Britt T. McKinney
Sr. Vice President & Chief Nuclear Officer

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APR 2 8 2006

U. S. Nuclear Regulatory Commission
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Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED LICENSE AMENDMENT
NUMBERS 289 FOR UNIT 1 OPERATING LICENSE NO. NPF-14
AND 257 FOR UNIT 2 OPERATING LICENSE NO. NPF-22
STANDBY LIQUID CONTROL SYSTEM **Docket Nos. 50-387**
PLA-6049 **and 50-388**

Reference: PPL Letter PLA-6002, Britt T. McKinney (PPL) to USNRC, "Susquehanna Steam Electric Station Proposed License Amendment Numbers 285 for Unit 1 Operating License No. NPF-14 and 253 for Unit 2 Operating License No. NPF-22 Constant Pressure Power Uprate," dated March 31, 2006.

Pursuant to 10 CFR 50.90, PPL Susquehanna LLC (PPL), hereby requests approval of amendments to the Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2 Technical Specifications (TS), as described in the enclosure.

The proposed change would modify the Standby Liquid Control System (SLC) for single pump operation and use of enriched Boron, which would increase operating margin.

During a meeting with NRC staff on April 5, 2006, to discuss the PPL Constant Pressure Power Uprate (CPPU) License Amendment Request (LAR), provided in Reference 1, PPL indicated that the approval of the proposed change to the Standby Liquid Control System was needed to support the scheduled Spring 2007 outage. Because the proposed change is contained in the CPPU LAR, approval of which has been requested by June 30, 2007, it was agreed that this separate LAR for the modification of the SLC system would be submitted. PPL is not planning modifications of the CPPU LAR until completion of the ongoing acceptance review of the CPPU LAR.

The description and technical evaluation of the proposed change is contained in the enclosure.

As demonstrated in the enclosed evaluation, the proposed amendment does not involve a significant hazard consideration.

A001

PPL plans to implement the change for Unit 2 before restart from the refueling outage currently planned for the Spring 2007. Therefore, to support the PPL schedule for the outage, PPL requests that the proposed change be approved by February 1, 2007.

Implementation of the changes are planned to be completed during the Spring refueling outages in 2007 for Unit 2 and 2008 for Unit 1.

The enclosure to this letter contains PPL's evaluation of this proposed change. Included are a description of the proposed change, technical analysis of the change, regulatory analysis of the change (No Significant Hazards Consideration and the Applicable Regulatory Requirements/Criteria), and Environmental Consideration.

Attachment 1 is a mark-up of the Technical Specifications showing the proposed changes.

Attachment 2 is a mark-up of the associated Technical Specification Bases, provided for information.

There are no regulatory commitments associated with the proposed change.

The need for the change has been discussed with the SSES NRC Project Manager.

The proposed change has been reviewed by the SSES Plant Operations Review Committee and by the Susquehanna Review Committee. In accordance with 10 CFR 50.91(b), PPL is providing the Commonwealth of Pennsylvania with a copy of this proposed License Amendment request.

If you have any questions or require additional information, please contact Mr. John M. Oddo at (610) 774-7596.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 4-28-06

B. T. McKinney

Enclosure:
PPL Susquehanna Evaluation of the Proposed Change

Attachments:

Attachment 1 Proposed Technical Specification Changes (Mark-up)

Attachment 2 Changes to Technical Specifications Bases Pages (Mark-up, Provided for Information)

Copy: NRC Region I
Mr. A. Blamey, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. Janati, DEP/BRP

Attachment 1 to PLA-6049

Proposed Operating License and Technical Specifications Changes (Mark-up)

Technical Specifications Changes
Unit 1
(Mark-up)

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 sodium pentaborate in solution IS NOT within limits of Figure 3.1.7-1.	A.1 Restore concentration of sodium pentaborate in solution to within limits OF FIGURE 3.1.7-1.	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

WITHIN THE LIMITS OF FIGURE 3.1.7-1.

	SURVEILLANCE	FREQUENCY
SR 3.1.7.1	Verify available volume of sodium pentaborate solution is ~~≥ 4587 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 sodium pentaborate in solution is ~~≥ 13.6 weight percent and~~ within the limits of Figure 3.1.7-1.	31 days AND Once within 24 hours after water or sodium pentaborate 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 and power operated 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 the correct position.	31 days
SR 3.1.7.7	Verify each pump develops a flow rate ≥ 41.2 gpm at a discharge pressure ≥ 1395 psig.	In accordance with the Inservice Testing Program
SR 3.1.7.8	Verify flow through one SLC subsystem pump into reactor pressure vessel.	24 months on a STAGGERED TEST BASIS
SR 3.1.7.9	Verify all heat traced piping between storage tank and pump suction is unblocked.	24 months AND Once within 24 hours after solution temperature is restored within the limits of Figure 3.1.7-2

1250

40.0

INSERT 3.1-22A

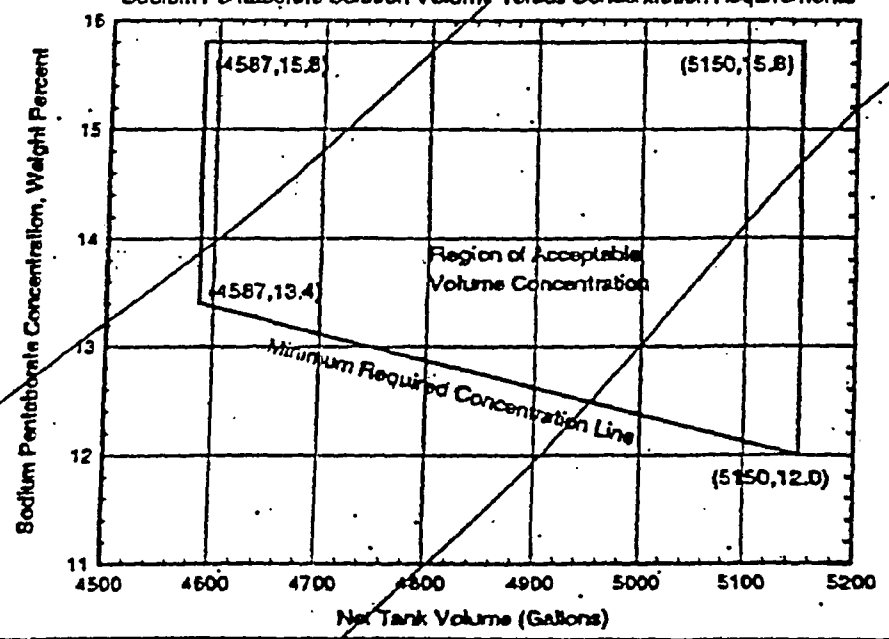
Insert 3.1-22A

	SURVEILLANCE	FREQUENCY
SR 3.1.7.10	Verify sodium pentaborate enrichment is ≥ 88 atom percent B-10.	Prior to addition to SLC tank.

INSERT 3.1-23A

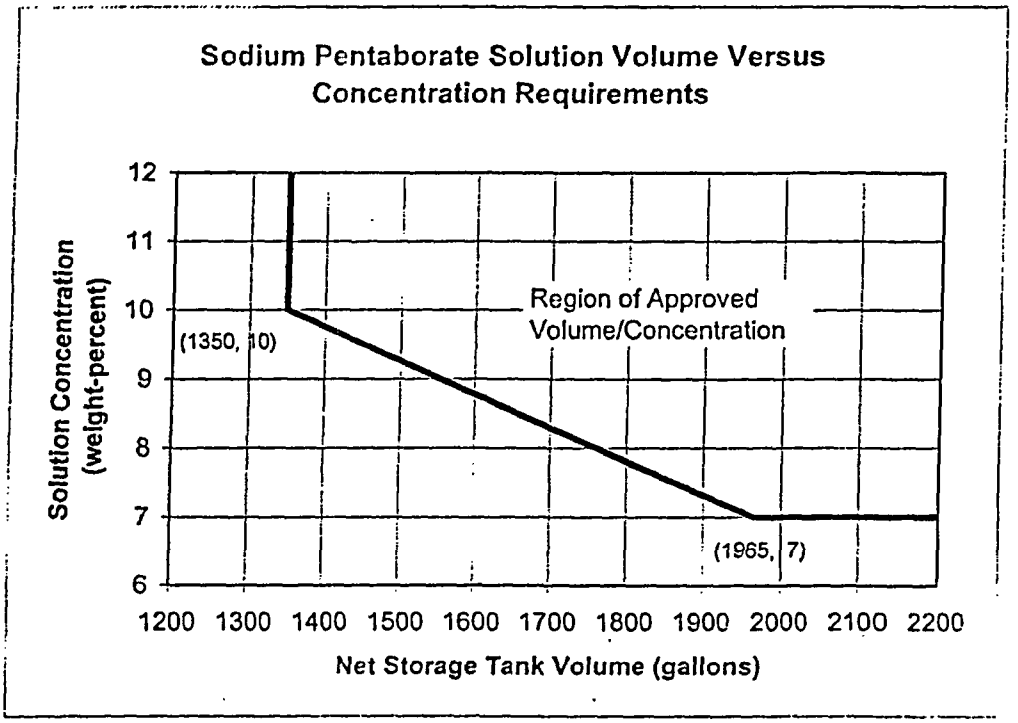
FIGURE 3.1.7-1

Sodium Pentaborate Solution Volume Versus Concentration Requirements



Insert 3.1-23A

FIGURE 3.1.7-1



Technical Specifications Changes
Unit 2
(Mark-up)

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 sodium pentaborate in solution IS NOT within limits of Figure 3.1.7-1.	A.1 Restore concentration of sodium pentaborate in solution to within limits OF FIGURE 3.1.7-1.	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

WITHIN THE LIMITS OF FIGURE 3.1.7-1

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.1.7.1	Verify available volume of sodium pentaborate solution is ≥ 4587 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 sodium pentaborate in solution is ≥ 13.6 weight percent and within the limits of Figure 3.1.7-1.	31 days AND Once within 24 hours after water or sodium pentaborate 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 and power operated 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 the correct position.	31 days
SR 3.1.7.7	Verify each pump develops a flow rate ≥ ~~41.2~~ 40.0 gpm at a discharge pressure ≥ ~~1395~~ 1250 psig.	In accordance with the Inservice Testing Program
SR 3.1.7.8	Verify flow through one SLC subsystem pump into reactor pressure vessel.	24 months on a STAGGERED TEST BASIS
SR 3.1.7.9	Verify all heat traced piping between storage tank and pump suction is unblocked.	24 months AND Once within 24 hours after solution temperature is restored within the limits of Figure 3.1.7-2

INSERT 3.1-22A

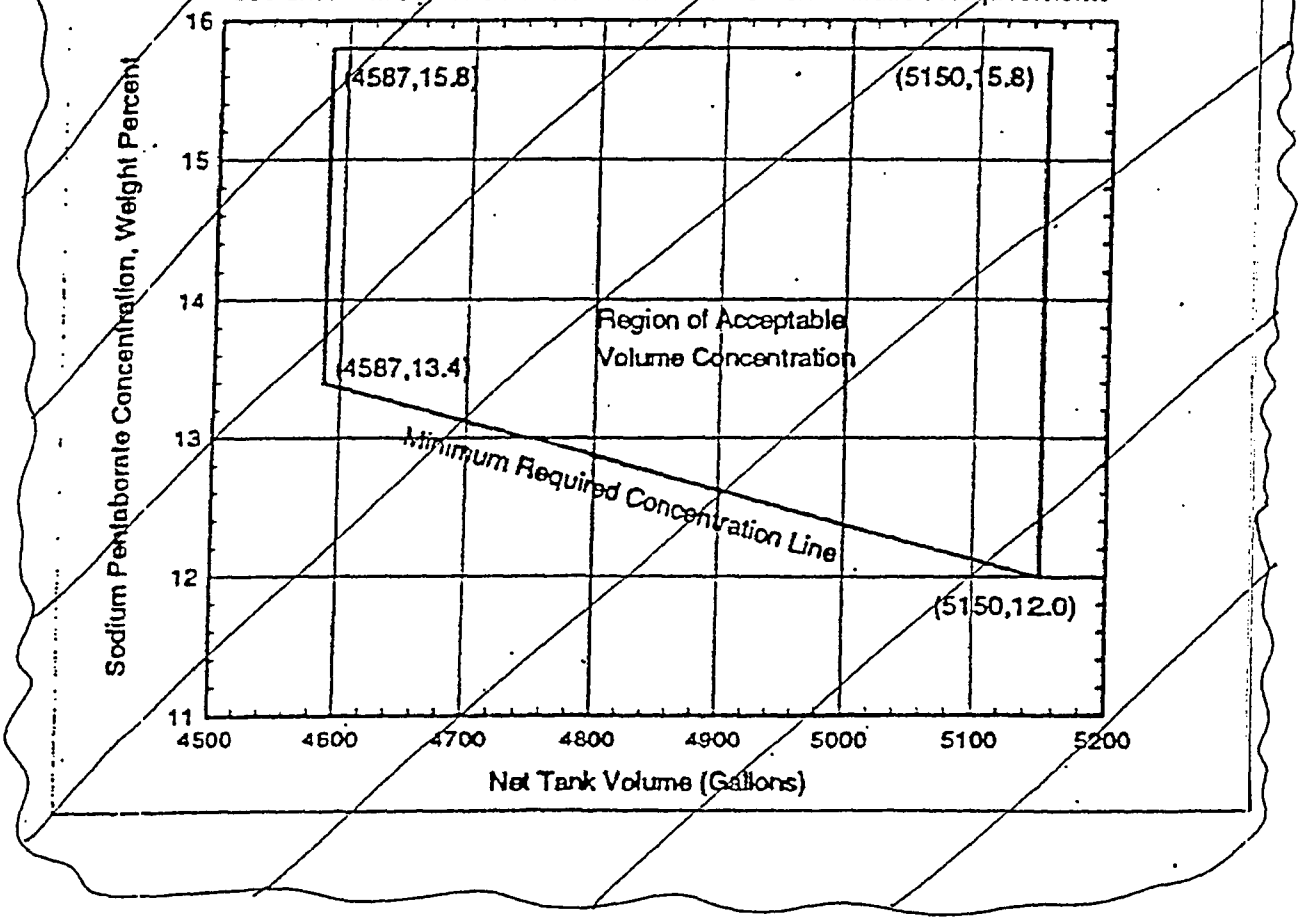
Insert 3.1-22A

	SURVEILLANCE	FREQUENCY
SR 3.1.7.10	Verify sodium pentaborate enrichment is ≥ 88 atom percent B-10.	Prior to addition to SLC tank.

INSERT 3.1-23A

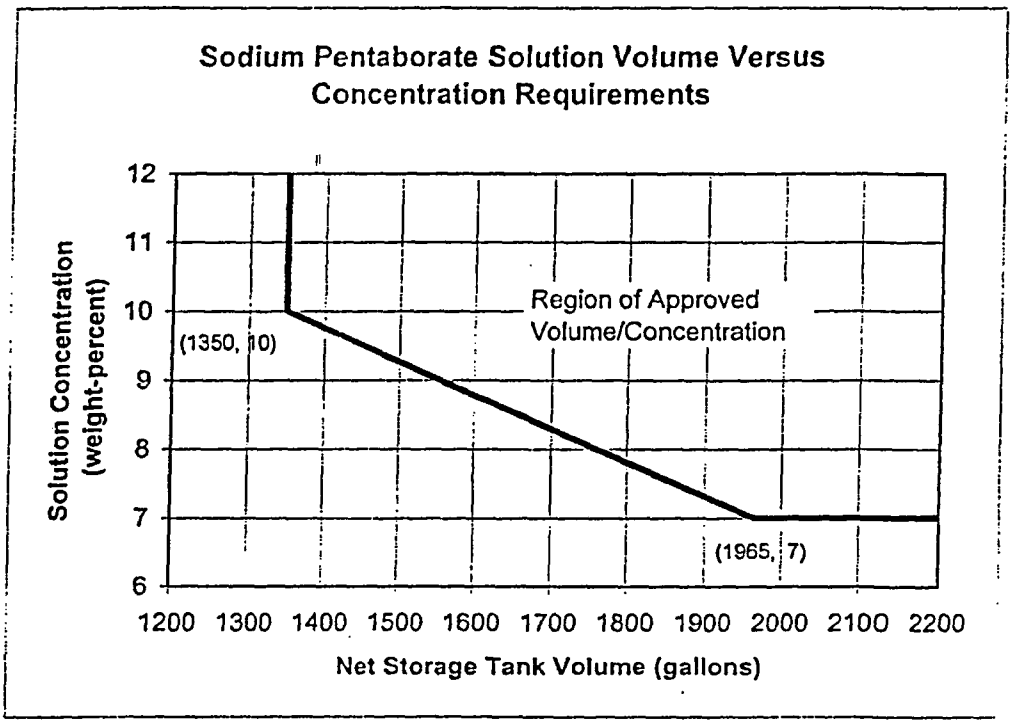
FIGURE 3.1.7-1

Sodium Pentaborate Solution Volume Versus Concentration Requirements



Insert 3.1-23A

FIGURE 3.1.7-1



Attachment 2 to PLA-6049

Proposed Technical Specifications Bases Changes (Mark-up)

Technical Specifications Bases Changes
Unit 1
(Mark-up)

BASES

APPLICABLE SAFETY ANALYSES (continued)

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 minimum concentration of 13.6 weight percent ensures compliance with the requirements of 10 CFR 50.62 (Ref. 1).

The SLC System satisfies the requirements of the NRC Policy Statement (Ref. 3) 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 not able to be withdrawn (except as permitted by LCO 3.10.3 and LCO 3.10.4) 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 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)

INSERT B 3.1-41A

BASES

ACTIONS A.1

If the boron solution concentration is less than the required limits for compliance with 10 CFR 50.62 (Ref. 1) (≥ 13.6 weight percent) but greater than the concentration required for cold shutdown (original licensing basis), the concentration must be restored to within limits > 13.6 weight percent in 72 hours. It is not necessary under these conditions to enter Condition C for 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 second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single continuous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, an SLC subsystem is inoperable 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 B, followed by 3 days in Condition 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 A was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

B.1

If one SLC subsystem is inoperable for reasons other than Condition A, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE subsystem is adequate to perform the

(continued)

Insert B 3.1- 41A

A-1

If the boron solution concentration is not within the limits in Figure 3.1.7-1, the operability of both SLC subsystems is impacted and the concentration must be restored to within limits within 8 hours. The allowed Completion Time of 8 hours is considered acceptable given the low probability of an event occurring concurrent with the failure of the control rods to shut down the reactor.

BASES

ACTIONS

B.1 (continued)

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 an event occurring concurrent with the failure of the Control Rod Drive (CRD) System to shut down the plant.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single continuous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, concentration is out of limits, 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 A, followed by 7 days in Condition 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 B was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

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 an event occurring concurrent with the failure of the control rods to shut down the reactor.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.7.7

Demonstrating that each SLC System pump develops a flow rate ≥ 41.2 gpm at a discharge pressure ≥ 1395 psig without actuating the pump's relief valve ensures that pump performance has not degraded during the fuel cycle. Testing at 1395 psig assures that the functional capability of the SLC system meets the ATWS Rule (10 CFR 50.62) (Ref. 1) requirements. 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. The Frequency of this Surveillance is in accordance with the Inservice Testing Program.

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 48 months at alternating 24 month intervals. The Surveillance may be performed in separate steps to prevent injecting solution 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 with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 24 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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.7.8 and SR 3.1.7.9 (continued)

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. This test can be performed by any series of overlapping or total flow path test so that the entire flow path is included. The 24 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 or the heat trace was not properly energized and building temperature was below the temperature at which the SLC solution would precipitate out, SR 3.1.7.9 must be performed once within 24 hours after the piping temperature is restored to within the limits of Figure 3.1.7-2.

REFERENCES

1. 10 CFR 50.62.
2. FSAR, Section 9.3.5.
3. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

INSERT B 3.1-46A

Insert B3.1-46A

SR3.1.7.10

Enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. Verification of 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. This verification may be based on independent isotopic analysis or a manufacturer certificate of compliance.

Technical Specifications Bases Changes
Unit 2
(Mark-up)

BASES

APPLICABLE SAFETY ANALYSES (continued)

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 minimum concentration of 13.6 weight percent ensures compliance with the requirements of 10 CFR 50.62 (Ref. 1).

The SLC System satisfies the requirements of the NRC Policy Statement (Ref. 3) 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 not able to be withdrawn (except as permitted by LCO 3.10.3 and LCO 3.10.4) 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 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)

INSERT B 3.1-41A

ACTIONS

A.1

If the boron solution concentration is less than the required limits for compliance with 10 CFR 50.62 (Ref. 1) (≥ 13.6 weight percent) but greater than the concentration required for cold shutdown (original licensing basis), the concentration must be restored to within limits > 13.6 weight percent in 72 hours. It is not necessary under these conditions to enter Condition C for 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 second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single continuous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, an SLC subsystem is inoperable 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 B, followed by 3 days in Condition 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 A was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

B.1

If one SLC subsystem is inoperable for reasons other than Condition A, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE subsystem is adequate to perform the

(continued)

Insert B 3.1- 41A

A-1

If the boron solution concentration is not within the limits in Figure 3.1.7-1, the operability of both SLC subsystems is impacted and the concentration must be restored to within limits within 8 hours. The allowed Completion Time of 8 hours is considered acceptable given the low probability of an event occurring concurrent with the failure of the control rods to shut down the reactor.

BASES

ACTIONS B.1 (continued)

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 an event occurring concurrent with the failure of the Control Rod Drive (CRD) System to shut down the plant.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of concentration out of limits or inoperable SLC subsystems during any single continuous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, concentration is out of limits, 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 A, followed by 7 days in Condition 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 B was entered. The 10 day Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

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 an event occurring concurrent with the failure of the control rods to shut down the reactor.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.7.7

Demonstrating that each SLC System pump develops a flow rate ≥ 41.2 gpm at a discharge pressure ≥ 1395 psig without actuating the pump's relief valve ensures that pump performance has not degraded during the fuel cycle. Testing at 1395 psig assures that the functional capability of the SLC System meets the ATWS Rule (10 CFR 50.62) (Ref. 1) requirements. 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. The Frequency of this Surveillance is in accordance with the Inservice Testing Program.

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 48 months at alternating 24 month intervals. The Surveillance may be performed in separate steps to prevent injecting solution 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 with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 24 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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.7.8 and SR 3.1.7.9 (continued)

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. This test can be performed by any series of overlapping or total flow path test so that the entire flow path is included. The 24 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 or the heat trace was not properly energized and building temperature was below the temperature at which the SLC solution would precipitate out, SR 3.1.7.9 must be performed once within 24 hours after the piping temperature is restored to within the limits of Figure 3.1.7-2.

REFERENCES

1. 10 CFR 50.62.
2. FSAR, Section 9.3.5.
3. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).

INSERT B 3.1-46A

Insert B3.1-46A

SR3.1.7.10

Enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. Verification of 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. This verification may be based on independent isotopic analysis or a manufacturer certificate of compliance.

ENCLOSURE TO PLA-6049

PPL SUSQUEHANNA EVALUATION OF PROPOSED CHANGES TO TECHNICAL SPECIFICATION 3.7.1, "STANDBY LIQUID CONTROL SYSTEM"

UNIT 1 AND UNIT 2 TECHNICAL SPECIFICATIONS

PPL Evaluation

SUBJECT: PPL SUSQUEHANNA EVALUATION OF PROPOSED CHANGES TO UNIT 1 AND UNIT 2 TECHNICAL SPECIFICATION 3.7.1, "STANDBY LIQUID CONTROL SYSTEM"

1. DESCRIPTION

PPL is proposing changes to the licensing basis to modify the Standby Liquid Control System for the use of enriched Boron and single pump operation.

The proposal would change the Standby Liquid Control (SLC) system Technical Specification (TS) 3.1.7. The change will be required to support the planned Susquehanna Steam Electric Station (SSES) Constant Pressure Power Uprate (CPPU), but is not dependent upon NRC approval of the uprate. Analysis supporting this change was performed based on operation at 3952 MWt (the planned uprated power level). Operation at Current Licensed Thermal Power (CLTP) with the proposed change is bounded by the analysis performed for operation at 3952 MWt and is therefore acceptable at the current licensed power level. The evaluation demonstrates continued compliance with 10 CFR 50.62.

PPL proposes to use an enriched sodium pentaborate solution. With enriched boron, a reduced solution weight-percent and reduced solution volume are required. In addition, with the replacement of the existing SLC solution, system operation can change from operation requiring both pumps, to operation requiring only a single pump. This allows a reduction in the required system flow and pump discharge pressure, due to a reduced system back pressure.

The planned modifications to the SLC systems will be installed during the Unit 2 13th Refueling Outage (currently scheduled to begin in the Spring of 2007) and the Unit 1 15th Refueling Outage (currently scheduled to begin in the Spring of 2008). To support this schedule, PPL requests that these amendments be issued by February 01, 2007.

2. PROPOSED CHANGE

The proposed changes to the SSES Units 1 and 2 SLC Technical Specifications, as shown in Attachment 1, involve the following:

1) Revision of the limit for the minimum concentration of sodium pentaborate in solution from "<13.6 weight-percent but within limits of Figure 3.1.7-1" to "is not within the limits of Figure 3.1.7-1" in Technical Specification 3.1.7, Condition A;

2) Revision of the restoring concentration of sodium pentaborate in solution from "to within limits >13.6 weight percent" to "within limits of Figure 3.1.7-1" in Technical Specification 3.1.7, Required Action A.1;

3) Revision of the completion time from "72 hours AND 10 days from discovery of failure to meet the LCO" to "8 hours" in Technical Specification 3.1.7 Action A;

4) Deletion of the completion time condition "AND 10 days from discovery of failure to meet the LCO" in Technical Specification 3.1.7, Action B;

5) Revision of the minimum available volume of tank inventory from "≥ 4587 gallons" to "within the limits of Figure 3.1.7-1" in SR 3.1.7.1;

6) Revision of the limit for the minimum concentration of sodium pentaborate in solution from "≥13.6 weight percent and within the limits of Figure 3.1.7-1" to "within the limits of Figure 3.1.7-1" in Surveillance Requirement (SR) 3.1.7.5;

7) Revision of the minimum pump flow rate from "41.2 gpm" to "40.0 gpm" in SR 3.1.7.7;

8) Revision of the minimum pump discharge pressure from "1395 psig" to "1250 psig" in SR 3.1.7.7;

9) The addition of a new SR to "Verify the sodium pentaborate enrichment is greater than, or equal to 88 atom percent B-10 prior to adding inventory to the SLC system tank."; and

10) Replacement of Figure 3.1.7-1 to reflect the lower required sodium pentaborate concentration versus tank volume, which reflects the use of enriched boron.

Technical Specification Bases Changes

PPL proposes to make the supporting changes to the Technical Specification Bases in accordance with Technical Specification 5.5.10, "Technical Specifications (TS) Bases Control Program." Associated Bases changes for Units 1 and 2 are provided in Attachment 2, for information only.

3. BACKGROUND

The SLC system is discussed in Section 9.3.5 of the SSES Final Safety Analysis Report (FSAR). The system is designed to bring the reactor, at any time during the fuel cycle, from full power to a sub-critical condition, without taking any credit for control rod motion following a scram. The SLC system satisfies the requirements of 10 CFR 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants."

A new analysis was performed to determine the required boron weight-percent and enrichment, as well as the minimum pump flow rate required to safely shutdown the reactor from operation at 3952 MWt. Consistent with the requirements of 10 CFR 50.62, the analysis assumed no control rod movement and failure of the Alternate Rod Insertion (ARI)

system following a scram. The result demonstrated that the ATWS acceptance criteria for critical plant parameters are satisfied.

The results of that analysis concluded that the requirements of 10 CFR 50.62 are satisfied with the following SLC system attributes:

1) A sodium pentaborate solution with a weight-percent greater than or equal to 7.0%;
2) A sodium pentaborate solution with an enrichment greater than or equal to 88 atom percent B-10;
3) A reactor shutdown boron requirement of greater than or equal to 660 ppm, plus a 25% margin for leakage and imperfect mixing; and
4) A total system flow rate of 40.0 gallons per minute.

PPL intends to replace the existing sodium pentaborate solution with a solution as described by items 1 and 2. Utilization of the enriched boron solution requires only a single pump to operate for the system to fulfill its design requirements. Therefore, the overall reliability of the SLC system is improved, since only one of the two pumps is required to operate.

In a separate license amendment request (Reference 1), PPL has proposed the implementation of an Alternative Source Term (AST), which complies with the guidance given in RG 1.183 and US NRC Standard Review Plan Section 15.0.1. Under the provisions of that request, the SLC system can be used to maintain suppression pool pH level above 7.0 following any DBA-LOCAs, which could involve significant fission product releases. The changes proposed by the modifications to TS 3.1.7 do not adversely affect this capability.

In another license amendment request (Reference 2), PPL has requested approval of amendments to the SSES Technical Specifications to permit implementation of Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA). ARTS/MELLLA supports operation of SSES in a core flow region which is above the current rated rod line. Implementation will increase plant efficiency by updating the thermal limits requirements. The changes proposed by the modifications to TS 3.1.7 do not adversely affect these requirements.

Precedent submittals for the use of an enriched sodium pentaborate solution are the Duane Arnold Energy Center, Fermi-2, Browns Ferry, and Hatch plants. Additionally, the Brunswick approved license change (Reference 3) is specifically cited because it is a recent precedent similar to this request.

4. TECHNICAL ANALYSIS

The Standby Liquid Control (SLC) system is designed to shut down the reactor from rated power conditions to cold shutdown in the postulated situation that some or all of the control

rods cannot be inserted. This manually operated system pumps a sodium pentaborate solution into the vessel, to provide neutron absorption and achieve a sub-critical reactor condition. The SLC system is designed to inject over a wide range of reactor operating pressures.

SLC system shutdown capability (in terms of the required reactor boron concentration) is re-evaluated for each fuel reload. Reload core design analyses are performed on a cycle-specific basis to ensure that required reactivity margins are maintained. Current Technical Specification requirements for cold shutdown margin are maintained by appropriate design of the enrichment and burnable neutron absorber content of the fuel lattices and by judicious placement of fresh and irradiated assemblies in the core. The boron shutdown concentration of 660 ppm does not change. The total weight of natural boron required for cold shutdown does not change. TS reactivity control requirements at the most reactive conditions of the core are met and confirmed using cycle-specific analyses.

The ATWS analysis results for operation at 3952 MWt (including operation in the ARTS/MELLLA operating domain) indicated the need for an increase in the SLC system boron injection rate to produce acceptable suppression pool temperature results. The required concentrations of the SLC tank sodium pentaborate solution are being reduced, as shown on the attached Technical Specification mark-ups (Attachment 1). The SLC system neutron absorber solution boron enrichment is increased to 88 atom-percent and the minimum solution concentration is reduced to 7 weight-percent. This also limits the reliance on tank and piping heat tracing, thus increasing system reliability. Due to the neutron absorber solution changes, the number of SLC system pumps required for injection may be reduced to one. Based on these changes, an acceptable suppression pool temperature response has been calculated.

The SLC system operation, using only one pump and with a sodium pentaborate solution with properties within the acceptance region of the new proposed Figure 3.1.7-1, will limit peak suppression pool temperature to a maximum of 206°F, which is within the SSES suppression pool design limit of 220°F.

In addition to requiring acceptable peak suppression pool temperatures under ATWS conditions, 10 CFR 50.62(c)(4) requires that each BWR have a SLC system with a minimum flow capacity and boron content equivalent in control capacity to 86 gpm of 13 weight-percent sodium pentaborate solution. NEDE-31096-P-A (Reference 4) provides guidance for boron equivalency determinations. Equation 1-1 of that document was used to demonstrate injection capacity equivalency as follows:

$$\frac{Q}{86}\times\frac{M}{M}\frac{251}{}\times\frac{C}{13}\times\frac{E}{19.8}\geq 1$$

Where: Q = SLC system flow rate;
$M251$ = Reference plant, with 251" diameter vessel, mass of water in the reactor and Recirculation System at hot rated conditions (lbs_m);
M = Mass of water in the reactor and Recirculation System at hot rated conditions (lbs_m);
C = Sodium pentaborate solution concentration (weight-percent); and,
E = Boron-10 isotope enrichment (19.8 atom-percent for natural boron).

Since SSES has a 251" diameter vessel, the value of $M251/M$ is equal to 1. Applying the values of the remaining parameters, which were assumed in the ATWS analysis, yields:

$$\frac{40}{86} \times \frac{7}{13} \times \frac{88}{19.8} = 1.11 \geq 1$$

Thus, this requirement of 10 CFR 50.62 is satisfied.

There are no significant impacts of the new sodium pentaborate solution on the mechanical and electrical aspects of the SLC system. The SLC pump, motor, and system valves are capable of delivering the required minimum flow rate to the reactor vessel under worst case postulated operating conditions. Since operation of only one pump is required, the margin between the maximum pump discharge pressure and the nominal setpoint of the pump discharge relief valve is increased. This is mainly due to the reduced system back pressure resulting from the lower pipe line flow losses.

Based on the results of the ATWS analysis, the maximum reactor lower plenum pressure following the limiting ATWS event reaches 1220 psia during the time the SLC system is analyzed to be in operation. However, due to the change to single-pump operation, the SLC system pump discharge pressure is reduced from the current value of 1395 psig to the proposed value of 1250 psig. The pressure margin for the SLC system pump discharge relief valves increases from 105 psig to 250 psig. This value is above the minimum value needed to assure that the relief valves remain closed during SLC system injection. Therefore, there is adequate margin to prevent the SLC system relief valve from lifting during SLC system operation to meet the guidelines published in NRC Information Notice 2001-13 (Reference 5.)

In the event that the SLC system is initiated before the time that the reactor pressure recovers from the first transient peak, resulting in opening of the SLC system pump relief valves, the reactor pressure must reduce sufficiently to ensure SLC system pump relief valve closure. The analysis indicates that the reactor pressure reduces sufficiently from the first transient peak to allow the SLC system pump relief valves to close.

Conclusion

The SLC system continues to meet the requirements contained in 10 CFR 50.62(c)(4) for SLC system injection capability for ATWS events. The combination of the neutron absorber boron enrichment of 88 atom-percent, minimum solution concentration of 7 weight-percent, and minimum SLC system pump flow rate of 40 gpm exceeds the equivalency in control capacity to 86 gallons per minute of 13 weight-percent sodium pentaborate solution for a 251-inch inside diameter reactor vessel contained in 10 CFR 50.62(c)(4).

The revised SLC system neutron absorber solution contains sufficient boron to shut down the reactor at cold shutdown conditions when operating at CLTP, including the 25% margin for leakage and imperfect mixing. The required concentration of sodium pentaborate versus volume has been determined for operation at 114% of CLTP. The results bound the results at CLTP.

In a separate license amendment request, PPL has proposed the implementation of an Alternative Source Term (AST), which, with specific exemptions, complies with the guidance given in RG 1.183 and US NRC Standard Review Plan 15.0.1 (Reference 1). In that request, the SLC system could be used to maintain suppression pool pH level above 7.0 following DBA-LOCAs which involve significant fission product releases. That evaluation demonstrates that the SLC system meets this post-LOCA suppression pool pH control design function.

5. REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

PPL Susquehanna has evaluated whether or not a significant hazards consideration is involved with the proposed change, by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed changes revise Technical Specification 3.1.7 for the Standby Liquid Control (SLC) system to reflect new boron weight-percent and enrichment requirements. In addition, the change to single pump operation reduces the required SLC pump flow and discharge pressure required to satisfy 10 CFR 50.62, thus increasing the reliability of the system. The changes do not otherwise alter the design or operation of the SLC system, and the existing design of the system is sufficient to support operation with the enriched sodium pentaborate solution. The SLC system is not considered to be the initiator of any event currently analyzed in the FSAR. Therefore, the

proposed changes do not increase the probability of a previously evaluated accident.

The SSES ATWS analysis was performed using standard accepted assumptions, inputs, and codes. That analysis, which demonstrated that the acceptance criteria for peak vessel pressure, peak cladding temperature, peak local cladding oxidation, peak suppression pool temperature, and peak containment pressure, established the requirements for the proposed boron weight-percent and concentration, and pump flow rate. The analysis assumed the use of only a single pump, versus two pumps. The results of the analysis are that no fission product barriers are adversely challenged, and the radiological consequences of previously evaluated accidents (i.e., ATWS) are not increased.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed changes revise Technical Specification 3.1.7 for the SLC system to reflect new boron weight-percent and enrichment requirements. In addition, the change to single pump operation reduces the required SLC pump flow and discharge pressure required to satisfy 10 CFR 50.62, thus increasing the reliability of the system. A new Surveillance Requirement (SR 3.1.7.10) is also added to verify the correct solution enrichment prior to addition of inventory to the SLC tank. The changes do not otherwise alter the design or operation of the SLC system, and the existing design of the system is sufficient to process the enriched sodium pentaborate solution. With the exception of these changes, no other physical changes to plant structures or systems are proposed. Thus, the proposed changes do not create a new initiating event for the spectrum of events currently postulated in the FSAR.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed changes revise Technical Specification 3.1.7 for the SLC system to reflect new boron weight-percent and enrichment requirements. In addition, the change to single pump operation reduces the required SLC pump flow and discharge pressure required to satisfy 10 CFR 50.62, thus increasing the reliability of the system. The changes do not otherwise alter the design or operation of the SLC system, and the existing design of the system is sufficient to process the enriched sodium pentaborate solution.

The analysis was performed using standard accepted assumptions, inputs, and codes. That analysis, which demonstrated that ATWS acceptance criteria are satisfied, established the requirements for the proposed boron weight-percent and concentration, and pump flow rate. Further, the analysis assumed only a single pump is in operation verses two pumps. The evaluation demonstrated that the SLC system meets this post-LOCA suppression pool pH control design function.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Conclusion

Based upon the above, PPL Susquehanna concludes that the proposed amendment presents no significant hazards consideration, under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements / Criteria

5.2.1 Analysis

10 CFR 50, Appendix A, GDC 26 requires that two independent reactivity control systems of different design principles be provided. For SSES, these systems are: the Control Rod Drive (CRD) system and the SLC system, which is the subject of the proposed Technical Specification changes. The evaluations performed in support of the amendment demonstrate that the SLC system continues to satisfy the provisions of this GDC.

10 CFR 50, Appendix A, GDC 27 requires that the reactivity control systems have the combined capability to assure that under postulated accident conditions, with sufficient margin to account for stuck control rods, that the

capability to adequately cool the core is maintained. The evaluations performed in support of the amendment demonstrate that the SLC system continues to satisfy the provisions of this GDC.

10 CFR 50.62(c)(4) states in part: "Each BWR must have a SLC system with a minimum flow capacity and boron content equivalent in control capacity to 86 gpm of 13 weight-percent sodium pentaborate solution." NEDE-31096-P-A provides guidance for boron equivalency determinations. The application of this guidance demonstrates that the equivalency requirement of 10 CFR 50.62 are met.

5.2.2 Conclusion

Based on the analyses provided in Section 4, Technical Analysis, the proposed change is consistent with applicable regulatory requirements and criteria. In conclusion, based on the considerations discussed above, (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.

6. ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, these proposed changes do not involve: (i) a significant hazards consideration; (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite; or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, these proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with these proposed changes.

7. REFERENCES

1. PPL Letter PLA-5963, Britt T. McKinney (PPL) to USNRC, "Susquehanna Steam Electric Station Proposed Amendment No. 281 to License NPF-14 and Proposed Amendment No. 251 to License NPF-22: Application for License Amendment and Related Technical Specification Changes to Implement Full-Scope Alternative Source Term in Accordance With 10 CFR 50.67," dated October 13, 2005.

2. PPL Letter PLA-5931, Britt T. McKinney (PPL) to USNRC, "Susquehanna Steam Electric Station Proposed License Amendment Numbers 279 for Unit 1 Operating License No. NPF-14 and 248 for Unit 2 Operating License No. NPF-22 ARTS/MELLLA Implementation," dated November 18, 2005.

3. Letter from US NRC to Mr. J.S. Keenan, "Brunswick Steam Electric Plant, Units 1 And 2 - Issuance Of Amendments RE: Standby Liquid Control Sodium Pentaborate Solution Requirements," March 25, 2003 (i.e., Amendment 227 and 255 For Brunswick Units 1 and 2).

4. GE Nuclear Energy, "Anticipated Transients Without SCRAM, Response To NRC ATWS Rule, 10 CFR 50.62," NEDE-31096-P-A, Class III, February 5

5. NRC Information Notice 2001-13: Inadequate Standby Liquid Control System Relief Valve Margin, August 10, 2001.