December 13, 1989

Docket No.: 50-352

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Mr. George A. Hunger, Jr.
Director-Licensing, MC 5-2A-5
Philadelphia Electric Company
Correspondence Control Desk
P.O. Box No. 195
Wayne, Pennsylvania 19087-0195

Dear Mr. Hunger:

SUBJECT: SOURCE RANGE MONITOR COUNT RATE CURVE (TAC NO. 74572)

RE: LIMERICK GENERATING STATION, UNIT 1

The Commission has issued the enclosed Amendment No. 34 to Facility Operating License No. NPF-39 for the Limerick Generating Station, Unit 1. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated August 3, 1989.

This amendment revises the TSs to ensure the design level of counting certainty is maintained at all times for the Source Range Monitors.

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

Sincerely,

Original signed by
Richard J. Clark

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

Enclosures:
1. Amendment No. 34 to License No. NPF-39
2. Safety Evaluation

cc w/enclosures:
See next page

[74572]

PDI-2/LA	PDI-2/PM	SRXB/C	OGC	PDI-2/D
MO'Brien	RClark:mf	RJones		WButler
/89	11/28/89	11/29/89	12/1/89	12/13/89

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

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cc w/enclosures:
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

PHILADELPHIA ELECTRIC COMPANY

DOCKET NO. 50-352

LIMERICK GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 34
License No. NPF-39

1. The Nuclear Regulatory Commission (the Commission) has found that

   A. The application for amendment by Philadelphia Electric Company (the licensee) dated August 3, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-39 is hereby amended to read as follows:

   Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 34 , are hereby incorporated into this license. Philadelphia Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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: December 13, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 34

FACILITY OPERATING LICENSE NO. NPF-39

DOCKET NO. 50-352

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

Remove	Insert
vii	vii*
viii	viii
3/4 3-60a	3/4 3-60a
-	3/4 3-60b
3/4 3-87	3/4 3-87*
3/4 3-88	3/4 3-88
3/4 9-3	3/4 9-3*
3/4 9-4	3/4 9-4

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

TABLE 3.3.6-2 (Continued)

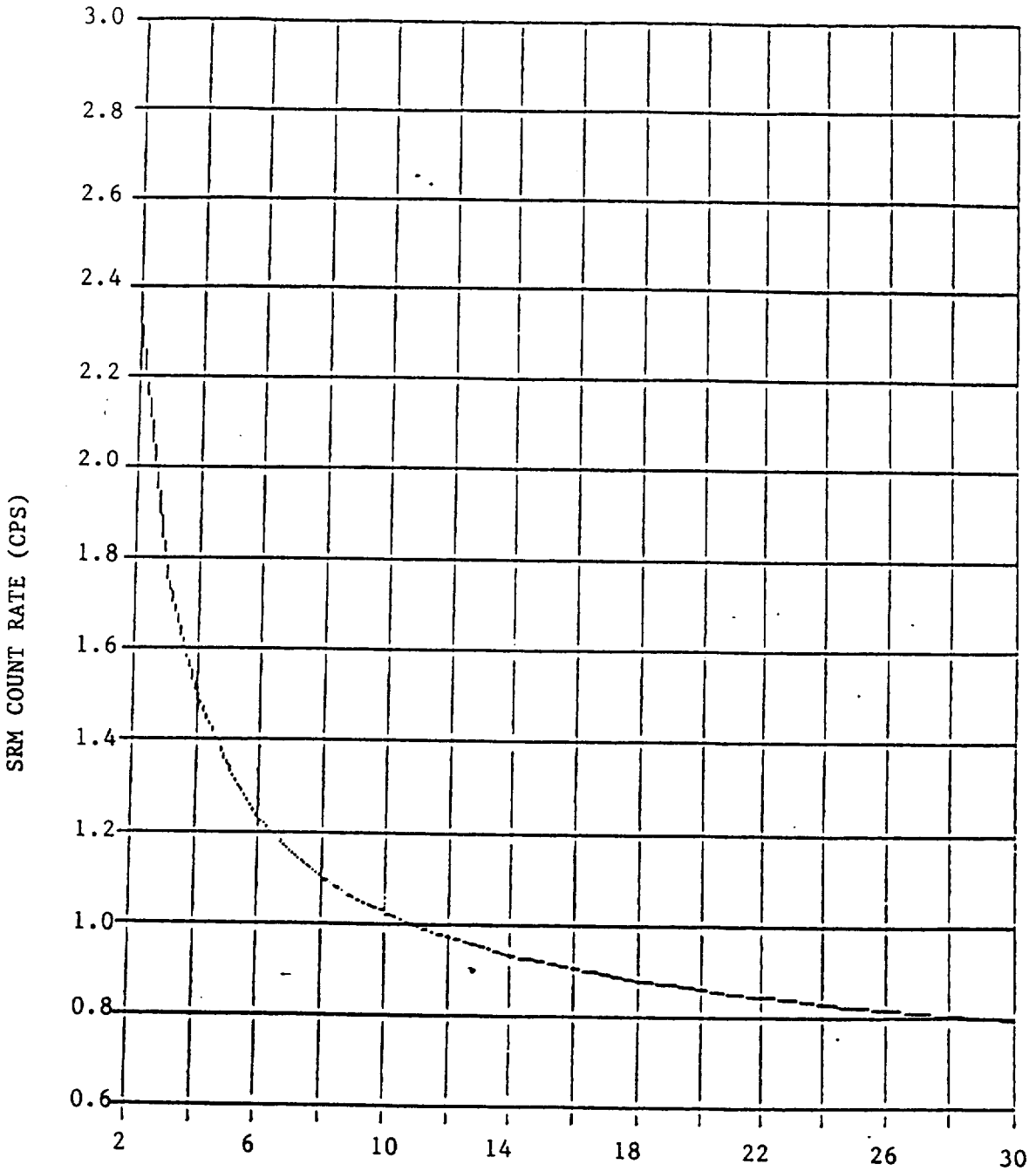
CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS

TRIP FUNCTION	TRIP SETPOINT	ALLOWABLE VALUE
6. REACTOR COOLANT SYSTEM RECIRCULATION FLOW		
a. Upscale	$\leq$ 111% of rated flow	$\leq$ 114% of rated flow
b. Inoperative	N.A.	N.A.
c. Comparator	$\leq$ 10% flow deviation	$\leq$ 11% flow deviation
7. REACTOR MODE SWITCH SHUTDOWN POSITION	N.A.	N.A.

*The rod block function varies as a function of recirculation loop drive flow (W). The trip setting of the Average Power Range Monitor rod block function must be maintained in accordance with Specification 3.2.2.

**May be reduced provided the Source Range Monitor has an observed count rate and signal-to-noise ratio on or above the curve shown in Figure 3.3.6-1.

***Equivalent to 13 gallons/scram discharge volume.



SRM COUNT RATE VERSUS SIGNAL TO NOISE RATIO

FIGURE 3.3.6-1

TABLE 4.3.7.5-1

ACCIDENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION
1. Reactor Vessel Pressure	M	R
2. Reactor Vessel Water Level	M	R
3. Suppression Chamber Water Level	M	R
4. Suppression Chamber Water Temperature	M	R
5. Suppression Chamber Air Temperature	M	R
6. Primary Containment Pressure	M	R
7. Drywell Air Temperature	M	R
8. Drywell Oxygen Concentration Analyzer	M	Q#
9. Drywell Hydrogen Concentration Analyzer	M	Q*
10. Safety/Relief Valve Position Indicators	M	R
11. Primary Containment Post LOCA Radiation Monitors	M	R**
12. North Stack Wide Range Accident Monitor***	M	R
13. Neutron Flux	M	R

*Using calibration gas containing:
a. Zero volume percent hydrogen, balance nitrogen.
b. Five volume percent hydrogen, balance nitrogen.

**CHANNEL CALIBRATION shall consist of an electronic calibration of the channel, not including the detector, for range decades above 10 R/h and a one point calibration check of the detector below 10 R/h with an installed or portable gamma source.

***High range noble gas monitors.

#Using calibration gas containing:
a. Zero volume percent oxygen, balance nitrogen.
b. Five volume percent oxygen, balance nitrogen.

INSTRUMENTATION

SOURCE RANGE MONITORS

LIMITING CONDITION FOR OPERATION

3.3.7.6 At least the following source range monitor channels shall be OPERABLE:

a. In OPERATIONAL CONDITION 2*, three.

b. In OPERATIONAL CONDITION 3 and 4, two.

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

ACTION:

a. In OPERATIONAL CONDITION 2* with one of the above required source range monitor channels inoperable, restore at least three source range monitor channels to OPERABLE status within 4 hours or be in at least HOT SHUTDOWN within the next 12 hours.

b. In OPERATIONAL CONDITION 3 or 4 with one or more of the above required source range monitor channels inoperable, verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the Shutdown position within 1 hour.

SURVEILLANCE REQUIREMENTS

4.3.7.6 Each of the above required source range monitor channels shall be demonstrated OPERABLE by:

a. Performance of a:

1. CHANNEL CHECK at least once per:

a) 12 hours in CONDITION 2*, and

b) 24 hours in CONDITION 3 or 4.

2. CHANNEL CALIBRATION** at least once per 18 months.

b. Performance of a CHANNEL FUNCTIONAL TEST:

1. Within 24 hours prior to moving the reactor mode switch from the Shutdown position, if not performed within the previous 7 days, and

2. At least once per 31 days.

c. Verifying, prior to withdrawal of control rods, that the SRM count rate is at least 3.0 cps*** with the detector fully inserted.

*With IRM's on range 2 or below.
**Neutron detectors may be excluded from CHANNEL CALIBRATION.
***May be reduced, provided the source range monitor has an observed count rate and signal-to-noise ratio on or above the curve shown in Figure 3.3.6-1.

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 At least two source range monitor (SRM) channels* shall be OPERABLE and inserted to the normal operating level with:

a. Continuous visual indication in the control room,

b. At least one with audible alarm in the control room,

c. One of the required SRM detectors located in the quadrant where CORE ALTERATIONS are being performed and the other required SRM detector located in an adjacent quadrant, and

d. Unless adequate shutdown margin has been demonstrated, the shorting links shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn.**

APPLICABILITY: OPERATIONAL CONDITION 5.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS and insert all insertable control rods.

SURVEILLANCE REQUIREMENTS

4.9.2 Each of the above required SRM channels shall be demonstrated OPERABLE by:

a. At least once per 12 hours:

1. Performance of a CHANNEL CHECK,
2. Verifying the detectors are inserted to the normal operating level, and
3. During CORE ALTERATIONS, verifying that the detector of an OPERABLE SRM channel is located in the core quadrant where CORE ALTERATIONS are being performed and another is located in an adjacent quadrant.

---

*These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core. The use of special movable detectors during CORE ALTERATIONS in place of the normal SRM nuclear detectors is permissible as long as these special detectors are connected to the normal SRM circuits.

**Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

SURVEILLANCE REQUIREMENTS (Continued)

b. Performance of a CHANNEL FUNCTIONAL TEST:

1. Within 24 hours prior to the start of CORE ALTERATIONS, and

2. At least once per 7 days.

c. Verifying that the channel count rate is at least 3.0 cps:*

1. Prior to control rod withdrawal,

2. Prior to and at least once per 12 hours during CORE ALTERATIONS, and

3. At least once per 24 hours.

d. Verifying, within 8 hours prior to and at least once per 12 hours during, that the RPS circuitry "shorting links" have been removed during:

1. The time any control rod is withdrawn,** or

2. Shutdown margin demonstrations.

*May be reduced, provided the source range monitor has an observed count rate and signal-to-noise ratio on or above the curve shown in Figure 3.3.6-1. These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core.

**Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 34 TO FACILITY OPERATING LICENSE NO. NPF-39

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNIT 1

DOCKET NO. 50-352

1.0 INTRODUCTION

By letter dated August 3, 1989, Philadelphia Electric Company (the licensee) requested an amendment to Facility Operating License No. NPF-39 for the Limerick Generating Station, Unit 1. The proposed amendment would revise the Technical Specifications (TSs) to ensure the design level of counting certainty is maintained at all times for the Source Range Monitors (SRMs). To support the requested amendment, the licensee also submitted a document entitled "SRM Count Rate vs Signal/Noise Ratio for Philadelphia Electric Company, Limerick, Unit 1," EDE-47-1188, prepared by the General Electric Company (GE). Similar amendments were approved for Philadelphia Electric's other BWR facility, Peach Bottom Units 2 and 3, by Amendment Nos. 140 and 142 to Facility Operating License Nos. DPR-44 and DRP-56 issued March 15, 1989.

2.0 DISCUSSION

The Limerick Generating Station (LGS) TS presently allow reduction of the minimum SRM count rate required for control rod withdrawal or core alterations from the normal 3 counts per second (cps) to 0.7 cps as long as the signal-to-noise ratio is greater than or equal to two. General Electric Company advised Philadelphia Electric Company and other BWR licensees that this provision is non-conservative with respect to the design bases of the SRM system, in that utilization of this provision could result in a reduction in counting certainty. In order to ensure that the design level of counting certainty is maintained, a change to the TS is proposed to incorporate a graph of SRM minimum count rate versus signal-to-noise ratio such that reduction of the count rate as permitted by the TS (3 cps to 0.8 cps) is accompanied by a corresponding increase in the signal-to-noise ratio (2 to 30). (The proposed amendment would also increase the minimum count rate from 0.7 to 0.8 cps.)

The SRM system consists of four identical neutron detection channels. Each channel contains a miniature in-core fission chamber, a pulse preamplifier, an electronics drawer, and remote reading indicators. Each detector is equipped with a motor driven mechanism to allow retraction from the core at neutron flux levels above the SRM range.

The SRM system monitors thermal neutron flux over a range sufficient to observe core shutdown source level, approach to criticality, and overlap into the Intermediate Range Monitoring (IRM) system. The indicating range of the SRM may be extended by retracting the detectors from the core. The SRM system provides four channels of neutron flux level information displayed over a range of 10^{-1} to 10^{6} cps (approximately corresponding to 10^{-9} to 10^{-2} of rated thermal power, and four channels of flux level rate of change information displayed as reactor period over a range of -100 to +10 seconds.

The SRM fission chambers are operated in the pulse counting mode and produce discrete output pulses with represent the composite effect of thermal neutron flux and gamma flux at the detector. Due to the nature of the detector, the pulses produced by thermal neutrons are of much greater magnitude than those produced by gamma, although the number of gamma pulses may far exceed the number of neutron pulses. An electronic circuit performs a discrimination action based on the amplitude of these pulses, thus providing an output signal proportional only to the neutron count rate.

The following changes to the TS are proposed by the licensee:

1) Insert Figure 3.3.6-1 on new page 3/4 3-60b, "SRM Count Rate versus Signal-to-Noise Ratio."

2) Revise Table 3.3.6-2 on Page 3/4 3-60a, TS section 4.3.7.6 on Page 3/4 3-88, and TS Section 4.9.2 on Page 3/4 9-4, to permit reduction of the minimum required SRM count rate below 3 cps "provided the Source Range Monitor has an observed count rate and signal-to-noise ratio on or above the curve shown on Figure 3.3.6-1."

3) Revise the index on Page viii to include Figure 3.3.6-1.

3.0 EVALUATION

The necessity for maintaining a minimum count rate on the SRMs when operating at pre-critical and low power conditions is based on the most conservative evaluation which includes fresh fuel loaded in the initial fuel cycle with no neutron sources present. A multiplying medium with no neutrons present forms the basis for the accident scenario in which reactivity is gradually but inadvertently added until the medium is in a supercritical configuration. The introduction of some neutrons at this point would cause the core to undergo a sudden power burst, rather than a gradual startup, with no warning from the nuclear instrumentation. While this scenario is of concern when a reactor is loaded with fresh fuel, it is of less concern when loaded with irradiated fuel.

Irradiated fuel continuously produces neutrons by spontaneous fission of certain plutonium isotopes, by photo fission, and by photo disintegration of deuterium naturally present in the moderator. The neutron production in irradiated fuel is normally great enough to meet the normal minimum

SRM count rate of 3 cps for the duration of a refueling outage, including the subsequent reactor startup. However, there is a possibility that a minimum count rate requirement of 3 cps could not be satisfied following an extended reactor shutdown. Providing a requirement of a least 3 cps as measured by the SRM assures that any transient, should it occur, begins at or above the initial value of 10^{-8} of rated power with the reactor critical as used in analyses of transient cold conditions. A review of Chapter 15, "Accident Analysis," (Section 15.4.), "Reactivity and Power Distribution Anomolies," of the LGS Final Safety Analysis Report (FSAR), has confirmed the use of 10^{-8} of rated power with the reactor critical in analyses of transient cold conditions. Furthermore, the inadvertent criticality concerns evaluated in Chapter 15 (Section 15.4.1) take no credit for the SRMs, since the SRMs are used for indication only.

Since 0.8 cps, the lowest count rate shown on Figure 3.3.6-1, corresponds to approximately $8X10^{-9}$ of rated power, we have concluded that reducing the downscale setpoint in accordance with Figure 3.3.6-1 will not invalidate the assumptions used in the transient analyses. Stipulating a signal-to-noise ratio in accordance with Figure 3.3.6-1 assures that the SRMs are indeed responding to neutrons and the neutron flux level with the reactor critical will be well above 10^{-8} of rated power due to subcritical multiplication.

The curve presented in Figure 3.3.6-1 was derived by General Electric Company specifically for LGS Unit 1. The technical basis for this curve is presented in General Electric Company Report EDE-47-1188, "SRM Count Rate vs S/N Ratio for Philadelphia Electric Company, Limerick Unit 1," dated December 2, 1988. The curve ensures the same level of confidence at lower cps setpoints as is provided at the nominal 3 cps setpoint. The 3 cps setpoint is based on an assumed signal-to-noise ratio of two, which yields a statistical neutron monitoring confidence of 95% that the indicated signal is correct. At lower cps setpoints, a higher signal-to-noise ratio is required to maintain the same level of counting certainty. The inverse relation between cps and signal-to-noise ratio depicted in Figure 3.3.6-1 ensures the 95% confidence level.

The proposed changes to the TSs ensure that design level of counting certainty is maintained at all times for the SRMs and are acceptable.

4.0 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.

5.0 CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (54 FR 40932) on October 4, 1989 and consulted with the Commonwealth of Pennsylvania. No public comments were received and the Commonwealth 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 the security nor to the health and safety of the public.

Principal Contributors: Richard Clark and Howard Richings

Dated: December 13, 1989