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

July 16, 1992

Docket Nos. 50-352
and 50-353

Mr. George J. Beck
Manager-Licensing, MC 52A-5
Philadelphia Electric Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, Pennsylvania 19087-0195

Dear Mr. Beck:

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 (TSCR NO. 90-20-0) (TAC NOS. M83237 AND M83238)

Effective June 1, 1992, there has been a change in our policy with respect to applications by licensees requesting changes to the Technical Specifications (TSs). The new policy is to promote the use of the improved Standard Technical Specifications (STS) such as NUREG-1433 for General Electric BWR-4 reactors when the proposed changes have potential generic applications. The amendment package for your application of April 3, 1992 has been reviewed under the new screening criteria. Your amendment request proposed to revise the surveillance requirements on the Standby Liquid Control (SLC) systems in Limerick, Units 1 and 2. While the design of the SLC systems at Limerick is different from most BWR-4s (you have three redundant pump and injection valve loops instead of the two pumps and paths in most BWR-4s), it appears that the LCOs and surveillance requirements in your application could have potential generic applicability.

Enclosed are Section 3.1.7 and Bases 3.1.7 from the STS which we would appreciate you considering as an alternative to the changes requested in your application of April 3, 1992. The STS would provide more flexibility with respect to testing the pump flow rate. The STS focus on the parameters important to safety such as verifying that the temperature of the sodium pentaborate solution is above the point where it would precipitate out of solution and not the various means of achieving this result. There are no TS surveillance requirements on the heat tracing or heaters. We would appreciate it if you would advise us within the next month if you plan to subsitute the improved STS for those submitted with your April 3, 1992 application.

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If you wish to discuss this or have any questions, please contact me at (301) 504-1402.

Sincerely,

Original signed by
Richard J. Clark

Richard J. Clark, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
BWR/4 STS Excerpts

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If you wish to discuss this or have any questions, please contact me at (301) 504-1402.

Sincerely,

Richard J. Clark

Richard J. Clark, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
BWR/4 STS Excerpts

cc w/enclosure:
See next page

cc:

J. W. Durham, Sr., Esquire
Sr. V.P. & General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Mr. Rod Krich 52A-5
Philadelphia Electric Company
955 Chesterbrook Boulevard
Wayne, Pennsylvania 19087-5691

Mr. Graham M. Leitch, Vice President
Limerick Generating Station
Post Office Box A
Sanatoga, Pennsylvania 19464

Mr. John Doering
Plant Manager
Limerick Generating Station
P.O. Box A
Sanatoga, Pennsylvania 19464

Regional Administrator
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. Thomas Kenny
Senior Resident Inspector
US Nuclear Regulatory Commission
P. O. Box 596
Pottstown, Pennsylvania 19464

Mr. Richard W. Dubiel
Superintendent - Services
Limerick Generating Station
P.O. Box A
Sanatoga, Pennsylvania 19464

Mr. William P. Dornsife, Director
Bureau of Radiation Protection
PA Dept. of Environmental Resources
P. O. Box 2063
Harrisburg, Pennsylvania 17120

Mr. James A. Muntz
Superintendent-Technical
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Mr. Gil J. Madsen
Regulatory Engineer
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Library
US Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. George A. Hunger
Project Manager
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Mr. Larry Hopkins
Superintendent-Operations
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Standby Liquid Control (SLC) System

LCO 3.1.7 Two SLC subsystems shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Concentration of boron in solution not within limits but > [ ].	A.1 Restore concentration of boron in solution to within limits.	72 hours AND 10 days from discovery of failure to meet the LCO
B. One SLC subsystem inoperable [for reasons other than Condition A].	B.1 Restore SLC subsystem to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO
C. Two SLC subsystems inoperable [for reasons other than Condition A].	C.1 Restore one SLC subsystem to OPERABLE status.	8 hours
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.7.1	Verify available volume of sodium pentaborate solution is [within the limits of Figure 3.1.7-1, or ≥ [4530] gallons].	24 hours
[SR 3.1.7.2	Verify temperature of sodium pentaborate solution is within the limits of [Figure 3.1.7-2].	24 hours]
[SR 3.1.7.3	Verify temperature of pump suction piping is within the limits of [Figure 3.1.7-2].	24 hours]
SR 3.1.7.4	Verify continuity of explosive charge.	31 days
SR 3.1.7.5	Verify the concentration of boron in solution is [within the limits of Figure 3.1.7-1].	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 within the limits of [Figure 3.1.7-2]

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.1.7.6	Verify each SLC subsystem manual, power-operated, [and automatic valve] in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position or can be aligned to correct position.	31 days
SR 3.1.7.7	Verify each pump develops a flow rate ≥ [41.2] gpm at a discharge pressure ≥ [1190] psig.	[In accordance with the Inservice Testing Program or 92 days]
SR 3.1.7.8	Verify flow through one SLC subsystem from pump into reactor pressure vessel.	[18] months on a STAGGERED TEST BASIS
[SR 3.1.7.9	Verify all heat-traced piping between storage tank and pump suction is unblocked	[18] months AND Once within 24 hours after solution temperature is restored within the limits of [Figure 3.1.7-2]]
[SR 3.1.7.10	Verify sodium pentaborate enrichment is ≥ [60.0] atom percent B-10.	Prior to addition to SLC tank]

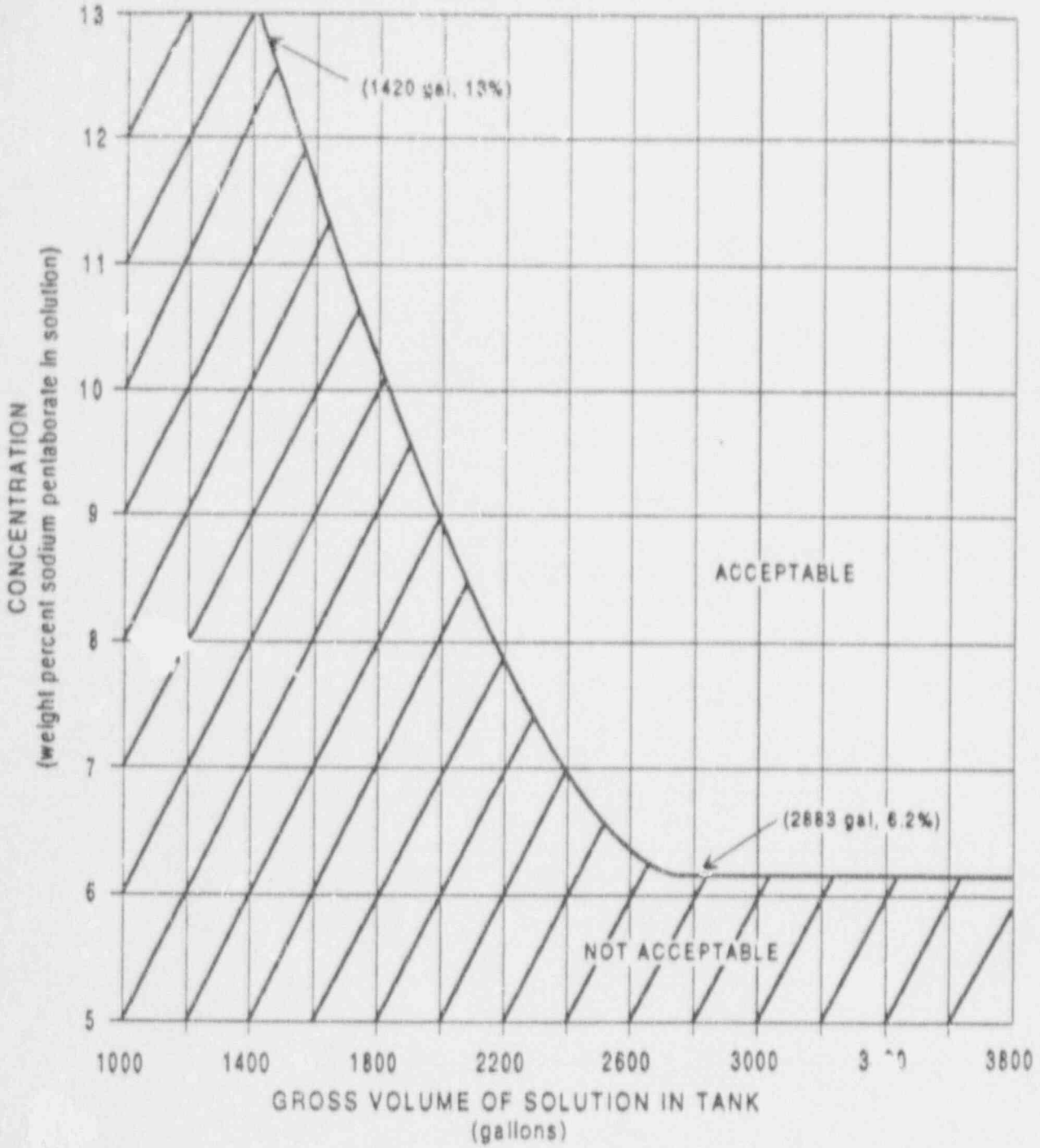

Figure 3.1.7-1 (page 1 of 1)
Sodium Pentaborate Solution Volume
Versus Concentration Requirements

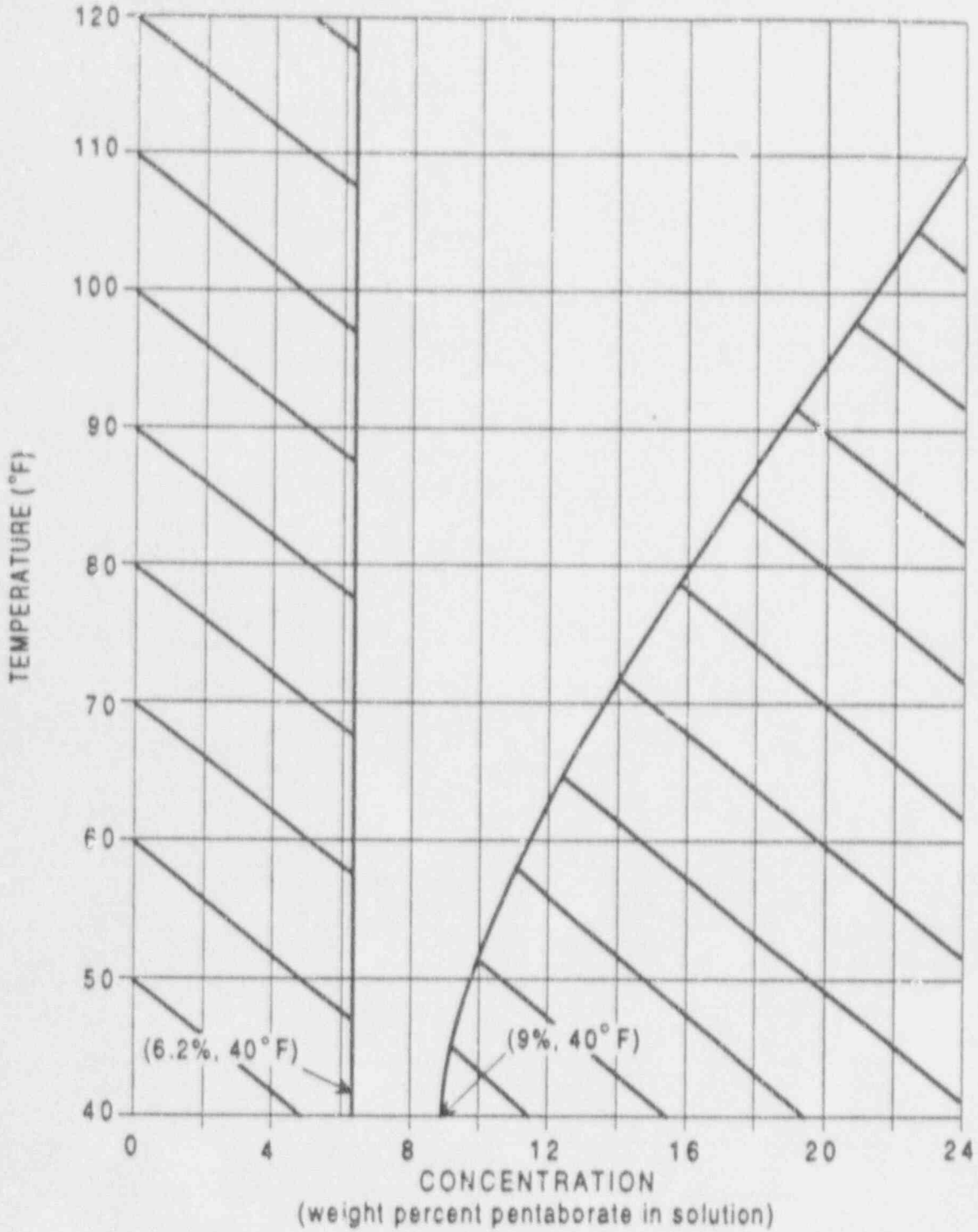

Figure 3.1.7-1 (page 1 of 1)
Sodium Pentaborate Solution Temperature Versus Concentration Requirements

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.7 Standby Liquid Control (SLC) System

BASES

BACKGROUND

The SLC System is designed to provide the capability of bringing the reactor, at any time in a fuel cycle, from full power and minimum control rod inventory (which is at the peak of the xenon transient) to a subcritical condition with the reactor in the most reactive, xenon-free state without taking credit for control rod movement. The SLC System satisfies the requirements of 10 CFR 50.62 (Ref. 1) on anticipated transient 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 ANALYSES

The SLC System is manually initiated from the main control room, as directed by the emergency operating procedures, if the operator believes the reactor cannot be shut down, or kept shut down, with the control rods. The SLC System is used in the event that enough control rods cannot be inserted to accomplish shutdown and cooldown in the normal manner. The SLC System injects borated water into the reactor core to add negative reactivity to compensate for all of the various reactivity effects that could occur during plant operations. To meet this objective, it is necessary to inject a quantity of boron, which produces a concentration of 660 ppm of natural boron, in the reactor coolant at 68°F. To allow for potential leakage and imperfect mixing in the reactor system, an amount of boron, equal to 25% of the amount cited above, is added (Ref. 2). The volume-versus-concentration limits in Figure 3.1.7-1 (in the accompanying LCO) and the temperature versus concentration limits in Figure 3.1.7-2 (in the accompanying LCO) are calculated such that the required concentration is achieved accounting for dilution in the RPV with normal

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

water level and including the water volume in the residual heat removal 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 boron solution storage tank. No credit is taken for the portion of the tank volume that cannot be injected.

The SLC System satisfies the requirements of the NRC Policy Statement because operating experience and probabilistic risk assessments have shown the SLC System to be important to public health and safety. Thus, it is retained in the Technical Specifications.

LCO

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 MODES 1 and 2, shutdown capability is required. In MODES 3 and 4, control rods are only allowed to be withdrawn under Special Operations LCO 3.10.3, "Single Control Rod Withdrawal—Hot Shutdown," and LCO 3.10.4, "Single Control Rod Withdrawal—Cold Shutdown," which provide adequate controls to ensure that the reactor remains subcritical. In MODE 5, only a single control rod can be withdrawn from a core cell containing fuel assemblies; demonstration of adequate SDM (LCO 3.1.1, "SHUTDOWN MARGIN (SDM)") 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.

(continued)

BASES (continued)

ACTIONS

A.1

If the boron solution concentration is less than the required limits for ATWS 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 ATWS 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 maximum Completion Time of 10 days is allowed for this LCO in the event of multiple Condition entry.

B.1

If one SLC subsystem is inoperable for reasons other than Condition A, the noperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE subsystem is adequate to perform the shutdown function. However, the overall reliability is reduced because a single failure in the remaining OPERABLE subsystem could result in reduced SLC System shutdown capability. The 7-day Completion Time is based on the availability of an OPERABLE subsystem capable of performing the intended SLC System function and the low probability of a Design Basis Accident (DBA) or severe transient occurring concurrent with the failure of the Control Rod Drive (CRD) System to shut down the plant. The maximum Completion Time of 10 days is allowed for this LCO in the event of multiple Condition entry.

C.1

If both SLC subsystems are inoperable for reasons other than Condition 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.

(continued)

BASES

ACTIONS (continued)

D.1

If any Required 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 MODE 3 within 12 hours. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.7.1, SR 3.1.7.2, and SR 3.1.7.3

SRs 3.1.7.1 through 3.1.7.3 are 24-hour Surveillances verifying 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 temperature versus concentration curve of Figure 3.1.7-2 ensures that a 10°F margin will be maintained above the saturation temperature. 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.

SR 3.1.7.4 and SR 3.1.7.6

SR 3.1.7.4 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.

SR 3.1.7.6 verifies that each valve in the system is in its correct position, but does not apply to the squib (i.e., explosive) valves. Verifying the correct alignment for

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.7.4 and SR 3.1.7.6 (continued)

Manual, power-operated, and automatic valves in the SLC System flow path provides assurance that the proper flow paths will exist for system operation. A valve is also allowed to be in the nonaccident position provided it can be aligned to the accident position from the control room, or locally by a dedicated operator at the valve. This is acceptable if the SLC System is a manually initiated system. This Surveillance also does not apply to valves that are locked, sealed, or otherwise secured in position since they are verified to be in the correct position prior to locking, sealing, or securing. This verification of valve alignment does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. The 31-day Frequency is based on engineering judgment, and is consistent with the procedural controls governing valve operation that ensures correct valve positions.

SR 3.1.7.5

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. SR 3.1.7.5 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. SR 3.1.7.5 must also be performed anytime the temperature is restored to within the limits of Figure 3.1.7-2, 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.

SR 3.1.7.7

Demonstrating that each SLC System pump develops a flow rate $\geq$ 41.2 gpm at a discharge pressure $\geq$ 1190 psig ensures that pump performance has not degraded during the fuel cycle. This minimum pump flow rate requirement ensures that, when combined with the sodium pentaborate solution concentration

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.7.7 (continued)

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 and trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this Surveillance is [in accordance with the Inservice Testing Program or 92 days].

SR 3.1.7.8 and SR 3.1.7.9

These Surveillances ensure 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 36 months at alternating 18-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 18-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 with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 18-month Frequency; therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.7.8 and SR 3.1.7.9 (continued)

The 18-month Frequency is acceptable since there is a low probability that the subject piping will be blocked due to precipitation of the boron from solution in the heat-traced piping. This is especially true in light of the temperature verification of this piping required by SR 3.1.7.3. However, if, in performing SR 3.1.7.3, it is determined that the temperature of this piping has fallen below the specified minimum, this Surveillance must be performed once within 24 hours after the piping temperature is restored to within the limits of Figure 3.1.7-2.

SR 3.1.7.10

Enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. Isotopic tests on the granular sodium pentaborate to verify the actual B-10 enrichment must be performed prior to addition to the SLC tank in order to ensure that the proper B-10 atom percentage is being used.

REFERENCES

1. 10 CFR 50.62.

2. FSAR, Section [4.2.3.4.3].