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ACCESSION NBR: 8712290389 DOC. DATE: 87/12/23 NOTARIZED: NO DOCKET #
FACIL: 50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316
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SUBJECT: Forwards addl info on emergency diesel generator surveillance interval extensions for Cycle 6, per NRC 871218 teclon request.

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AMERICAN ELECTRIC POWER

AEP:NRC:0916AG

Donald C. Cook Nuclear Plant Unit 2
Docket No. 50-316
License No. DPR-74
ADDITIONAL INFORMATION ON SURVEILLANCE INTERVAL EXTENSIONS FOR UNIT 2 CYCLE 6

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: T. E. Murley

December 23, 1987

Dear Dr. Murley:

This letter responds to requests for additional information made by your staff during a telephone conversation on December 18, 1987. Specifically, we were asked to provide supplemental information regarding the diesel generator surveillance interval extensions that we requested in our letter AEP:NRC:0916AE, dated October 28, 1987. The information requested is contained in the attachment to this letter.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,

M. P. Alexich
Vice President
cm
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cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
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Attachment to AEP:NRC:0916AG

Supplemental Information Regarding Diesel Generator
Surveillance Interval Extensions

Answers to NRC Questions of 12/18/87
Regarding Cook Nuclear Plant Emergency Diesel Generator
Surveillance Extensions

Problem Areas from Past Inspections

Completed packages of Maintenance Procedure MHP 4030STP.046 (Emergency Diesel Generator System 18-month Inspection) were reviewed for identified equipment deficiencies by the Plant Maintenance Department on 12/18 and 12/21/87. Packages from the previous 5 inspections for the Unit 1 diesels, and from the previous 4 inspections for the Unit 2 diesels, were reviewed.

The vast majority of these deficiencies were in the category of minor gasket leaks. These leaks are judged to have had no effect on the operability or reliability of the affected diesel generator. The other categories were:

1. Broken intake or exhaust valve springs (5 occurrences)

2. Failed valve lifters (6 occurrences)

3. Re-torquing of a cylinder head bolt and a foundation bolt (1 occurrence each)

4. Crankshaft deflection out of specification (4 occurrences all in 1984 or earlier)

5. Missing nut or lockwire (1 occurrence each)

6. Injector failure or popping pressure out of specification (3 occurrences)

7. Main bearing found worn upon inspection (1 occurrence)

These items would all fit in the category of routine maintenance.

Emergency Diesel Generator Manufacturer's Recommendation on Surveillance Interval Extension

The Cook EDGs were manufactured by Worthington Compressor Co. of Buffalo, NY. The company was merged with Dresser-Rand of Painted Post, NY in 1987.

Dresser-Rand technical personnel were contacted by AEPSC on 12/21/87. They stated that extending the interval of the

surveillance inspections until June 1, 1988 should cause no problems. They also stated that no additional inspections were recommended for the interim period from January 1 to June 1, 1988.

As a point of reference, the manufacturer's standard recommendation calls for an inspection of similar scope every 4000 hours of operation. This recommendation applies to diesels in continuous operation and is therefore not directly applicable to the Cook EDGs. For comparison, the Cook Unit 2 EDGs have each incurred approximately 1500 total hours of operation.

Emergency Diesel Generator Reliability

Reliability for the last 100 starts is 100% for 2AB diesel and 99% for 2CD diesel.

Effect on Blackout Tests

Extension of the surveillance inspection interval should not affect the ability of the EDGs to successfully perform the blackout tests specified in the Technical Specifications.

The main problem area of past blackout tests has been in the area of load rejections. During a full load (3500 kw) rejection, approximately 80% of the Technical Specification overspeed margin (7.5%) had been used. The amount of overspeed margin used in subsequent tests has been reduced to approximately 55% by tuning and adjustment of the governor, and of fuel rack linkages. We believe this problem to be corrected, however, it is not considered relevant to the extension of the surveillance interval since these components are not subjected to substantial wear or degradation.

Results of Last Inspection

The most recent 2AB EDG inspection was completed on 5/3/86. No major problems were found. One main bearing that was inspected was found to be worn on the lower half. The bearing was replaced.

The most recent 2CD EDG inspection was completed on 6/3/86. No major problems were found during the inspection. Following the inspection, during a post-maintenance test run, a main bearing failure occurred. This failure caused damage to the crankshaft and base. The engine was rebuilt with new parts and tested successfully.

Design and Operational Changes to Enhance Main Bearing Reliability

Two main bearing failures have occurred on the Cook EDGs since initial criticality of Unit 1 in 1975. The failures have never been attributed to a specific cause or causes. Several improvements in the areas of design and operation have been or will be implemented:

1. Improved method of checking crankshaft web deflection. (Completed)

2. Reducing oil sump temperature from 165F to 145F. (Completed on Unit 1)

3. Installation of a main bearing metal temperature indication/high temperature trip system. (Completed on Unit 1)

4. Elimination of Tech Spec requirement to run EDG at 3850 kw (10% overload) for 2 hours during the post-maintenance 24-hour run prior to blackout testing. (Completed on Unit 1)

5. Change in the maintenance procedure to ensure that the bottom half, as well as the top half, is inspected any time a main bearing assembly is opened for inspection. (Completed)

6. Change to Tech Spec to allow "slow" starts for most surveillance starts, consistent with manufacturer's recommendations and Generic Letter 84-15.

7. Installation of an improved-design center main bearing. This design will improve the load-carrying capability of the bearing and improve the oil supply to the predominantly-loaded area of the bearing.

G. D. Hines
12/22/87

SURVEILLANCE TEST DUE DATES

1. Maintenance Inspection (T/S 4.8.1.1.2.c.1)

Diesel	Last Test Date	Due Date (including 25% grace)	Approximate Length of Extension*
2AB	05/03/86	03/18/88	3-1/2 months
2CD	06/03/86	04/18/88	2-1/2 months

2. Blackout Testing (T/Ss 4.8.1.1.2.c.2 through 4.8.1.1.c.12)

Diesel	Last Test Date	Due Date (including 25% grace)	Approximate Length of Extension*
2AB	07/01/86	05/16/88	1-1/2 months
2CD	07/01/86	05/16/88	1-1/2 months

*Assumes that the fuel is unloaded from the core on July 1, 1988.

SPECIFIC DIESEL GENERATOR RELATED

TECHNICAL SPECIFICATION EXTENSIONS

The diesel-generator related Technical Specifications which we are requesting extensions for are listed below:

T/S	Test
4.8.1.1.2.C.1	Diesel generator inspection per manufacturer's recommendations.
4.8.1.1.2.C.2 - 4.8.1.1.2.C.12	Diesel generator "blackout" testing
4.8.1.2	Mode 5 and 6 reference to Technical Specification 4.8.1.1.2.
4.4.11.3	PORV and block valve emergency power supply.
4.7.4.1.b	ESW automatic valve actuation.

The relevant Technical Specification pages, with the specific extension Technical Specifications circled, are attached for the reviewer's convenience.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 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. Two separate and independent diesel generators each with:

1. A day fuel tank containing a minimum volume of 70 gallons of fuel,

2. A separate fuel storage system containing a minimum volume of 42,000 gallons of fuel, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With either an offsite circuit or diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a and 4:8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter; restore at least two offsite circuits and two diesel generators to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. 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 Requirements 4.8.1.1.1.a and 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter; restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two offsite circuits and two diesel generators to OPERABLE status within 72 hours from the time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

ACTION (Continued)

c. With two of the above required offsite A.C. circuits inoperable, demonstrate the OPERABILITY of two diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter, unless the diesel generators are already operating; restore at least one of the inoperable offsite sources to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours. With only one offsite source restored, restore at least two offsite circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

d. With two of the above required diesel generators inoperable, demonstrate the OPERABILITY of two offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; restore at least one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two diesel generators to OPERABLE status within 72 hours from time of initial loss or be in least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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, indicated power availability, and

b. Demonstrated OPERABLE at least once per 18 months by transferring the unit power source automatically from the normal auxiliary source to the preferred reserve source and by transferring manually to the alternate reserve source.

4.8.1.1.2 Each diesel generator shall be demonstrated OPERABLE:*

a. In accordance with the frequency specified in Table 4.8-1 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.

* The provisions of Specification 4.0.6 are applicable.

SURVEILLANCE REQUIREMENTS (Continued)

3. Verifying the fuel transfer pump can be started and transfers fuel from the storage system to the day tank.

4. Verifying the diesel starts from ambient condition and accelerates to at least 514 rpm in ≤ 10 seconds.

5. Verifying the generator is loaded to ≥ 1750 kw, and operates for ≥ 60 minutes and verifying that the generator output breaker to the emergency bus is OPERABLE.

6. Verifying the diesel generator is aligned to provide standby power to the associated emergency busses.

b. At least once per 92 days by verifying that a sample of diesel fuel from the fuel storage tank obtained in accordance with ASTM-D270-65 is within the acceptable limits specified in Table 1 of ASTM-D975-74 when checked for viscosity, water and sediment.

c. At least once per 18 months during shutdown 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) Verifying that the automatic sequence timing relays are OPERABLE with each load sequence time within ± 5% of its required value and that each load is sequenced on within the design allowable time limit.

(3) Verifying the generator capability to reject a load of ≥ 600 kw while maintaining voltage at 4160 ± 420 volts and frequency at 60 ± 1.2 Hz.

(4) Verifying the generator capability to reject a load of 3500 kw without exceeding 75% of the difference between nominal speed and the overspeed trip setpoint.

(5) Simulating a loss of offsite power by itself, and:

a) Verifying de-energization of the emergency busses and load shedding from the emergency busses.

SURVEILLANCE REQUIREMENTS (Continued)

b) Verifying the diesel starts from ambient condition on the auto-start signal, energizes the emergency busses with permanently connected loads, energizes the auto-connected shutdown loads through the load sequencer and operates for ≥ 5 minutes while its generator is loaded with the shutdown loads.

(6.) Verifying that on an ESF actuation test signal (without loss of offsite power) the diesel generator starts on the auto-start signal and operates on standby for ≥ 5 minutes.

(7.) Verifying that on a simulated loss of the diesel generator (with offsite power not available), the loads are shed from the emergency busses and that subsequent loading of the diesel generator is in accordance with design requirements.

(8.) Simulating a loss of offsite power in conjunction with an ESF actuation test signal, and

a) Verifying de-energization of the emergency busses and load shedding from the emergency busses.

b) Verifying the diesel starts from ambient condition on the auto-start signal, energizes the emergency busses with permanently connected loads, energizes the auto-connected emergency (accident) loads through the load sequencer and operates for ≥ 5 minutes while its generator is loaded with the emergency loads.

c) Verifying that on diesel generator trip, the loads are shed from the emergency buses and the diesel re-starts on the auto-start signal following manual resetting of the diesel trip lockout relay, the emergency buses are energized with permanently connected loads, the auto-connected emergency loads are energized through the load sequencer and the diesel operates for ≥5 minutes while its generator is loaded with emergency loads.

d) Verifying that all diesel generator trips, except engine overspeed and generator differential, are automatically bypassed upon loss of voltage on the emergency bus and/or safety injection actuation signal.

(9.) 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 3850 kw and during the remaining 22 hours of this test, the diesel generator shall be loaded to 3500 kw. Within 5 minutes after completing this 24 hour test, repeat Specification 4.8.1.1.2.c.5.

SURVEILLANCE REQUIREMENTS (Continued)

(10.) Verifying that the auto-connected loads to each diesel generator do not exceed the 2 hour rating of 3850 kw.

(11) 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.

c.) Proceed through its shutdown sequence.

(12.) Verifying that with the diesel generator operating in a test mode, a simulated safety injection signal overrides the test mode by (1) returning the diesel generator to standby operation and (2) automatically energizing the emergency loads with offsite power.

d. At least once per 10 years or after any modifications which could affect diesel generator interdepencence by starting both diesel generators simultaneously, during shutdown, and verifying that both diesel generators accelerate to at least 514 rpm in $\leq$ 10 seconds.

4.8.1.1.3 Reports - All diesel generator failures, valid or non-valid, shall be reported to the Commission pursuant to Specification 6.9.1. If the number of failures in the last 100 valid tests (on a per nuclear unit basis) is $\geq$ 7, the report shall be supplemented to include the additional information recommended in Regulatory Position C.3.b of Regulatory Guide 1.108, Revision 1, August 1977.

TABLE 4.8-1

DIESEL GENERATOR TEST SCHEDULE

Number of Failures In Last 100 Valid Tests*	Test Frequency
$\leq$ 1	At least once per 31 days
2	At least once per 14 days
3	At least once per 7 days
$\geq$ 4	At least once per 3 days

* Criteria for determining number of failures and number of valid tests shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, Revision 1, August 1977, where the last 100 tests are determined on a per nuclear unit basis.

RELIEF VALVES - OPERATING

LIMITING CONDITION FOR OPERATION

3.4.11 Three power operated relief valves (PORVs) and their associated block valves shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTION:

a. PORVs inoperable:*

1. With one PORV inoperable,

within 1 hour either restore the PORV to OPERABLE status or close the associated block valve and remove power from the block valve; otherwise be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

2. With two PORVs inoperable,

within 1 hour either restore at least one PORV to OPERABLE status or close the associated block valves and remove power from the block valves; restore at least one PORV to OPERABLE status within the following 72 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

3. With three PORVs inoperable,

within 1 hour either restore at least one of the PORVs to OPERABLE status or close their associated block valves and remove power from the block valves and be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

b. Block valves inoperable:*

1. With one block valve inoperable,

within 1 hour either (1) restore the block valve to OPERABLE status, or (2) close the block valve and remove power from the block valve, or (3) close the associated PORV and remove power from the associated solenoid valve; otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

* PORVs isolated to limit RCS leakage through their seats and the block valves shut to isolate this leakage are not considered inoperable.

LIMITING CONDITION FOR OPERATION (Continued)

2. With two or more block valves inoperable,

within 1 hour either (1) restore a total of at least two block valves to OPERABLE status, or (2) close the block valves and remove power from the block valves, or (3) close the associated PORVs and remove power from their associated solenoid valves; and apply the portions of ACTION a.2 or a.3 above for inoperable PORVs, relating to OPERATIONAL MODE, as appropriate.

c. With PORVs and block valves not in the same line inoperable,*

within 1 hour either (1) restore the valves to OPERABLE status or (2) close and de-energize the other valve in each line. Apply the portions of ACTION a.2 or a.3 above, relating to OPERATIONAL MODE, as appropriate for two or three lines unavailable.

d. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.4.11.1 Each of the three PORVs shall be demonstrated OPERABLE:

a. At least once per 31 days by performance of a CHANNEL FUNCTIONAL TEST, excluding valve operation, and

b. At least once per 18 months by performance of a CHANNEL CALIBRATION.

4.4.11.2 Each of the three block valves shall be demonstrated OPERABLE at least once per 92 days by operating the valve through one complete cycle of full travel. The block valve(s) do not have to be tested when ACTION 3.4.11.a or 3.4.11.c is applied.

4.4.11.3 The emergency power supply for the PORVs and block valves shall be demonstrated OPERABLE at least once per 18 months by operating the valves through a complete cycle of full travel while the emergency buses are energized by the onsite diesel generators and onsite plant batteries. This testing can be performed in conjunction with the requirements of Specifications 4.8.1.1.2.c and 4.8.2.3.2.d.

* PORVs isolated to limit RCS leakage through their seats and the block valves shut to isolate this leakage are not considered inoperable.

PLANT SYSTEMS

3/4.7.4 ESSENTIAL SERVICE WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.4.1 At least two independent essential service water loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.4.1 At least two essential service water loops shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. At least once per 18 months during shutdown, by verifying that each automatic valve servicing safety related equipment actuates to its correct position on a Safety Injection test signal.