

September 28, 1989

Docket No.: 50-352

Mr. George A. Hunger, Jr.
Director-Licensing
Philadelphia Electric Company
Correspondence Control Desk
P. O. Box 7520
Philadelphia, Pennsylvania 19101

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Dear Mr. Hunger:

SUBJECT: DIESEL GENERATOR TESTING (TAC NO. 69578)

RE: LIMERICK GENERATING STATION, UNIT 1

The Commission has issued the enclosed Amendment No. 32 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 September 9, 1988 as supplemented by letter dated August 11, 1989.

This amendment revises the testing requirements in Sections 3.8.1.1 and 3.8.1.2 along with the associated BASES related to the onsite emergency diesel generators. The application was in response to Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability" dated July 2, 1984.

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. 32 to License No. NPF-39
2. Safety Evaluation

cc w/enclosures:

See next page

Previously concurred*

[LI AMEND1]

MO'Brien
PDI-2/LA
MO'Brien
9/28/89

RClark
PDI-2/PW*
RClark:mr
05/22/89
09/07/89

WButler
PDI-2/D*
WButler
9/28/89

OChopra
SELB*
OChopra
06/30/89

FRosa
SELB/C*
FRosa
06/30/89

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

September 28, 1989

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

Sincerely,

A handwritten signature in cursive script that reads "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. 32 to License No. NPF-39
2. Safety Evaluation

cc w/enclosures:
See next page

Mr. George A. Hunger, Jr.
Philadelphia Electric Company

Limerick Generating Station
Units 1 & 2

cc:

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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. 32
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 September 9, 1988, as supplemented by letter dated August 11, 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. 32, 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, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 28, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 32

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.*

<u>Remove</u>	<u>Insert</u>
3/4 8-1	3/4 8-1
3/4 8-2	3/4 8-1a
-	3/4 8-2
-	-
3/4 8-3	3/4 8-3
3/4 8-4	3/4 8-4
3/4 8-5	3/4 8-5
3/4 8-6	3/4 8-6
3/4 8-7	3/4 8-7
3/4 8-8	3/4 8-7a
-	3/4 8-8
-	-
3/4 8-9	3/4 8-9
3/4 8-10	3/4 8-10*
B 3/4 8-1	B 3/4 8-1
B 3/4 8-2	B 3/4 8-2*

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

A.C. SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

- a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and
- b. Four separate and independent diesel generators, each with:
 1. A separate day tank containing a minimum of 200 gallons of fuel,
 2. A separate fuel storage system containing a minimum of 33,500 gallons of fuel, and
 3. A separate fuel transfer pump.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 3.

ACTION:

- a. With one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1a. within 24 hours and at least once per 7 days thereafter. If the diesel generator became inoperable for any reason other than preplanned preventative maintenance, or testing, demonstrate the OPERABILITY of the remaining operable diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel generator at a time, within 24 hours* and at least once per 7 days thereafter. Restore the inoperable diesel generator to OPERABLE status within 92 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- b. With two diesel generators of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1a. within 1 hour and at least once per 8 hours thereafter. Perform requirements of Action e. Demonstrate the OPERABILITY of the remaining diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel generator at a time, within 8 hours. Restore at least one of the inoperable diesel generators to OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

*Contrary to the provisions of Specification 3.0.2, this test is required to be completed regardless of when the inoperable diesel generator is restored to OPERABILITY for failures that are potentially generic to the remaining Unit 1 diesel generators and for which appropriate alternative testing cannot be designed.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

A.C. SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

- c. With three diesel generators of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a. within 1 hour and at least once per 8 hours thereafter; and perform Surveillance Requirement 4.8.1.1.2.a.4 for the remaining diesel generator, within 1 hour. Restore at least one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- d. With one offsite circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. If the diesel generator became inoperable for any reason other than preplanned preventive maintenance, or testing, demonstrate the OPERABILITY of the remaining diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel generator at a time, within 8 hours*. Restore at least two offsite circuits to OPERABLE status within 72 hours from the time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

*Contrary to the provisions of Specification 3.0.2, this test is required to be completed regardless of when the inoperable diesel generator is restored to OPERABILITY for failures that are potentially generic to the remaining Unit 1 diesel generators and for which appropriate alternative testing cannot be designed.

ELECTRICAL POWER SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- e. With two diesel generators of the above required A.C. electrical power sources inoperable, in addition to ACTION b., above, verify within 2 hours that all required systems, subsystems, trains, components, and devices that depend on the remaining diesel generators as a source of emergency power are also OPERABLE; otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- f. With one offsite circuit of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and if any of the diesel generators have not been successfully tested within the preceding 24 hours, demonstrate OPERABILITY of these diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel at a time, within 24 hours. Restore at least two offsite circuits to OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- g. With two of the above required offsite circuits inoperable, demonstrate the OPERABILITY of all of the above required diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel generator at a time, within 8 hours unless the diesel generators are already operating; restore at least one of the inoperable offsite circuits to OPERABLE status within 24 hours or be in at least HOT SHUTDOWN within the next 12 hours. With only one offsite circuit restored to OPERABLE status, restore at least two offsite circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- h. With one offsite circuit and two diesel generators of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; demonstrate the OPERABILITY of the remaining diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 for one diesel generator at a time, within 8 hours. Restore at least one of the above required inoperable A.C. sources to OPERABLE status within 12 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Restore at least two offsite circuits and at least three of the above required diesel generators to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS

4.8.1.1.1 Each of the above required independent circuits between the offsite transmission network and the onsite Class 1E distribution system shall be:

- a. Determined OPERABLE at least once per 7 days by verifying correct breaker alignments and indicated power availability, and
- b. Demonstrated OPERABLE at least once per 18 months during shutdown by transferring, manually and automatically, unit power supply from the normal circuit to the alternate circuit.

4.8.1.1.2 Each of the above required diesel generators shall be demonstrated OPERABLE:

- a. In accordance with the frequency specified in Table 4.8.1.1.2-1 on a STAGGERED TEST BASIS by:
 1. Verifying the fuel level in the day fuel tank.
 2. Verifying the fuel level in the fuel storage tank.
 3. Verifying the fuel transfer pump starts and transfers fuel from the storage system to the day fuel tank.
 4. Verify that the diesel can start* and gradually accelerate to synchronous speed with generator voltage and frequency at 4285 ± 420 volts and 60 ± 1.2 HZ.
 5. Verify diesel is synchronized, gradually loaded* to an indicated 2700-2800 KW** and operates with this load for at least 60 minutes.
 6. Verifying the diesel generator is aligned to provide standby power to the associated emergency busses.
 7. Verifying the pressure in all diesel generator air start receivers to be greater than or equal to 225 psig.

*This test shall be conducted in accordance with the manufacturer's recommendations regarding engine pre-lube and warmup procedures, and as applicable regarding loading and shutdown recommendations.

**This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring by the manufacturer or momentary variations due to changing bus loads shall not invalidate the test.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- b. By removing accumulated water:
 - 1) From the day tank at least once per 31 days and after each occasion when the diesel is operated for greater than 1 hour, and
 - 2) From the storage tank at least once per 31 days.
- c. By sampling new fuel oil in accordance with ASTM D4057-81 prior to addition to the storage tanks and:
 - 1) By verifying in accordance with the tests specified in ASTM D975-81 prior to addition to the storage tanks that the sample has:
 - a) An API Gravity of within 0.3 degrees at 60°F or a specific gravity of within 0.0016 at 60/60°F, when compared to the supplier's certificate or an absolute specific gravity at 60/60°F of greater than or equal to 0.83 but less than or equal to 0.89 or an API gravity at 60°F of greater than or equal to 27 degrees but less than or equal to 39 degrees.
 - b) A kinematic viscosity at 40°C of greater than or equal to 1.9 centistokes, but less than or equal to 4.1 centistokes, if gravity was not determined by comparison with the supplier's certification.
 - c) A flash point equal to or greater than 125°F, and
 - d) A clear and bright appearance with proper color when tested in accordance with ASTM D4176-82.
 - 2) By verifying within 31 days of obtaining the sample that the other properties specified in Table 1 of ASTM D975-81 are met when tested in accordance with ASTM D975-81 except that the analysis for sulfur may be performed in accordance with ASTM D1552-79 or ASTM D2622-82.
- d. At least once every 31 days by obtaining a sample of fuel oil from the storage tanks in accordance with ASTM D2276-78, and verifying that total particulate contamination is less than 10 mg/liter when checked in accordance with ASTM D2276-78, Method A, except that the filters specified in ASTM D2276-78, Sections 5.1.6 and 5.1.7, may have a nominal pore size of up to three (3) microns.
- e. At least once each refueling cycle by:
 - 1. Subjecting the diesel to an inspection in accordance with procedures prepared in conjunction with its manufacturer's recommendations for this class of standby service.
 - 2. Verify the diesel generator capability to reject a load of greater than or equal to that of the RHR Pump Motor (992 Kw) for each diesel generator while maintaining voltage at 4285 ± 420 volts and frequency at 60 ± 1.2 hz.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

3. Verifying the diesel generator capability to reject a load of 2850 kW without tripping. The generator voltage shall not exceed 4784 volts during and following the load rejection.
4. Simulating a loss-of-offsite power by itself, and:
 - a) Verifying deenergization of the emergency busses and load shedding from the emergency busses.
 - b) Verifying the diesel generator starts* on the auto-start signal, energizes the emergency busses within 10 seconds, energizes the auto-connected loads through the individual load timers and operates for greater than or equal to 5 minutes while its generator is loaded with the shutdown loads. After energization, the steady-state voltage and frequency of the emergency busses shall be maintained at 4285 ± 420 volts and 60 ± 1.2 Hz during this test.
5. Verifying that on an ECCS actuation test signal, without loss-of-offsite power, the diesel generator starts* on the auto-start signal and operates on standby for greater than or equal to 5 minutes. The generator voltage and frequency shall reach 4285 ± 420 volts and 60 ± 1.2 Hz within 10 seconds after the auto-start signal; the steady state generator voltage and frequency shall be maintained within these limits during this test.
6. Simulating a loss-of-offsite power in conjunction with an ECCS actuation test signal, and:
 - a) Verifying deenergization of the emergency busses and load shedding from the emergency busses.
 - b) Verifying the diesel generator starts* on the auto-start signal, energizes the emergency busses within 10 seconds, energizes the auto-connected shutdown loads through the individual load timers and operates for greater than or equal to 5 minutes while its generator is loaded with the emergency loads. After energization, the steady-state voltage and frequency of the emergency busses shall be maintained at 4285 ± 420 volts and 60 ± 1.2 Hz during this test.
7. Verifying that all automatic diesel generator trips, except engine overspeed and generator differential over-current are automatically bypassed upon an ECCS actuation signal.

*This test shall be conducted in accordance with the manufacturer's recommendations regarding engine prelube and warm-up procedures, and as applicable regarding loading and shutdown recommendations.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

8. Verifying the diesel generator operates* for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to an indicated 2950-3050 kW** and during the remaining 22 hours of this test, the diesel generator shall be loaded to an indicated 2700-2800 kW**. Within 5 minutes after completing this 24-hour test, perform Surveillance Requirement 4.8.1.1.2e.4.b).***
9. Verifying that the auto-connected loads to each diesel generator do not exceed the 2000-hour rating of 3100 kW.
10. Verifying the diesel generator's capability to:
 - a) Synchronize with the offsite power source while the generator is loaded with its emergency loads upon a simulated restoration of offsite power,
 - b) Transfer its loads to the offsite power source, and
 - c) Be restored to its standby status.
11. Verifying that with the diesel generator operating in a test mode and connected to its bus, a simulated ECCS actuation signal overrides the test mode by (1) returning the diesel generator to standby operation, and (2) automatically energizes the emergency loads with offsite power.
12. Verifying that the automatic load sequence timers are OPERABLE with the interval between each load block within $\pm 10\%$ of its design interval.

*This test shall be conducted in accordance with the manufacturer's recommendations regarding engine prelube and warmup procedures, and as applicable regarding loading and shutdown recommendations.

**This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring by the manufacturer or momentary variations due to changing bus loads shall not invalidate the test.

***If Surveillance Requirement 4.8.1.1.2e.4.b) is not satisfactorily completed, it is not necessary to repeat the preceding 24-hour test. Instead, the diesel generator may be operated at 2700-2800 kW for 1 hour or until operating temperature has stabilized.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

13. Verifying that the following diesel generator lockout features prevent diesel generator starting only when required:
 - a) Control Room Switch In Pull-To-Lock (With Local/Remote Switch in Remote)
 - b) Local/Remote Switch in Local.
 - c) Emergency Stop
- f. At least once per 10 years or after any modifications which could affect diesel generator interdependence by starting* all four diesel generators simultaneously, during shutdown, and verifying that all four diesel generators accelerate to at least 882 rpm in less than or equal to 10 seconds.
- g. At least once per 10 years by:
 1. Draining each fuel oil storage tank, removing the accumulated sediment and cleaning the tank using a sodium hypochlorite or equivalent solution, and
 2. Performing a pressure test of those portions of the diesel fuel oil system designed to Section III, subsection ND of the ASME Code in accordance with ASME Code Section XI Article IWD-5000.

*This test shall be conducted in accordance with the manufacturer's recommendations regarding engine prelube and warmup procedures, and as applicable regarding loading and shutdown recommendations.

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

h. At least once per 184 days the diesel generator shall be started* and verified to accelerate to synchronous speed in less than or equal to 10 seconds. The generator voltage and frequency shall reach 4285 ± 420 volts and 60 ± 1.2 HZ within 10 seconds after the start signal. The diesel generator shall be started for this test by using one of the following signals:

- a) Manual***
- b) Simulated loss-of-offsite power by itself.
- c) Simulated loss-of-offsite power in conjunction with an ECCS actuation test signal.
- d) An ECCS actuation test signal by itself.

The generator shall be manually synchronized to its appropriate emergency bus, loaded to an indicated 2700-2800 KW** in less than or equal to 200 seconds, and operate for at least 60 minutes. This test, if it is performed so it coincides with the testing required by Surveillance Requirement 4.8.1.1.2.a.4 and 4.8.1.1.2.a.5, may also serve to concurrently meet those requirements as well.

4.8.1.1.3 Reports - All diesel generator failures, valid or non-valid, shall be reported to the Commission in a Special Report pursuant to Specification 6.9.2 within 30 days. Reports of diesel generator failures shall include the information recommended in Regulatory Position C.3.b of Regulatory Guide 1.108, Revision 1, August 1977.

*This test shall be conducted in accordance with the manufacturer's recommendations regarding engine prelube and warmup procedures, and as applicable regarding loading and shutdown recommendations.

**This band is meant as guidance to avoid routine overloading of the engine. Loads in excess of this band for special testing under direct monitoring by the manufacturer or momentary variations due to changing bus loads shall not invalidate the test.

***If diesel generator started manually from the control room, 10 seconds after the automatic prelube period.

TABLE 4.8.1.1.2-1

DIESEL GENERATOR TEST SCHEDULE

<u>NUMBER OF FAILURES IN LAST 20 VALID DEMANDS*</u>	<u>TEST FREQUENCY</u>
less than or equal to 1 or,	at least once per 31 days
<u>greater than or equal to 2**</u>	<u>at least once per 7 days</u>

*Criteria for determining the number of failures and number of valid demands shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, but determined on a per diesel generator basis.

**The associated test frequency shall be maintained until seven consecutive failure free demands have been performed and the number of failures in the last 20 demands have been reduced to one.

ELECTRICAL POWER SYSTEMS

A.C. SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.1.2 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

- a. One circuit between the offsite transmission network and the onsite Class 1E distribution system, and
- b. Two diesel generators each with:
 1. A day fuel tank containing a minimum of 200 gallons of fuel.
 2. A fuel storage system containing a minimum of 33,500 gallons of fuel.
 3. A fuel transfer pump.

APPLICABILITY: OPERATIONAL CONDITIONS 4, 5, and *.

ACTION:

- a. With less than the above required A.C. electrical power sources OPERABLE, suspend CORE ALTERATIONS, handling of irradiated fuel in the secondary containment, operations with a potential for draining the reactor vessel and crane operations over the spent fuel storage pool when fuel assemblies are stored therein. In addition, when in OPERATIONAL CONDITION 5 with the water level less than 22 feet above the reactor pressure vessel flange, immediately initiate corrective action to restore the required power sources to OPERABLE status as soon as practical.
- b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.8.1.2 At least the above required A.C. electrical power sources shall be demonstrated OPERABLE per Surveillance Requirements 4.8.1.1.1, 4.8.1.1.2, and 4.8.1.1.3.

*When handling irradiated fuel in the secondary containment.

ELECTRICAL POWER SYSTEMS

3/4.8.2 D.C. SOURCES

D.C. SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 As a minimum, the following D.C. electrical power sources shall be OPERABLE:

- a. Division 1, Consisting of:
 1. 125-Volt Battery 1A1 (1A1D101).
 2. 125-Volt Battery 1A2 (1A2D101).
 3. 125-Volt Battery Charger 1BCA1 (1A1D103).
 4. 125-Volt Battery Charger 1BCA2 (1A2D103).
- b. Division 2, Consisting of:
 1. 125-Volt Battery 1B1 (1B1D101).
 2. 125-Volt Battery 1B2 (1B2D101).
 3. 125-Volt Battery Charger 1BCB1 (1B1D103).
 4. 125-Volt Battery Charger 1BCB2 (1B2D103).
- c. Division 3, Consisting of:
 1. 125-Volt Battery 1C (1CD101).
 2. 125-Volt Battery Charger 1BCC (1CD103).
- d. Division 4, Consisting of:
 1. 125-Volt Battery 1D (1DD101).
 2. 125-Volt Battery Charger 1BCD (1DD103).

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 3.

ACTION:

With any battery and/or charger of the above required D.C. electrical power sources inoperable, restore the inoperable division battery to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.1 Each of the above required division batteries and chargers shall be demonstrated OPERABLE:

- a. At least once per 7 days by verifying that:
 1. The parameters in Table 4.8.2.1-1 meet the Category A limits, and
 2. Total battery terminal voltage for each 125-volt battery is greater than or equal to 131 volts on float charge.

3/4.8 ELECTRICAL POWER SYSTEMS

BASES

3/4.8.1, 3/4.8.2, and 3/4.8.3 A.C. SOURCES, D.C. SOURCES, and ONSITE POWER DISTRIBUTION SYSTEMS

The OPERABILITY of the A.C. and D.C. power sources and associated distribution systems during operation ensures that sufficient power will be available to supply the safety-related equipment required for (1) the safe shutdown of the facility and (2) the mitigation and control of accident conditions within the facility. The minimum specified independent and redundant A.C. and D.C. power sources and distribution systems satisfy the requirements of General Design Criterion 17 of Appendix A to 10 CFR Part 50.

The ACTION requirements specified for the levels of degradation of the power sources provide restriction upon continued facility operation commensurate with the level of degradation. The OPERABILITY of the power sources are consistent with the initial condition assumptions of the safety analyses and are based upon maintaining at least two of the onsite A.C. and the corresponding D.C. power sources and associated distribution systems OPERABLE during accident conditions coincident with an assumed loss-of-offsite power and single failure of the other onsite A.C. or D.C. source.

The A.C. and D.C. source allowable out-of-service times are based on Regulatory Guide 1.93, "Availability of Electrical Power Sources," December 1974. When two diesel generators are inoperable, there is an additional ACTION requirement to verify that all required systems, subsystems, trains, components, and devices, that depend on the remaining OPERABLE diesel generators as a source of emergency power, are also OPERABLE. This requirement is intended to provide assurance that a loss-of-offsite power event will not result in a complete loss of safety function of critical systems during the period one of the diesel generators is inoperable. The term verify as used in this context means to administratively check by examining logs or other information to determine if certain components are out-of-service for maintenance or other reasons. It does not mean to perform the surveillance requirements needed to demonstrate the OPERABILITY of the component.

The OPERABILITY of the minimum specified A.C. and D.C. power sources and associated distribution systems during shutdown and refueling ensures that (1) the facility can be maintained in the shutdown or refueling condition for extended time periods and (2) sufficient instrumentation and control capability is available for monitoring and maintaining the unit status.

The surveillance requirements for demonstrating the OPERABILITY of the diesel generators are in accordance with the recommendations of Regulatory Guide 1.9, "Selection of Diesel Generator Set Capacity for Standby Power Supplies," March 10, 1971, Regulatory Guide 1.137 "Fuel-Oil Systems for Standby Diesel Generators," Revision 1, October 1979 and Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants," Revision 1, August 1977 except for paragraphs C.2.A(3), C.2.C(1), C.2.C(2), C.2.D(2), C.2.D(3) and C.2.D(4). The exceptions to Regulatory Guide 1.108 allow for gradual loading of diesel generators during testing and decreased surveillance test frequencies (in response to Generic Letter 84-15).

ELECTRICAL POWER SYSTEMS

BASES

A.C. SOURCES, D.C. SOURCES, and ONSITE POWER DISTRIBUTION SYSTEMS (Continued)

The surveillance requirements for demonstrating the OPERABILITY of the unit batteries are in accordance with the recommendations of Regulatory Guide 1.129 "Maintenance Testing and Replacement of Large Lead Storage Batteries for Nuclear Power Plants," February 1978 and IEEE Std 450-1980, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations."

Verifying average electrolyte temperature above the minimum for which the battery was sized, total battery terminal voltage on float charge, connection resistance values and the performance of battery service and discharge tests ensures the effectiveness of the charging system, the ability to handle high discharge rates and compares the battery capacity at that time with the rated capacity.

Table 4.8.2.1-1 specifies the normal limits for each designated pilot cell and each connected cell for electrolyte level, float voltage and specific gravity. The limits for the designated pilot cells float voltage and specific gravity, greater than 2.13 volts and 0.015 below the manufacturer's full charge specific gravity or a battery charger current that had stabilized at a low value, is characteristic of a charged cell with adequate capacity. The normal limits for each connected cell for float voltage and specific gravity, greater than 2.13 volts and not more than 0.020 below the manufacturer's full charge specific gravity with an average specific gravity of all the connected cells not more than 0.010 below the manufacturer's full charge specific gravity, ensures the OPERABILITY and capability of the battery.

Operation with a battery cell's parameter outside the normal limit but within the allowable value specified in Table 4.8.2.1-1 is permitted for up to 7 days. During this 7-day period: (1) the allowable value for electrolyte level ensures no physical damage to the plates with an adequate electron transfer capability; (2) the allowable value for the average specific gravity of all the cells, not more than 0.020 below the manufacturer's recommended full charge specific gravity ensures that the decrease in rating will be less than the safety margin provided in sizing; (3) the allowable value for an individual cell's specific gravity, ensures that an individual cell's specific gravity will not be more than 0.040 below the manufacturer's full charge specific gravity and that the overall capability of the battery will be maintained within an acceptable limit; and (4) the allowable value for an individual cell's float voltage, greater than 2.07 volts, ensures the battery's capability to perform its design function.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 32 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 September 9, 1988, as supplemented by letter dated August 11, 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 testing requirements in Sections 3.8.1.1 and 3.8.1.2 along with the associated BASES related to the onsite emergency diesel generators (EDG) in response to Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability" which was issued July 2, 1984.

2.0 DISCUSSION

On a generic basis, the NRC has been and continues to be interested in achieving and maintaining a high reliability level for EDGs. In 1975, an NRC technical report evaluated EDG failure experiences reported during the period of 1959-1973. During this period, EDG testing was conducted on a monthly basis and during refueling. This report concluded that one specific problem dominated the failure experiences and identified it as the starting of the engine. This experience spawned the general perception that if the EDG could start, it would likely continue on to accept load and operate in a reliable manner.

In 1977, Revision 1 to Regulatory Guide 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electrical Power Systems at Nuclear Power Plants" was issued. This revision of Regulatory Guide 1.108 was an effort to improve the routine testing schedule by relating the testing frequency to the number of failures being experienced. With the emphasis on EDG starts, Regulatory Guide 1.108 indicates that the EDGs be "cold fast start" tested at various intervals depending upon the total number of EDG failures. These "cold fast starts" demonstrate the starting capabilities from ambient conditions with full electrical loads. An objective of this testing schedule was to encourage utilities with high failure rate EDGs to take major repair actions to avoid the costs of very frequent EDG tests.

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Subsequent reviews of EDG failure experience from 1976 to 1978 indicated that engine starting was no longer the dominant failure mechanism. Apparently industry efforts in this area were becoming effective. However, in July 1982, the first EDG failure occurred that was clearly identified as being caused by testing. One of the Nordberg 3500 KW EDGs at the Brunswick Nuclear Station had failed. The licensee reported that the metallurgical examination determined the failure cause to be fatigue due to excessive starts. Inspection of the other EDGs revealed that two of the three also had indications of similar fatigue. This reactor operating experience confirmed concerns expressed earlier that excessive tests would be detrimental.

In September 1982, a staff summary of EDG experience presented to the ACRS suggested that: (a) routine test starts on a 3-day frequency should be eliminated; (b) testing should be focused on identifying unreliable EDGs, and then major repair action should be pursued, rather than just more testing; (c) when an EDG failure has occurred, an initial test of redundant EDG(s) should be conducted with a followup test about every 3 days to provide increased assurance that a new failure has not occurred.

In 1983 as part of an investigation into Station Blackout, the NRC published NUREG/CR-2989, "Reliability of Emergency Onsite AC Power Systems at Nuclear Power Plants." This study, based upon data from 1976 to 1980, concluded that the industry average EDG failure rate was 2.5×10^{-2} per demand (an average reliability of 0.975). Major contributors to this failure rate were failures in EDG subsystems (e.g., failures of instrumentation and control components, failures of fuel system components such as injectors, failures in the air start motors, valves and controls, failures in switchgear components, failures in the lube oil system, etc.), or human error related and hardware related common mode failures, and cooling water unavailabilities. No one cause of EDG failures was dominant. The report recommended several actions that could be taken to improve EDG reliabilities. These varied from having the governor overhauled on a periodic basis, review of repeat failures to determine root causes, use of corrosion inhibitors in jacket water coolants and upgrading EDG-related procedures, to the installation of an additional EDG.

In July 1984, the NRC issued Generic Letter 84-15 which described changes in staff requirements to improve EDG reliability. The Generic letter requested that Licensees take actions to reduce "cold fast starts," including encouraging them to propose TS changes. On April 25, 1985, the NRC issued Amendment 48 to Facility Operating License No. NPF-7 for the North Anna Power Station, Unit No. 2 (NA-2), reducing the required testing of the EDGs. The changes to the NA-2 TSs reduced the parameters for each test, reduced the number of tests and applied to both routine surveillance and special tests. These changes to the EDG TSs considered both the EDG manufacturer recommendations and current regulatory guidance. The changes which were approved for NA-2 subsequently became the standard used by the industry for surveillance test method and schedule revisions necessary to improve the reliability and availability of the EDGs.

3.0 EVALUATION

The Licensee has provided specific changes that will improve the reliability and availability of the EDGs based upon recommendation from the EDG manufacturer and the appropriate recommendations provided in Generic Letter 84-15.

- (A) The licensee proposes to specify prelubrication and prewarming of EDGs prior to preplanned EDG starts as required by the TSS. The staff concluded in Generic Letter 84-15 that overall improvement in diesel engine reliability and availability can be gained by performing diesel generator starts using engine prelude to reduce engine stress and wear. The staff also concludes that allowing prelubrication and prewarming increases the margin of safety by increasing the reliability/availability of the EDGs, thereby decreasing the risk of station blackout. This change is acceptable.
- (B) The licensee proposes to provide for gradual acceleration and gradual electrical load increases to an indicated load range during EDG testing in accordance with manufacturer's recommendations in order to decrease the stresses inherent with rapid acceleration and sudden large electrical load changes. Gradual acceleration and gradual electrical loading of the generator decreases the stresses on both the generator and engine and therefore would be operationally advantageous, avoid premature wear, and lead to greater EDG availability. This change to TS is acceptable.

The licensee has proposed to delete the requirement in Sections 4.8.1.1.2.a.4 that every routine test start be a fast (10 second) start (i.e., acceleration to full engine speed, and generator voltage and frequency). The licensee is developing procedures, in consultation with the manufacturer, that would have the engine start and accelerate to an initial setting (idle speed) followed by a manual increase of the speed setting to synchronous speed over a period of 1 to 2 minutes. The proposed changes to allow gradual electrical loading of the EDG upon synchronization incorporates manufacturer's recommendations into the surveillance test requirements and are acceptable.

The licensee has proposed a Footnote * on pages 3/4 8-3, 3/4 8-5, 3/4 8-6, 3/4 8-7 and 3/4 8-7a to provide direction to perform surveillance tests in accordance with manufacturer recommendations regarding loading and shutdown in addition to previously discussed prelubrication and prewarming. The proposed change assures the EDGs are operated in accordance with manufacturer's recommendations during all planned testing in order to extend diesel life and improve reliability and is acceptable.

The present TSs require that whenever one or more of the diesel generators or offsite power sources becomes inoperable, the remaining diesel generators be started within certain time limits to demonstrate operability of the units. The licensee retained this requirement but also proposed that every planned EDG start be followed by a 60 minute loaded run to at least its 60% continuous rating. The staff advised the licensee that when a diesel generator is paralleled with an offsite power source in order to load it, this makes it vulnerable to perturbations in the offsite power system and creates a potential for losing both the diesel generator and offsite power source due to a common cause at a time when the number of offsite and onsite power sources to the emergency buses has already been reduced by the initial inoperabilities. In the supplemented letter of August 11, 1989, the licensee submitted revised TSs to conform to the staff's suggestion. The revised TSs deleted the proposed to perform a 60 minute loaded run when the diesels are started to demonstrate operability. The revised TSs are acceptable.

The licensee has proposed changes to allow the EDGs to be loaded to a band of 2700-2800 kW rather than > 2850 kW to prevent routine overloading during the performance of the monthly and 184 days surveillance testing. The load value of 3135 kW for the 2-hour portion of the 24-hour test of Section 4.8.1.1.2.e.8 would also be changed to a band of 2950-3050 kW to prevent overloading the EDGs to greater than its 2 hour rating. The staff believes that the open-ended language "greater than or equal to" has the potential for routine overloading of the diesel generators. In view of this consideration, the staff finds these proposed changes to be acceptable.

- (C) The licensee proposed changes to ACTION requirements a. and d. in Section 3.8.1.1 to test the remaining EDGs within 24 hours if an EDG becomes inoperable due to any other cause than preplanned, preventative maintenance, modification or testing. The purpose of testing the remaining EDGs is to assure that any unknown (or undiscovered) generic problem does not exist. Since the inclusion of the word "modification" is not in the current Limerick 1 TSs or in the BWR Standard TSs (STS), the staff proposed to the licensee that the word "modification" be deleted. The licensee accepted the staff's proposed change; the deletion was reflected in the revised submittal of August 11, 1989. On this basis, the staff finds the licensee's proposed changes, as modified, to be consistent with the current STS and are acceptable.

The licensee proposed to add a Footnote * on pages 3/4 8-1 and 3/4 8-1a to ACTION requirements a. and d. to require the completion of testing regardless of when the inoperable EDG is restored to operability for failures that are potentially generic. This is consistent with the STS and is acceptable.

In Section 3.8.1.1, the licensee has proposed to include in ACTION b, c, d, f, g, and h the time limits in Generic Letter 84-15 for performing surveillances when one or more EDGs or offsite power sources are not available. However, the licensee has added the word "commencing" to the surveillance requirements. Since this would not be consistent with GL 84-15, the staff proposed that the word "commencing" be deleted where it appeared in this Section. The licensee agreed with the change and incorporated the suggestion in the revised TSs submitted with the August 11, 1989 letter. The revised TSs are acceptable.

The licensee has also proposed to increase the one hour action time for the initial test of the remaining EDGs in ACTION requirements b., d.g. and h. of Section 3.8.1.1 to 8 hours and ACTION f to 24 hours, respectively. The requirement to test the EDGs every 8 hours thereafter in Section 3.8.1.1 ACTION b., c., d., f., g. and h. has been deleted. The proposed changes are consistent with Generic Letter 84-15 and are acceptable.

- (D) In Section 4.8.1.1.2.e., the licensee proposed to allow EDG maintenance inspections and testing to be performed at least once per 18 months while at power. The staff feels that some EDG surveillance requirements should not be performed while at power and recommended that the wording in this Section be changed to "At least once per each refueling cycle" rather than "once per 18 months." The licensee agreed with the change and incorporated the revised wording in the August 11, 1989 submittal. This is a change in wording and does not change the intent of the requirement. Therefore, the TS change, as modified is acceptable.
- (E) The licensee proposed a new Section 4.8.1.1.2.h. which requires at least once per 184 days a fast (10 second) start of each EDG to full speed and loading to full load in 200 seconds. This change is consistent with Generic Letter 84-15 and is acceptable.
- (F) In Section 3.8.1.1 ACTION items b and h, the licensee had proposed to "perform" certain surveillance requirements. To clarify why these surveillance requirements were being performed, the staff proposed that the wording be changed to "Demonstrate the OPERABILITY of the remaining diesel generators by performing" the specified surveillance requirements. The licensee accepted the clarification and incorporated the revised wording in the August 11, 1989 submittal. This was solely a clarifying phase that did not change the requirement.
- (G) Table 4.8.1.1.2-1 addresses diesel generator surveillance testing frequency. The present requirement bases the DG test frequency on the number of failures in the last 100 valid tests on a per nuclear unit basis. The licensee has proposed to base the testing frequency on the number of failures in the last 20 tests. In addition, the proposed test frequency is based on a per diesel generator rather than per nuclear basis. This proposed change is consistent with Generic Letter 84-15 and is acceptable.

In the no significant hazards consideration which was published in the Federal Register (54 FR 5171) on February 1, 1989, the staff stated upfront that the proposed changes to the TSs were to conform to the recommendations in the Commission's Generic Letter 84-15. The "model" TSs included with the generic letter were general guidance rather than proscriptive because of the wide variation in redundancies between plants. At Limerick, there are eight (8) diesel generators, four for each unit. At some two unit plants, there is only one diesel generator per unit, with one "swing" DG. At Limerick, each unit is provided with separate and independent onsite Class 1E ac power systems. The Class 1E power system for each unit consists of four independent Class 1E buses, powered by four independent diesel generators, which provide power to four divisions of Class 1E loads. For Limerick, Units 1 and 2, the TS requirements for testing the DGs would be expected to be different than for a two unit plant without the redundancy and independence that exists at Limerick. These TS requirements are developed on a case by case basis between the licensee and NRC staff. As discussed above, there were some differences of opinion on the general guidance in Generic Letter 84-15. As noted in the licensee's letter of August 11, 1989, the revised TSs incorporated staff suggestions. Also, administrative clarifications and typographical corrections were made to the licensee's incoming technical specifications pages. The revisions do not change the intent of the original amendment request and are consistent with the staff's no significant hazards consideration notice.

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 5171) on February 1, 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 the security nor to the health and safety of the public.

Principal Contributor: Dick Clark, Om Chopra.

Dated: September 28, 1989