate SDM (LCO 3.3.A.1, "Reactivity Margin - core loading") ensures that the reactor will not become critical. Therefore, the SLC System is not required to be OPERABLE when only a single control rod can be withdrawn.

Operation with Inoperable Equipment

3.4.A.

If the boron solution concentration is less than the required limits for mitigation but greater than the concentration required for cold shutdown (original licensing basis), the concentration must be restored to within limits in 72 hours. It is not necessary under these conditions to declare both SLC subsystems inoperable since they are capable of performing their original design basis function. Because of the low probability of an event and the fact that the SLC System capability still exists for vessel injection under these conditions, the allowed Completion Time of 72 hours is acceptable and provides adequate time to restore concentration to within limits.

The original shutdown criteria (licensing basis) required a quantity of boron be injected into the vessel to produce a concentration equivalent to 700 ppm of natural boron in the reactor core in less than 125 minutes. To meet this criteria, at least 4770 gallons of 9.4% sodium pentaborate or equivalent was required to be available for delivery to the reactor. Since the SLC pump flowrate is unchanged and the quantity of boron in the SLC storage tank is a function of volume, concentration, and enrichment, the following formula describes the relationships necessary to ensure that sufficient B-10 is available:(BECo Calculation - N82)

$$\frac{E}{19.8} \times \frac{C}{9.4} \times \frac{V}{4770} \geq 1.0$$

Minimum Concentration (C) to achieve original shutdown criteria assuming a SLC tank usable volume (V) of 3650 gallons [4050 gallons (low level alarm) - 400 gallons (volume below suction path)], and a 54.5% enriched boron solution is:

$$C = \frac{19.8}{E} \times \frac{4770}{V} \times 9.4$$

$$C = \frac{19.8}{54.5} \times \frac{4770}{3650} \times 9.4 = 4.46\%$$

Operation with Inoperable Equipment (continued)

3.4.A (continued)

Therefore, maintaining the solution concentration > 8% will ensure original shutdown criteria is satisfied.

The second completion time establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single contiguous occurrence of failing to meet the LCO. If condition 3.4.A is entered while, for instance, an SLC subsystem is inoperable (condition 3.4.B) and that subsystem is subsequently returned to OPERABLE, the LCO may already have been not met for up to 7 days. This situation could lead to a total duration of 10 days (7 days in condition 3.4.B, followed by 3 days in condition 3.4.A), since initial failure of the LCO, to restore the SLC System. Then an SLC subsystem could be found inoperable again, and concentration could be restored to within limits. This could continue indefinitely.

This completion time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock," resulting in establishing the "time zero" at the time the LCO was initially not met instead of at the time condition 3.4.A was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

3.4.B

Only one of the two standby liquid control pumping loops is needed for operating the system. If one SLC subsystem is inoperable for reasons other than condition 3.4.A, the inoperable subsystem must be restored to OPERABLE status within 7 days. One inoperable pumping circuit does not immediately threaten the shutdown capability, and reactor operation can continue while the circuit is being repaired. Assurance that the remaining system will perform its intended function and that the long term average availability of the system is not reduced is obtained for a one out of two system by an allowable equipment out of service time of one third of the normal surveillance frequency. This method determines an equipment out of service time of ten days. Additional conservatism is introduced by reducing the allowable out of service time to seven days.

The second completion time establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single contiguous occurrence of failing to meet the LCO. If condition 3.4.B is entered while, for instance, concentration is out of limits (condition 3.4.A), and is subsequently returned to within limits, the LCO may already have been not met for up to 3 days. This situation could lead to a total duration of 10 days (3 days in condition 3.4.A, followed by 7 days in condition 3.4.B), since initial failure of the LCO, to restore the SLC System. Then concentration could be found out of limits again, and the SLC subsystem could be restored to OPERABLE. This could continue indefinitely.

This completion time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock," resulting in establishing the "time zero" at the time the LCO was initially not met instead of at the time condition 3.4.B was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

3/4.4 STANDBY LIQUID CONTROL SYSTEM

Surveillance Requirements

3.4.C

If both SLC subsystems are inoperable for reasons other than condition 3.4.A, at least one subsystem must be restored to OPERABLE status within 8 hours. The allowed completion time of 8 hours is considered acceptable given the low probability of a DBA or transient occurring concurrent with the failure of the control rods to shut down the reactor.

3.4.D

If any action and associated completion time is not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to Hot Shutdown within 12 hours. The allowed completion time of 12 hours is reasonable, based on operating experience, to reach Hot Shutdown from full power conditions in an orderly manner and without challenging plant systems.

4.4.1

Demonstrating that each SLC System pump develops a flow rate of 39 gpm at a minimum system head of 1275 psig ensures that pump performance is acceptable during the fuel cycle. This minimum pump flow rate requirement ensures that, when combined with the sodium pentaborate solution concentration requirements, the rate of negative reactivity insertion from the SLC System will adequately compensate for the positive reactivity effects encountered during power reduction, cooldown of the moderator, and xenon decay. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. Testing the pumps and valves in accordance with the Inservice Testing Program [ASME B&PV Code Section XI (Articles IWP and IWV, except where specific relief is granted)] adequately assesses component operational readiness.

4.4.2

This Surveillance ensures that there is a functioning flow path from the boron solution storage tank to the RPV, including the firing of an explosive valve. The replacement charge for the explosive valve shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of that batch successfully fired. The pump and explosive valve tested should be alternated such that both complete flow paths are tested every 48 months at alternating 24 month intervals. The Surveillance may be performed in separate steps to prevent injecting boron into the RPV. An acceptable method for verifying flow from the pump to the RPV is to pump demineralized water from a test tank through one SLC subsystem and into the RPV. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the surveillance were performed at power. Various components of the system are individually tested periodically, thus making more frequent testing of the entire system unnecessary.

4.4.3

This Surveillance verifies the continuity of the explosive charges in the injection valves to ensure that proper operation will occur if required. Other administrative controls, such as those that limit the shelf life of the explosive charges, must be followed. The 31 day frequency is based on operating experience and has demonstrated the reliability of the explosive charge continuity.

SURVEILLANCE REQUIREMENTS (continued)

4.4.4, 4.4.5 and 4.4.9

These 24 hour Surveillances verify certain characteristics of the SLC System (e.g., the volume and temperature of the borated solution in the storage tank), thereby ensuring SLC System OPERABILITY without disturbing normal plant operation. These Surveillances ensure that the proper borated solution volume and temperature, including the temperature of the pump suction piping, are maintained. Maintaining a minimum specified borated solution temperature is important in ensuring that the boron remains in solution and does not precipitate out in the storage tank or in the pump suction piping. The solution shall be kept at least 10°F above saturation temperature to guard against boron precipitation. Minimum solution temperature is 48°F. This is 10°F above the saturation temperature for the maximum allowed sodium pentaborate concentration of 9.22 Wt. Percent.

Maintaining ≥ 4000 gallons of ≥ 8% concentration of 54.5 atom percent B–10 solution provides assurance that the original design criteria will be met which is consistent with the current license bases as revised by Amendment No. 102.

The 24 hour Frequency is based on operating experience and has shown there are relatively slow variations in the measured parameters of volume and temperature.

4.4.6

This Surveillance requires an examination of the sodium pentaborate solution by using chemical analysis to ensure that the proper concentration of boron exists in the storage tank. This Surveillance must be performed anytime boron or water is added to the storage tank solution to determine that the boron solution concentration is within the specified limits. This surveillance must also be performed anytime the temperature is restored to > 48° F, to ensure that no significant boron precipitation occurred. The 31 day frequency of this Surveillance is appropriate because of the relatively slow variation of boron concentration between surveillances.

4.4.7

Enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. The boron enrichment (B–10 atom percent) of the solution in the tank does not vary with the addition of enriched sodium pentaborate or water provided 54.5% enriched(B–10 atom percent) material is added. The procurement process ensures that material is only purchased from a Quality Assurance approved vendor. The Quality Assurance requirements for storage of "Q" material ensures against onsite contamination/degradation of the material. Receipt inspection, isotopic tests, to verify the actual B–10 enrichment, must be performed prior to use.

Since a change in enrichment cannot occur by any process other than the addition of new chemicals to the Standby Liquid Control solution tank, verification of Boron-10 enrichment as a function of the receipt inspection of new chemicals in conjunction with the quality controls in place for onsite storage is sufficient to satisfy the prior to addition Completion Time.

4.4.8

Demonstrating that all heat traced piping between the boron solution storage tank and the suction inlet to the injection pumps is unblocked ensures that there is a functioning flow path for injecting the sodium pentaborate solution. An acceptable method for verifying that the suction piping is unblocked is to pump from the storage tank to the test tank.

TABLE 6.9-1

REPORTS

Area		Reference	Submittal Date
a.	Secondary Containment Leak Rate Testing (1)	4.7.C.1.c	Upon completion of each test (2)
b.	(Deleted)		
c.	(Deleted)		
d.	(Deleted)		
e.	(Deleted)		

NOTES:

1. Each integrated leak rate test of the secondary containment shall be the subject of a summary technical report. This report shall include data on the wind speed, wind direction, outside and inside temperatures during the test, concurrent reactor building pressure, and emergency ventilation flow rate. The report shall also include analyses and interpretations of those data which demonstrate compliance with the specified leak rate limits.

2. The report shall be submitted approximately 90 days after completion of each test. Test periods shall be based on the commercial service date as the starting point.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

By application dated May 1, 1996, as supplemented November 26, 1996, Boston Edison Company (the licensee) requested changes to the Technical Specifications (TSs) for Pilgrim Nuclear Power Station. The proposed changes will modify Table 3.1.1, "Reactor Protection System (SCRAM) Instrumentation Requirement," Table 3.2.C.1, "Instrumentation That Initiates Rod Blocks," and TS 3/4.4, "Standby Liquid Control." The November 26, 1996, letter provided clarifying information and additional changes that did not change the initial proposed no significant hazards consideration determination.

2.0 TABLE 3.1.1, "REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENT"

The licensee's May 1, 1996, letter to the NRC proposes to modify Table 3.1.1, "Reactor Protection System (SCRAM) Instrumentation Requirement." The amendment will modify Note 7 to Table 3.1.1. Currently, the note specifies that when the mode switch is in the refuel position and the reactor coolant system (RCS) temperature $< 212^\circ$ F and the reactor is subcritical with fuel in the vessel, the following SCRAM functions: Mode Switch in Shutdown, Manual SCRAM, High Flux (intermediate-range monitor (IRM), SCRAM Discharge Volume High Level, average power range monitor (APRM) (15%) High Flux SCRAM are required to be operable. For the above SCRAMs, the proposed TS change now makes an exception to the SCRAM function operability requirement when the mode switch is in the refuel position and the reactor vessel head is removed and all control rods are fully inserted in cells containing one or more fuel assemblies. In addition, to be consistent with the Standard Technical Specification (STS), the licensee has applied Note 7 to the IRM Inoperative and APRM Inoperative SCRAMs. The refueling definition deviates from the improved STS as refueling is described as head-off while the improved STS would only require a bolt to be detensioned. The Pilgrim FSAR describes limitations on station operations necessary to satisfy operational criteria. The final safety analysis report (FSAR) states that refueling operations are accomplished with the head-off so that the primary system cannot be repressurized. This definition was used in the development of the station TSs and is consistent with the FSAR.

When in the refueling mode, the refueling interlocks are engaged including the one-rod-out interlock. The one-rod-out interlock precludes moving more than a single control rod at a time and requires all other rods be fully inserted. This condition is allowable because TS 3.3.A.1, "Reactivity Margin - core loading," assures that the core can be made subcritical with one-rod-out. The one-rod-out requirement is analyzed for the most reactive condition during the operating cycle with the strongest operable control rod in its full out position and all other rods fully inserted and, therefore, bounds the refueling condition. The shutdown margin is determined as part of the reload analysis and confirmed by insequence criticality testing during startup and monthly monitoring of critical rod configuration. When a rod is being moved, as allowed by the refueling interlocks, the SCRAM function will be operable. In addition, during fuel movement all control rods are required to be fully inserted. This assures that the reactor is maintained in a shutdown condition during refueling for all possible conditions such that no event requiring a SCRAM will occur. Based on the above, the NRC staff has determined that the subcriticality is maintained during all possible refueling conditions and, therefore, the SCRAM function is not needed and this TS change is acceptable. In addition, the NRC staff has reviewed these proposed changes and concluded that the proposed changes are consistent with the STS.

3.0 TABLE 3.2.C.1, "INSTRUMENTATION THAT INITIATES ROD BLOCKS"

The licensee's May 1, 1996, letter to the NRC proposes to modify Table 3.2.C.1, "Instrumentation that Initiates Rod Blocks." The proposed amendment will add Note 6 to Table 3.2.C.1. The current TSs specify that all rod block functions associated with the applicable functions of Table 3.1.1 are required to be operable at all times. The proposed change makes an exception to the rod block function operability requirement when the mode switch is in the refuel position and the reactor vessel head is removed and all control rods are fully inserted in cells containing one or more fuel assemblies, for the following rod blocks; APRM Upscale, APRM Inoperative, IRM Downscale, IRM Detector not in Startup Position, IRM Upscale, IRM Inoperative, SRM Detector not in Startup Position, SRM Downscale, SRM Upscale, SRM Inoperative, SCRAM Discharge Instrument Volume Water Level-High, and SCRAM Discharge Instrument Volume-SCRAM Trip Bypassed. When a control rod is being moved as allowed by the refueling interlocks, all rod block functions in the TS will be operable.

The control rods provide the primary means for control of reactivity changes. The control rod block instrumentation is designed to ensure that specified fuel design limits are not exceeded. When placed in the shutdown mode, the reactor receives an automatic SCRAM concurrent with a rod block. When in the refueling mode, the refueling interlocks are engaged including the one-rod-out interlock. The one-rod-out interlock is the rod block function during refueling which allows moving a single control rod if all other rods are fully inserted. The one-rod-out interlock also precludes moving more than a single control rod at a time. Specification 3.3.A.1, "Reactivity Margin - core loading," requires that the core can be made subcritical in the most reactive condition during the operating cycle with the strongest operable control rod in its full out position and all other rods fully inserted. Therefore, TS 3.3.A.1 and the one-rod-out interlock assures that the reactor is maintained in a subcritical condition during refueling for all possible conditions such that no other rod block is required and the staff concludes that this TS change is acceptable. In addition, the staff has reviewed these proposed changes and concluded that the proposed changes are consistent with the STS.

The STS require a shutdown rod block function to be operable in the shutdown mode and a refueling mode rod block. The current TSs did not include the shutdown rod block function. To establish requirements consistent with the STS, the licensee proposed to add the shutdown rod block to Tables 3.2.C.1, 3.2.C-2 and 4.2.C. The staff has reviewed these changes and concluded they provide an additional limitation or restriction on the plant operation and are acceptable.

4.0 STANDBY LIQUID CONTROL

The licensee's May 1, 1996, letter to the NRC proposes to reformat and modify TS 3.4, "Standby Liquid Control System," to make them consistent with the STS. The staff review compared the current requirements with the proposed requirements to ensure that either current TS limits are maintained or that a reasonable safety bases exist for adopting the STS requirements.

4.1 Requirements Maintained or Changed by the Proposed TS Change

The staff compared the current TS requirements with the proposed TS to ensure all the original requirements are maintained or a basis for modification or deletion is provided. An evaluation of the proposed TS changes are provided by the notes that follow. If a note does not appear, the staff has concluded that the original TS requirements have been maintained. Below is a table of the current requirements and their equivalent in the proposed TS:

4.2 Current Requirements		Location In Proposed TS
3.4	Applicability	3.4 Applicability (Note 1)
3.4.A	Normal System Availability	3.4.C, 3.4.D (Note 2)
3.4.B	Operation with Inoperable Components	3.4.B
3.4.C.1	The net volume	3.4.A, 3.4.C, 4.4.4 (Note 2)
3.4.C.2	Temperature	3.4.C, 4.4.5 (Note 2)
3.4.C.3	Enrichment	4.4.7
3.4.D.1	Cold Shutdown in 24 hours	3.4.C, 3.4.D (Note 2)
3.4.D.2	Enrichment Requirements	4.4.6, 4.4.7, BASES (Note 3)
3.4.D.3	Enrichment Requirements Original	4.4.A, 4.4.7, BASES (Note 3)

NOTES

1. Currently, the Standby Liquid Control (SLC) may be inoperable in the cold shutdown condition when all operable control rods are fully inserted (that is the SLC is required to be operable in the run, startup, and hot shutdown). The proposed TS changes the applicability statement such that the SLC is required to be operable in the run and startup modes only. The safety objective of the system SLC is to provide a backup method, independent of the control rods, to maintain the reactor subcritical as the nuclear system cools in the event that not enough control rods can be inserted to counteract the positive reactivity effects of a

colder moderator. It also provides a method to mitigate the effects of Anticipated Transients Without Scram (ATWS). With the reactor in the hot or cold shutdown condition, criticality is prohibited because the mode switch position "Shutdown" prevents rod withdrawal. In the refuel mode, only a single control rod can be withdrawn from a core cell containing fuel assemblies. Demonstration of adequate shutdown margin, required by 3.3.A.1, "Reactivity Margin - core loading," ensures that the reactor will not become critical. Therefore, it is not possible to make the reactor core critical in the hot or cold shutdown conditions and the SLC system is not required to be operable for the hot or cold shutdown conditions. Based on the above, the staff concludes that the changes to the applicability statement are acceptable. In addition, the staff has reviewed these proposed changes and concluded that the proposed changes are consistent with the improved STS.

2. The current SLC TSs specify five limiting conditions that would make both trains of the SLC inoperable and require the plant to be placed in cold shutdown (outside mode of applicability) with all rods fully inserted within 24 hours. The staff has determined that the five limiting conditions relating to the SLC operability have been maintained by the proposed TS. However, the proposed TS allows 8 hours for the plant to restore one train to operable status, and if a train cannot be restored, the plant must be in hot shutdown within 12 hours. The licensee justified these time limits based on the following:

   a. The 8-hour completion time is considered acceptable given the low probability of a design-basis accident (DBA) or transient occurring concurrent with the failure of the control rods to shut down the reactor, and

   b. The 12-hour completion time to bring the plant to hot shutdown is reasonable based on operating experience to reach hot shutdown from full power in an orderly manner and without challenging plant systems.

   The intent of the action statements is to place the plant in a mode outside of its applicability statement in a safe and reasonable time frame. Based on the above, the staff concludes that the proposed TS is more conservative, by allowing less time to place the plant in a mode outside of the applicability statement and represents an enhancement to current TS. The staff has reviewed these proposed changes and found them acceptable and consistent with the STS.

3. The requirement to verify B-10 enrichment by test any time boron is added to the solution and, during each refueling outage, is replaced with verifying the enrichment of the B-10 prior to its addition to the tanks. The B-10 enrichment will be independently verified upon receipt to ensure that the enrichment is as

certified by the vendor. Since enrichment of the solution in the tank cannot change by any other means but chemical addition, the TS requirement to ensure the enrichment at the required level is maintained because only properly enriched material is available for addition.

The current TS requires that any time boron is added to the solution, and during each refueling outage, the enrichment level shall be verified by analysis. If the results of that analysis are not received within 30 days or the analysis determines the enrichment does not meet the specifications, the licensee must report to the NRC their plan of action to restore the required enrichment. TS Table 6.9.1 provides the reporting requirements. The reporting requirements of Table 6.9.1 for boron enrichment will be deleted because they are no longer applicable. The verification of enrichment will be made prior to the need to use the material and verification of the solution is no longer necessary. The bases for this change is discussed above. In addition, the staff has reviewed these proposed changes and concluded that the proposed changes are consistent with the STS.

Surveillance Requirements		Location In Proposed TS
4.4.A.1	Pump Test	4.4.1
4.4.A.2	Relief Valve Setpoint	Deleted (Note 4)
4.4.A.b	Manual Initiation Test	4.4.2 (Note 5)
4.4.A.c	4.4.A.b Test interval	4.4.2 (Note 5)
4.4.B.1	Testing of redundant component	Deleted (Note 6)
4.4.C.1	Daily volume check	4.4.4
4.4.C.2	Daily temperature check	4.4.5, 4.4.9 (Note 7)
4.4.C.3	Concentration check	4.4.4, 4.4.6
4.4.C.4	Enrichment check	4.4.7, BASES (Note 3)
Table 6.9-1	SLC enrichment out of specification report	Deleted (Note 3)

4. The requirements to verify the proper operation and setpoint of the relief valves in the SLC system are redundant to the Inservice Test Program as required by 10 CFR 50.55a(g). The program is required by TS 3/4.13 and is in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. Therefore, this requirement can be deleted from the current TS.

5. These TSs were reworded and combined to make the TS more readable, and, therefore, more understandable, by plant operators as well as other users. During the rewording, no technical changes (either actual or interpretational) to the TSs were made.

6. The requirement for demonstrating operability of the redundant subsystems was originally specified because there was a lack of plant operating history and insufficient equipment failure data to justify not testing redundant equipment. Since that time, plant operating experience has demonstrated that testing of the

redundant subsystem when one subsystem is inoperable is not necessary to provide adequate assurance of operability of the remaining subsystem. Deletion of this requirement is based on the acceptability of taking credit for normal periodic surveillance as a demonstration of operability and availability of the remaining components. This change is consistent with changes granted under Amendment No. 135.

7. The current TS requires that if the sodium pentaborate solution temperature falls below 48 °F, the system will be flow tested to verify flow path. The TS does not state when the flow test must be performed or how often. The proposed TS requires that the sodium pentaborate solution and pump suction piping be maintained above 48 °F or place the plant in TS 3.4.C, which would require the plant to return the temperature to greater than 48 °F within 8 hours or shut down the plant in the following 12 hours. In addition, when the temperature is restored to > 48 °F within 24 hours, the concentration must be verified and all heat traced piping between the storage tank and pump must be verified to be unblocked. Even though the flow test requirement has been deleted, the staff has concluded that the revised TS more clearly specify what actions to take if the temperature is out of limit and provides time frames for completing the actions. The adequacy of the 8-hour action time was discussed in Note 2. The staff has concluded that the proposed changes are consistent with the STS.

<u>New Requirements</u>

3.4.A 72 hour Boron concentration action time (Note 8)
3.4.A and B 10 days from discovery (Note 9)
4.4.3 Continuity of Explosive Charge (Note 10)
4.4.8 Heat traced piping unblocked (Note 11)
4.4.9 Pump suction temperature (Note 12)

8. As a result of ATWS rule, the shutdown criteria for the SLC system changed. The current TS allows the sodium pentaborate solution enrichment to be less than the required enrichment for up to 7 days if the enrichment, concentration, and volume meet the original pre-ATWS design criteria. The original concentration requirement had been determined to be a 4.46% sodium pentaborate concentration. The proposed TS limiting condition of operation allows continued operation for 3 days with a minimum concentration of 8% sodium pentaborate solution. The 8% concentration was selected based on the original pre-ATWS shutdown criteria with margin. The enrichment limit set by the TSs was discussed previously. The volume limits have not changed from the current TS. This proposed TS is consistent with the STS.

9. The proposed LCO for concentration of boron in solution and subsystem inoperability include a limit on the maximum time allowed for SLC subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. This new

restriction is intended to prevent exceeding the assumptions regarding out-of-service time for a SLC subsystem as a result of sequential inoperabilities of SLC subsystems due to boron concentration not within limits and an SLC subsystem inoperable due to other reasons. This proposed TS is consistent with the recommendations in the STS.

10. A new monthly surveillance was added to verify continuity of the explosive charge associated with the explosive valves.

11. A new surveillance was added to verify all heat traced piping between the storage tank and pump suction is unblocked every 24 months and within 24 hours whenever the solution temperature must be restored to >48 °F.

12. A new surveillance was added to verify temperature of the pump suction piping. This surveillance was added to ensure the temperature remains at least 10 °F above the boron precipitation value.

The staff has reviewed these new requirements and conclude they result in an enhancement to the existing TSs. Therefore, these new requirements are acceptable.

The staff has concluded that the revised TS specify more clearly when SLC is required, what actions to take if SLC is inoperable, and time frames for completing the actions. Based on the above, the staff concludes that the revisions enhance the current TS by making them more definitive and supplementing them with action statements and required completion times and, therefore, the changes are acceptable. In addition, the staff has reviewed these proposed changes and concluded that the proposed changes are consistent with the STS.

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 (61 FR 28606). 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.

Principal Contributor: A. Wang

Date: December 27, 1996