November 20, 1989

Docket No. 50-387

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Mr. Harold W. Keiser
Senior Vice President-Nuclear
Pennsylvania Power and Light Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Dear Mr. Keiser:

SUBJECT: TECHNICAL SPECIFICATION CHANGES REFLECTING THERMAL HYDRAULIC STABILITY CONSIDERATIONS (TAC NO. 73056)

RE: SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1

The Commission has issued the enclosed Amendment No. 93 to Facility Operating License No. NPF-14 for the Susquehanna Steam Electric Station, Unit 1. This amendment is in response to your letter dated April 12, 1989 as revised June 22, 1989.

This amendment revises the Technical Specifications to incorporate changes reflecting thermal hydraulic stability concerns outlined in NRC Bulletin 88-07.

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

Sincerely,

/S/

Mohan C. Thadani, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 93 to License No. NPF-14
2. Safety Evaluation

cc w/enclosures:
See next page

[KEISER LETTER]

PDI-2/LA	PDI-2/PM	PDI-2/D
MO'Brien	MThadani:tr	WButler
10/16/89	10/16/89	10/3/89
10/30/89		

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P PNU

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

FOR THE NUCLEAR REGULATORY COMMISSION

/S/

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 20, 1989

PDI-2/LA MO'Brien 10/30/89	PDI-2/PM MThadani 10/16/89	OGC 10/25/89	PDI-2/D WButler 10/31/89

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

November 20, 1989

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Senior Vice President-Nuclear
Pennsylvania Power and Light Company
2 North Ninth Street
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cc w/enclosures:
See next page

Mr. Harold W. Keiser
Pennsylvania Power & Light Company

Susquehanna Steam Electric Station
Units 1 & 2

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

PENNSYLVANIA POWER & LIGHT COMPANY

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-387

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 93
License No. NPF-14

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

   A. The application for the amendment filed by the Pennsylvania Power & Light Company, dated April 12, 1989 as revised June 22, 1989 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, 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 the Facility Operating License No. NPF-14 is hereby amended to read as follows:

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 93 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. PP&L shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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P PNU

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

FOR THE NUCLEAR REGULATORY COMMISSION

Walter R. Butler

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 20, 1989

ATTACHMENT TO LICENSE AMENDMENT NO.

FACILITY OPERATING LICENSE NO. NPF-14

DOCKET NO. 50-387

Replace the following pages of the Appendix A Technical Specifications with enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change. The overleaf pages are provided to maintain document completeness.*

REMOVE	INSERT
xxi	xxi
xxii	xxii*
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3/4 4-1a	3/4 4-1a
3/4 4-1b	3/4 4-1b
3/4 4-1c	3/4 4-1c
3/4 4-1d	3/4 4-1d
3/4 4-1e	3/4 4-1e
3/4 4-1f	3/4 4-1f
3/4 4-1g	3/4 4-1g
-	3/4 4-2*
-	-
3/4 4-3	3/4 4-3*
3/4 4-4	3/4 4-4
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B 3/4 4-2	B 3/4 4-1a
-	B 3/4 4-2*
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3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS - TWO LOOP OPERATION

LIMITING CONDITION FOR OPERATION

3.4.1.1.1 Two reactor coolant system recirculation loops shall be in operation with the reactor at a THERMAL POWER/coreflow condition outside of Regions I and II of Figure 3.4.1.1.1-1.

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*†, except during single loop operation.#

ACTION:

a. In OPERATIONAL CONDITION 1:

1. With:

a) No reactor coolant system recirculation loops in operation, or

b) Region I of Figure 3.4.1.1.1-1 entered, or

c) Region II of Figure 3.4.1.1.1-1 entered and core thermal hydraulic instability occurring as evidenced by:

1) Two or more APRM readings oscillating with at least one oscillating greater than or equal to 10% of RATED THERMAL POWER peak-to-peak, or

2) Two or more LPRM upscale alarms activating and deactivating with a 1 to 5 second period, or

3) Observation of a sustained LPRM oscillation of greater than 10 w/cm^2 peak-to-peak with a 1 to 5 second period, or

d) Region II of Figure 3.4.1.1.1-1 entered and less than 50% of the required LPRM upscale alarms OPERABLE,

immediately place the reactor mode switch in the shutdown position.

2. If Region II of Figure 3.4.1.1.1-1 is entered and greater than or equal to 50% of the required LPRM upscale alarms OPERABLE, immediately exit the region by:

a) inserting a predetermined set of high worth control rods, or

b) increasing core flow.

---

*See Special Test Exception 3.10.4.
#See Specification 3.4.1.1.2 for single loop operation requirements.
†The LPRM upscale alarms are not required to be OPERABLE to meet this specification in OPERATIONAL CONDITION 2.

ACTION: (Continued)

3. With less than 50% of the required LPRM upscale alarms OPERABLE, follow ACTION a.1.d. upon entry into Region II of Figure 3.4.1.1.1-1.

b. In OPERATIONAL CONDITION 2 with no reactor coolant system recirculation loops in operation, return at least one reactor coolant system recirculation loop to operation, or be in HOT SHUTDOWN within the next 6 hours.

c. With any pump discharge valve not OPERABLE remove the associated loop from operation, close the valve and comply with the requirements of Specification 3.4.1.1.2.

d. With any pump discharge bypass valve not OPERABLE close the valve and verify closed at least once per 31 days.

4.4.1.1.1.1 Each pump discharge valve and bypass valve shall be demonstrated OPERABLE by cycling each valve through at least one complete cycle of full travel during each startup** prior to THERMAL POWER exceeding 25% of RATED THERMAL POWER.

4.4.1.1.1.2 Each pump MG set scoop tube electrical and mechanical stop shall be demonstrated OPERABLE with overspeed setpoints less than or equal to 102.5 and 105%, respectively, of rated core flow, at least once per 18 months.

4.4.1.1.1.3 At least 50% of the required LPRM upscale alarms shall be determined OPERABLE by performance of the following on each LPRM upscale alarm:

1) CHANNEL FUNCTIONAL TEST at least once per 92 days and

2) CHANNEL CALIBRATION at least once per 184 days.

**If not performed within the previous 31 days.

Figure 3.4.1.1.1-1
THERMAL POWER RESTRICTIONS

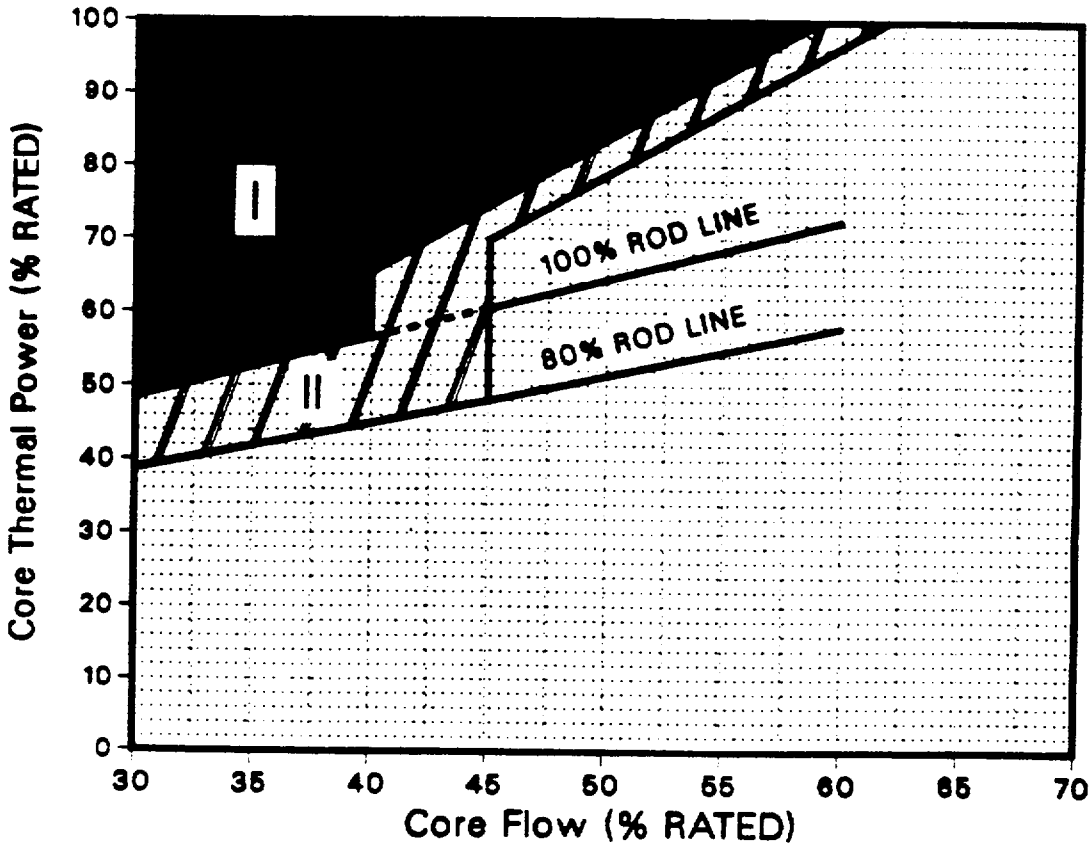

FIGURE 3.4.1.1-1
THERMAL POWER RESTRICTIONS

LIMITING CONDITION FOR OPERATION

3.4.1.1.2 One reactor coolant recirculation loop shall be in operation with the pump speed ≤ 80% of the rated pump speed and the reactor at a THERMAL POWER/core flow condition outside of Regions I and II of Figure 3.4.1.1.1-1, and

a. the following revised specification limits shall be followed:

1. Specification 2.1.2: the MCPR Safety Limit shall be increased to 1.07.

2. Table 2.2.1-1: the APRM Flow-Biased Scram Trip Setpoints shall be as follows:

Trip Setpoint	Allowable Value
≤ 0.58W + 54%	≤ 0.58W + 57%.

3. Specification 3.2.1: The MAPLHGR limits shall be as specified in Figures 3.2.1-2 and 3.2.1-3.

4. Specification 3.2.2: the APRM Setpoints shall be as follows:

Trip Setpoint	Allowable Value
$S \leq (0.58W + 54\%)T$	$S \leq (0.58W + 57\%)T$
$S_{RB} \leq (0.58W + 45\%)T$	$S_{RB} \leq (0.58W + 48\%)T$

5. Specification 3.2.3: The MINIMUM CRITICAL POWER RATIO (MCPR) shall be greater than or equal to the largest of the following values:

a. 1.42,

b. the MCPR determined from Figure 3.2.3-1 plus 0.01, and

c. the MCPR determined from Figure 3.2.3-2 plus 0.01.

6. Table 3.3.6-2: the RBM/APRM Control Rod Block Setpoints shall be as follows:

		Trip Setpoint	Allowable Value
a.	RBM - Upscale	≤ 0.66W + 36%	≤ 0.66W + 39%
b.	APRM-Flow Biased	≤ 0.58 + 45%	≤ 0.58W + 48%

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*+, except during two loop operation.#

ACTION:

a. In OPERATIONAL CONDITION 1:

1. With:

a) No reactor coolant system recirculation loops in operation, or

b) Region I of Figure 3.4.1.1.1-1 entered, or

c) Region II of Figure 3.4.1.1.1-1 entered and core thermal hydraulic instability occurring as evidenced by:

1) Two or more APRM readings oscillating with at least once oscillating greater than or equal to 10% of RATED THERMAL POWER peak-to-peak, or

2) Two or more LPRM upscale alarms activating and deactivating with a 1 to 5 second period, or

3) Observation of a sustained LPRM oscillation of greater than 10 w/cm^2 peak-to-peak with a 1 to 5 second period, or

d) Region II of Figure 3.4.1.1.1-1 entered and less than 50% of the required LPRM upscale alarms OPERABLE,

immediately place the reactor mode switch in the shutdown position.

2. If Region II of Figure 3.4.1.1.1-1 is entered and greater than or equal to 50% of the required LPRM upscale alarms are OPERABLE, immediately exit the region by:

a) inserting a predetermined set of high worth control rods, or

b) increasing core flow by increasing the speed of the operating recirculation pump.

3. With less than 50% of the required LPRM upscale alarms OPERABLE, follow ACTION a.1.d upon entry into Region II of Figure 3.4.1.1.1-1.

b. In OPERABLE CONDITION 2 with no reactor coolant system recirculation loops in operation, return at least one reactor coolant system recirculation loop to operation, or be in HOT SHUTDOWN within the next 6 hours.

SURVEILLANCE REQUIREMENTS (Continued)

c. With any of the limits specified in 3/4.1.1.2a not satisfied:

1. Upon entering single loop operation, comply with the new limits within 6 hours or be in at least HOT SHUTDOWN within the following 6 hours.

2. If the provisions of ACTION c.1 do not apply, take the ACTION(s) required by the referenced Specification(s).

d. With one or more jet pumps inoperable, be in at least HOT SHUTDOWN within 12 hours.

e. With any pump discharge valve not OPERABLE remove the associated loop from operation, close the valve and verify closed at least once per 31 days.

f. With any pump discharge bypass valve not OPERABLE close the valve and verify closed at least once per 31 days.

SURVEILLANCE REQUIREMENTS

4.4.1.1.2.1 Upon entering single loop operation and at least once per 24 hours thereafter, verify that the pump speed in the operating loop is $\leq$ 80% of the rated pump speed.

4.4.1.1.2.2 At least 50% of the required LPRM upscale alarms shall be determined OPERABLE by performance of the following on each LPRM upscale alarm:

1) CHANNEL FUNCTIONAL TEST at least once per 92 days, and

2) CHANNEL CALIBRATION at least once per 184 days.

4.4.1.1.2.3 Within 15 minutes prior to either THERMAL POWER increase resulting from a control rod withdrawal or recirculation loop flow increase, verify that the following differential temperature requirements are met if THERMAL POWER is $\leq$ 30%**** of RATED THERMAL POWER or the recirculation loop flow in the operating recirculation loop is $\leq$ 50%**** of rated loop flow:

a. $\leq$ 145°F between reactor vessel steam space coolant and bottom head drain line coolant,

b.## $\leq$ 50°F between the reactor coolant within the loop not in operation and the coolant in the reactor pressure vessel, and

c.## $\leq$ 50°F between the reactor coolant within the loop not in operation and operating loop.

SURVEILLANCE REQUIREMENTS (Continued)

4.4.1.1.2.4 The pump discharge valve and bypass valve in both loops shall be demonstrated OPERABLE by cycling each valve through at least one complete cycle of full travel during each startup** prior to THERMAL POWER exceeding 25% of RATED THERMAL POWER.

4.4.1.1.2.5 The pump MG set scoop tube electrical and mechanical stop shall be demonstrated OPERABLE with overspeed setpoints less than or equal to 102.5% and 105%, respectively, of rated core flow, at least once per 18 months.

4.4.1.1.2.6 During single recirculation loop operation, all jet pumps, including those in the inoperable loop, shall be demonstrated OPERABLE at least once per 24 hours by verifying that no two of the following conditions occur:###

a. The indicated recirculation loop flow in the operating loop differs by more than 10% from the established single recirculation pump speed-loop flow characteristics.

b. The indicated total core flow differs by more than 10% from the established total core flow value from single recirculation loop flow measurements.

c. The indicated diffuser-to-lower plenum differential pressure of any individual jet pump differs from established single recirculation loop patterns by more than 10%.

4.4.1.1.2.7 The SURVEILLANCE REQUIREMENTS associated with the specifications referenced in 3.4.1.1.2a shall be followed.

* See Special Test Exception 3.10.4.

** If not performed within the previous 31 days.

**** Initial value. Final value to be determined based on startup testing. Any required change to this value shall be submitted to the Commission within 90 days of test completion.

\# See Specification 3.4.1.1.1 for two loop operation requirements.

This requirement does not apply when the loop not in operation is isolated from the reactor pressure vessel.

During startup testing following each refueling outage, data shall be recorded for the parameters listed to provide a basis for

establishing the specified relationships. Comparisons of the actual data in accordance with the criteria listed shall commence upon the performance of subsequent required surveillances.

\+ The LPRM upscale alarms are not required to be OPERABLE to meet this specification in OPERATIONAL CONDITION 2.

JET PUMPS

LIMITING CONDITION FOR OPERATION

3.4.1.2 All jet pumps shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2, when both recirculation loops are in operation.

ACTION:

With one or more jet pumps inoperable, be in at least HOT SHUTDOWN within 12 hours.

SURVEILLANCE REQUIREMENTS

4.4.1.2** Each of the above required jet pumps shall be demonstrated OPERABLE prior to THERMAL POWER exceeding 25% of RATED THERMAL POWER and at least once per 24 hours by determining recirculation loop flow, total core flow and diffuser-to-lower plenum differential pressure for each jet pump and verifying that no two of the following conditions occur when the recirculation pumps are operating at the same speed:

a. The indicated recirculation loop flow differs by more than 10% from the established pump speed-loop flow characteristics.

b. The indicated total core flow differs by more than 10% from the established total core flow value derived from recirculation loop flow measurements.

c. The indicated diffuser-to-lower plenum differential pressure of any individual jet pump differs from established patterns by more than 10%.

**See Specification 4.4.1.1.2.9 for single loop operation requirements.

RECIRCULATION PUMPS

LIMITING CONDITION FOR OPERATION

3.4.1.3 Recirculation pump speed mismatch shall be maintained within:

a. 5% of each other with core flow greater than or equal to 75% of rated core flow.

b. 10% of each other with core flow less than 75% of rated core flow.

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*, when both recirculation loops are in operation.

ACTION:

With the recirculation pump speeds different by more than the specified limits, either:

a. Restore the recirculation pump speeds to within the specified limit within 2 hours, or

b. Declare the recirculation loop of the pump with the slower speed not in operation and take the ACTION required by Specification 3.4.1.1.1.

SURVEILLANCE REQUIREMENTS

4.4.1.3 Recirculation pump speed mismatch shall be verified to be within the limits at least once per 24 hours.

*See Special Test Exception 3.10.4.

IDLE RECIRCULATION LOOP STARTUP

LIMITING CONDITION FOR OPERATION

3.4.1.4 An idle recirculation loop shall not be started unless the temperature differential between the reactor pressure vessel steam space coolant and the bottom head drain line coolant is less than or equal to 145°F, and:

a. When both loops have been idle, unless the temperature differential between the reactor coolant within the idle loop to be started up and the coolant in the reactor pressure vessel is less than or equal to 50°F, or

b. When only one loop has been idle, unless the temperature differential between the reactor coolant within the idle and operating recirculation loops is less than or equal to 50°F, and the operating loop flow rate is less than or equal to 50% of rated loop flow, and the reactor is operating at a THERMAL POWER/core flow condition below the 80% Rod Line shown in Figure 3.4.1.1.1-1.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3 and 4.

ACTION:

With temperature differences and/or flow rates exceeding the above limits, suspend startup of any idle recirculation loop.

SURVEILLANCE REQUIREMENTS

4.4.1.4 The temperature differentials and flow rate shall be determined to be within the limits within 15 minutes prior to startup of an idle recirculation loop.

3/4.4.1 RECIRCULATION SYSTEM

Operation with one reactor recirculation loop inoperable has been evaluated and found acceptable, provided that the unit is operated in accordance with Specification 3.4.1.1.2.

For single loop operation, the MAPLHGR limits are multiplied by a factor of 1.0 for ANF fuel. This multiplication factor is derived from LOCA analyses initiated from single loop operation conditions. The resulting MAPLHGR limits for single loop operation assure the peak cladding temperature during a LOCA event remains below 2200°F.

The MINIMUM CRITICAL POWER RATIO (MCPR) limits for single loop operation assure that the Safety Limit MCPR is not exceeded for any Anticipated Operational Occurrence (AOO) and for the Recirculation Pump Seizure Accident.

For single loop operation, the RBM and APRM setpoints are adjusted by a 8.5% decrease in recirculation drive flow to account for the active loop drive flow that bypasses the core and goes up through the inactive loop jet pumps.

Surveillance on the pump speed of the operating recirculation loop is imposed to exclude the possibility of excessive reactor vessel internals vibration. Surveillance on differential temperatures below the threshold limits on THERMAL POWER or recirculation loop flow mitigates undue thermal stress on vessel nozzles, recirculation pumps and the vessel bottom head during extended operation in the single loop mode. The threshold limits are those values which will sweep up the cold water from the vessel bottom head.

Specifications have been provided to prevent, detect, and mitigate core thermal hydraulic instability events. These specifications are prescribed in accordance with NRC Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors (BWRs)," dated December 30, 1988. The boundaries of the regions in Figure 3.4.1.1.1.1-1 are determined using ANF decay ratio calculations and supported by Susquehanna SES stability testing.

LPRM upscale alarms are required to detect reactor core thermal hydraulic instability events. The criteria for determining which LPRM upscale alarms are required is based on assignment of these alarms to designated core zones. These core zones consist of the level A, B and C alarms in 4 or 5 adjacent LPRM strings. The number and location of LPRM strings in each zone assure that with 50% or more of the associated LPRM upscale alarms OPERABLE sufficient monitoring capability is available to detect core wide and regional oscillations. Operating plant instability data is used to determine the specific LPRM strings assigned to each zone. The core zones and required LPRM upscale alarms in each zone are specified in appropriate procedures.

An inoperable jet pump is not, in itself, a sufficient reason to declare a recirculation loop inoperable, but it does, in case of a design-basis-accident, increase the blowdown area and reduce the capability of reflooding the core; thus, the requirement for shutdown of the facility with a jet pump inoperable. Jet pump failure can be detected by monitoring jet pump performance on a prescribed schedule for significant degradation.

3/4.4.1 RECIRCULATION SYSTEM (Continued)

Recirculation pump speed mismatch limits are in compliance with the ECCS LOCA analysis design criteria for two loop operation. The limits will ensure an adequate core flow coastdown from either recirculation loop following a LOCA. In the case where the mismatch limits cannot be maintained during the loop operation, continued operation is permitted in the single loop mode.

In order to prevent undue stress on the vessel nozzles and bottom head region, the recirculation loop temperatures shall be within 50°F of each other prior to startup of an idle loop. The loop temperature must also be within 50°F of the reactor pressure vessel coolant temperature to prevent thermal shock to the recirculation pump and recirculation nozzles. Since the coolant in the bottom of the vessel is at a lower temperature than the coolant in the upper regions of the core, undue stress on the vessel would result if the temperature difference was greater than 145°F.

3/4.4.2 SAFETY/RELIEF VALVES

The safety valve function of the safety/relief valves operate to prevent the reactor coolant system from being pressurized above the Safety Limit of 1325 psig in accordance with the ASME Code. A total of 10 OPERABLE safety-relief valves is required to limit reactor pressure to within ASME III allowable values for the worst case upset transient.

Demonstration of the safety/relief valve lift settings will occur only during shutdown and will be performed in accordance with the provisions of Specification 4.0.5.

3/4.4.3 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.3.1 LEAKAGE DETECTION SYSTEMS

The RCS leakage detection systems required by this specification are provided to monitor and detect leakage from the reactor coolant pressure boundary.

3/4.4.3.2 OPERATIONAL LEAKAGE

The allowable leakage rates from the reactor coolant system have been based on the predicted and experimentally observed behavior of cracks in pipes. The normally expected background leakage due to equipment design and the detection capability of the instrumentation for determining system leakage was also considered. The evidence obtained from experiments suggests that for leakage somewhat greater than that specified for UNIDENTIFIED LEAKAGE the probability is small that the imperfection or crack associated with such leakage would grow rapidly. However, in all cases, if the leakage rates exceed the values specified or the leakage is located and known to be PRESSURE BOUNDARY LEAKAGE, the reactor will be shutdown to allow further investigation and corrective action.

The Surveillance Requirements for RCS pressure isolation valves provide added assurance of valve integrity thereby reducing the probability of gross valve failure and consequent intersystem LOCA.

3/4.4.4 CHEMISTRY

The water chemistry limits of the reactor coolant system are established to prevent damage to the reactor materials in contact with the coolant. Chloride limits are specified to prevent stress corrosion cracking of the stainless steel. The effect of chloride is not as great when the oxygen concentration in the coolant is low, thus the 0.2 ppm limit on chlorides is permitted during POWER OPERATION. During shutdown and refueling operations, the temperature necessary for stress corrosion to occur is not present so a 0.5 ppm concentration of chlorides is not considered harmful during these periods.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 93 TO FACILITY OPERATING LICENSE NO. NPF-14

PENNSYLVANIA POWER & LIGHT COMPANY

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-387

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1

1.0 INTRODUCTION

In a letter dated April 12, 1989, Pennsylvania Power and Light Company (PPLC) proposed Technical Specification (TS) changes for Susquehanna Steam Electric Station, Unit 1 (SSES1). The proposed changes alter current TS associated with thermal hydraulic stability (THS) concerns by defining revised regions on the operating power-flow map pertinent to THS and new or revised operating requirements and restrictions on activities relating to these regions. There was also another letter from PPLC, dated June 22, 1989, proposing changes to the boundaries of the regions presented in the first submittal, as a result of recent improvements in flow calibration procedures.

The proposed regions, requirements and restrictions are intended to avoid problems with thermal hydraulic instability, which have been a focus of NRC attention following the LaSalle instability event of March 1988. This attention has resulted in the issuance of NRC Bulletin 88-07 and Supplement 1 to that bulletin. These provide NRC action requests for utilities to provide operator training, instrumentation verification and operating procedures intended to minimize instability potential or consequences. The requested operating procedures of Supplement 1 are based primarily on the General Electric (GE) "Interim Recommendations for Stability Actions" (IRSA). The IRSA are presented in an attachment to the supplement. Supplement 1 also requests (1) that plants without effective automatic scram protection for regional oscillations (IRSA group 2 plants) should initiate manual scram upon loss of both recirculation pumps, and (2) that the region boundaries of IRSA be reevaluated and justified for core loadings with fuel other than that supplied by GE.

The IRSA, along with the other NRC staff requests presented in the supplement, constitute current NRC recommendations for BWR THS related operations. They are the result of calculations and reviews by the NRC, GE, the BWR Owners' Group and associated consultants. The bulletin supplement requested that licensees implement the IRSA (and other associated requests) by modifying relevant procedures. Modification of TS was not specifically requested since it is expected that long term solution implementation, to replace the interim recommendations, will begin within about a year. However, several licensees

SSES1 currently has TS relating to THS restrictions procedures and relevant power-flow map regions, but they differ in many details from those requested in Supplement 1. Furthermore SSES1 is a IRSA group 2 plant (having a filtered APRM flow biased neutron flux signal to provide a simulated thermal power monitor), and has current and future core fuel loadings consisting of Advanced Nuclear Fuel (ANF) 8x8 and 9x9 fuel assemblies. These factors, along with the recent flow calibration change, require changes in SSES1 operations and power flow map region boundaries to comply with the Supplement 1 requests. PPLC has therefore submitted proposed TS changes and justifications to provide specifications which would not be in conflict with procedural compliance with the NRC requested changes.

The proposed changes are primarily to TS 3/4.4.1.1.1, Recirculation Loops - Two Loop Operation (TLO) and TS 3/4.4.1.1.2, Recirculation Loops - Single Loop Operation (SLO). In addition there are changes to the associated Bases, a minor related change to TS 3.4.1.4, changes to the Recirculation Loops TS which transfer items from Surveillance to Action, and changes to the Index.

2.0 EVALUATION

The IRSA specify three regions (A, B, C) on the power-flow map involving different degrees of allowed or prohibited operation. These are bounded by constant flow lines or control rod lines (lines of flow variation with all other reactor parameters, particularly control rod position, held constant). Region A is above the 100 percent rod line (intercepts 100 percent rated power at 100 percent rated flow) and below 40 percent flow. Region B is between the 80 and 100 percent rod lines and below 40 percent flow. Region C is above the 80 percent rod line and between 40 and 45 percent flow. Deliberate entry into regions A and B is not permitted, and if it occurs immediate exit is required. For a group 2 plant (such as SSES1) immediate scram is required in region A, while the region B control rod insertion or flow increase may be used to exit. Operations may be conducted in region C, with suitable surveillance, if required during "startups" to prevent fuel damage. If during operations in B or C instability occurs, the reactor shall be scrammed, with evidence for instability coming from Average Power Range Monitor (APRM) oscillation greater than 10 percent or Local Power Range Monitor (LPRM) upscale or downscale alarms.

The SSES1 TS deal with THS concerns in the TLO and SLO Recirculation Loop TS. They currently specify a region above the 80 percent rod line and below about 45 percent flow to be avoided, in SLO, and requiring, in TLO surveillance and departure on excessive Average or Local Power Range Monitor (APRM or LPRM) noise levels. The proposed TS changes delete the current THS related sections of these TS and provide specifications complying with the IRSA, with region boundaries modified to meet the alternate vendor fuel request of Supplement 1, and also provide for scram with the loss of both recirculation pumps as requested by the supplement.

The IRSA region boundaries are based on stability experience with GE supplied fuel. For fuel from other vendors Supplement 1 indicates that the IRSA regions should be adopted in principle but with boundaries based (for SSES1 circumstances) on calculated core decay ratios using NRC approved methodology.

Since SSES1 has ANF 8x8 and 9x9 fuel, ANF has provided core decay ratio calculations for SSES1 Cycle 5 operation using COTRAN, which has been checked against decay ratio measurements in Susquehanna and has been approved and used for stability calculations for previous Susquehanna ANF reload cores. The appropriate boundary markers for this analysis are a calculated decay ratio of 0.9 (or less) for the equivalent IRSA A-B or A-C boundary and 0.75 (or less) for the equivalent outer B or C boundary. These have been used for determining the proposed SSES1 regions and are acceptable.

The new SSES1 regions are displayed in the revised Figure 3.4.1.1-1 which was provided in the original submittal and revised in the second. The revision was necessary because recent improvements in procedures for determining the plant drive flow/core flow relationship resulted in a change in the APRM Rod Block line, increasing the allowable region of operation. The decay ratio mapping was expanded into this region and the stability region boundaries were redrawn. The original boundaries were the same as in IRSA except that region B and C were combined into a single Region II (and region A is designated Region I). The IRSA operating restrictions of region B were conservatively applied throughout Region II. The change in the second submittal is to a more restrictive pattern, with Region I extending above 40 percent flow and above an altered Region II which now includes an extension in a narrow band above 45 percent flow. These boundaries provide a conservative representation of the 0.90 and 0.75 decay ratio lines, and these regions provide a conservative representation of the Supplement 1 request and are acceptable.

The changes to TS 3/4.4.1.1.1 (TLO) and to TS 3/4.4.1.1.2 (SLO) are essentially the same. For both specifications the current Limiting Conditions of Operation, Actions and Surveillance items relating to THS are deleted and replaced with new items referring to the regions on revised Figure 3.4.1.1.1-1 and providing for restrictions on operations in those regions. They require that reactor operation be conducted outside of Regions I and II. In Operational Condition 1 (RUN) immediate scram (mode switch in Shutdown) is required if (1) no recirculation loop is in operation, or (2) Region I is entered, or (3) Region II is entered and less than 50 percent of LPRM upscale alarms are operable or if the reactor is unstable as indicated by (using an abbreviated description) (a) APRM peak-to-peak (oscillation) readings greater than 10 percent rated power, or (b) LPRM upscale alarms, or (c) LPRM peak-to-peak readings exceeding 10 w/cm^2 (about 25 percent rated). There are also new surveillance requirements for the periodic determination of the operability of the LPRM upscale alarms. If Region II is entered and the reactor is not unstable and the LPRM alarms are operable, immediate departure by control rod insertion or flow increase (pump restart not allowed) is required. In Operational Condition 2, Hot Shutdown in 6 hours is required if no recirculation pumps are operating (and can not be restarted). These

proposed requirements all meet or exceed IRSA and Supplement 1 requests. They are a complete and reasonable implementation and are acceptable. There are also corresponding changes to the Bases for 3/4.4.1. These changes provide a reasonable background for the TS changes and are also acceptable.

Finally, there is a related addition to TS 3.4.1.4, Idle Recirculation Loop Startup, requiring the reactor to be operating below the 80 percent rod line (Figure 3.4.1.1.1-1) when restarting a recirculation loop. This is to avoid possible THS problems on restart and is acceptable.

In addition to the changes to the THS requirements of TS 3/4.4.1.1.1 and .2, PPLC has proposed an administrative change which would transfer from the Surveillance sections (4.4.1.1.1.2, 2.6 and 2.8) to the Action sections (TLO Actions c and d, and SLO Actions e and f) several actions and surveillances relating to recirculation pump discharge and bypass valves. These transfers do not change the intent on content of the specifications. The change does provide clearer operator guidelines and the specifications are better classified as Actions. The change is acceptable.

The overall conclusion of the review is that the proposed TS changes and the material submitted to support the changes are acceptable. It should be noted, however, that the NRC staff, its consultants, the BWR Owners' Group (BWROG), GE and others are continuing the review of THS concerns. The BWROG is developing several long term solutions for the problem. It is expected that a selection will be announced by the end of 1989. Any new requirements resulting from the continuing generic review of THS concerns and BWROG long term solutions will be applicable to SSES1 and may impact some of the operations, systems surveillance or TS found to be acceptable in this review.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The 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 this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this 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 nor environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (54 FR 29406) on July 12, 1989 and consulted with the State of Pennsylvania. No public comments were received, and the State of Pennsylvania did not have any comments.

The staff 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, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security nor to the health and safety of the public.

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Dated: November 20, 1989