

ELECTRICAL POWER SYSTEM

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 manually and automatically unit power supply from the normal circuit to the alternate circuit.

4.8.1.1.2 Each diesel generator shall be demonstrated OPERABLE*:

- a. At least once per 31 days on a STAGGERED TEST BASIS by:
 1. Verifying the fuel level in the diesel oil feed tank,
 2. Verifying the fuel level in the diesel generator fuel oil storage tank,
 3. Verifying the fuel transfer pump can be started and transfers fuel from the storage system to the diesel oil feed tank,
 4. Verifying the diesel starts.** The generator voltage and frequency shall be at least 3920 volts and 58.8 Hz in ≤ 10 seconds after the start signal. The steady state voltage and frequency shall be maintained at $4160 + 420, -240$ volts and 60 ± 1.2 Hz. 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 ESF actuation test signal.
 - d) An ESF actuation test signal by itself.

*All planned starts for the purpose of surveillance in this section may be preceded by a prelube period as recommended by the manufacturer.

**A modified diesel generator start involving idling and gradual acceleration to synchronous speed may be used for this surveillance requirement as recommended by the manufacturer. When modified start procedures are not used, the time, speed, voltage, and frequency tolerances of this surveillance requirement must be met.

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5. Verifying the generator is synchronized, loaded to an indicated 4000-4400 Kw* in accordance with the manufacturer's recommendation and operates for at least an additional 60 minutes[#], and
 6. Verifying the diesel generator is aligned to provide standby power to the associated emergency busses.
- b. At least once per 31 days and after each operation of the diesel where the period of operation was greater than or equal to 1 hour by checking for and removing accumulated water from the diesel oil feed tanks.
- c. At least once per 92 days and from new fuel oil prior to addition to the storage tanks, by obtaining a sample of fuel oil in accordance with ASTM-D270-1975, and by verifying that the sample meets the following minimum requirements and is tested within the specified time limits:
1. As soon as sample is taken (or prior to adding new fuel to the storage tank) verify in accordance with the test specified in ASTM-D975-77 that the sample has:
 - a) A water and sediment content of less or equal to 0.05 volume percent.
 - b) A kinematic viscosity @ 40°C of greater than or equal to 1.9 centistokes, but less than or equal to 4.1 centistokes.
 - c) A specific gravity as specified by the manufacturer @ 60/60°F of greater than or equal to 0.85 but less than or equal to 0.99 or an API gravity @ 60°F of greater than or equal to 11 degrees but less than or equal to 35 degrees.
 2. Verify an impurity level of less than 2 mg of insolubles per 100 ml when tested in accordance with ASTM-D2274-70; analysis shall be completed within 7 days after obtaining the sample but may be performed after the addition of new fuel oil; and

*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 of the manufacturer or momentary variation due to changing bus loads shall not invalidate the test.

[#]This surveillance requirement shall be preceded by and immediately follow without shutdown a successful performance of 4.8.1.1.2a.4 or 4.8.1.1.2d.

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3. Verify the other properties specified in Table 1 of ASTM-D975-1977 and Regulatory Guide 1.137, Revision 1, October 1979, Position 2.a., when tested in accordance with ASTM-D975-1977; analysis shall be completed within 14 days after obtaining the sample but may be performed after the addition of new fuel oil. Failure to meet this requirement shall not affect diesel generator OPERABILITY; however, corrective action shall be initiated within 72 hours to return the fuel oil supply to within acceptable limits.
- d. At least once per 184 days a diesel generator fast start test shall be performed in accordance with TS 4.8.1.1.2a.4. Performance of the 184 day fast start test satisfies the 31 day testing requirements specified in TS 4.8.1.1.2a.4.
- e. At least once per 18 months during shutdown by:
 1. Verifying the generator capability to reject a load of greater than or equal to 455 kW while maintaining voltage at $4160 + 420, -240$ volts and frequency at $60 + 4.5, -1.2$ Hz.
 2. Verifying the generator capability to reject a load of an indicated 4000-4400 kW without tripping. The generator voltage shall not exceed 5023 volts during and following the load rejection.
 3. 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 starts on the auto-start signal, energizes the emergency busses and the permanently connected loads within 10 seconds after the auto-start signal, energizes the auto-connected shutdown loads through the load sequencer 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 $4160 + 420, -240$ volts and $60 + 1.2, -0.3$ Hz during this test.
 4. Verifying that on an SIAS 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 steady-state generator voltage and frequency shall be $4160 + 420, -240$ volts and 60 ± 1.2 Hz within 10 seconds after the auto-start signal; the generator voltage and frequency shall be maintained within these limits during this test.

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SURVEILLANCE REQUIREMENTS (Continued)

8. 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.
9. Verifying that with the diesel generator operating in a test mode (connected to its bus), a simulated safety injection signal overrides the test mode by (1) returning the diesel generator to standby operation and (2) automatically energizes the emergency loads with offsite power.
10. Verifying that each fuel transfer pump transfers fuel to its associated diesel oil feed tank by taking suction from the opposite train fuel oil storage tank via the installed cross connect.
11. Verifying that the automatic load sequence timer is OPERABLE with the time of each load block within $\pm 10\%$ of the sequenced load block time.
12. Verifying that the following diesel generator lockout features prevent diesel generator starting only when required:
 - a) turning gear engaged
 - b) emergency stop
 - c) loss of D.C. control power
 - d) governor fuel oil linkage tripped
- f. At the first refueling outage, and thereafter, at intervals not to exceed 24 months, subject the diesels to an inspection in accordance with procedures prepared in conjunction with its manufacturer's recommendations for this class of standby service.
- g. At least once per 10 years or after any modifications which could affect diesel generator interdependence by starting the diesel generators simultaneously, during shutdown, and verifying that the diesel generators accelerate to at least 600 rpm (60 ± 1.2 Hz) in less than or equal to 10 seconds.
- h. At least once per 10 years by:
 1. Draining each diesel generator fuel oil storage tank, removing the accumulated sediment, and cleaning the tank using a sodium hypochlorite solution or equivalent, and

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SURVEILLANCE REQUIREMENTS (Continued)

2. Performing a pressure test of those portions of the diesel fuel oil system designed to Section III, subsection ND of the ASME Code at a test pressure equal to 110% of the system design pressure.
 - i. By performing a visual inspection of the interior of the diesel generator fuel oil storage tanks each time the tank is drained and, if necessary, clean the tank with a sodium hypochlorite solution, or equivalent.

4.8.1.1.3 Reports - (Not Used)

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BASES

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

The Surveillance Requirements for demonstrating the OPERABILITY of the diesel generators are consistent with the recommendations of Regulatory Guides 1.9 "Selection of Diesel Generator Set Capacity for Standby Power Supplies," March 10, 1971, and 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants," Revision 1, August 1977, and 1.137, "Fuel Oil Systems for Standby Diesel Generators," Revision 1, October 1979. Other provisions are derived from Generic Letter 93-05 "Line-Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation" 94-01 "Removal of Accelerated Testing and Special Reporting Requirements for Emergency Diesel Generators," and NUREG 1432 Standard Technical Specifications Combustion Engineering Plants.

The minimum voltage and frequency stated in the Surveillance Requirement are those necessary to ensure the diesel generator can accept the Design Basis Accident loading while maintaining acceptable voltage and frequency levels. Stable operation at the nominal voltage and frequency values is also essential to establishing diesel generator OPERABILITY, but a time constraint is not imposed. This is because a typical diesel generator will experience a period of voltage and frequency oscillations prior to reaching steady state operation if these oscillations are not dampened out by load application. This period may extend beyond the 10 second acceptance criteria and could be a cause for failing the Surveillance Requirement. In lieu of a time constraint in the Surveillance Requirement, the actual time to reach steady state operation is monitored and trended. This is to ensure there is no voltage regulator or governor degradation which could cause a diesel generator to become inoperable. The 10 seconds in the Surveillance Requirement is met when the diesel generator first reaches the specified voltage and frequency, at which time the output breaker would close if an automatic actuation had occurred.

The diesel generator Surveillance testing performed once per 18 months during shutdown is in accordance with Regulatory Guide 1.108, Regulatory Position C.2.

The maximum voltage limit in surveillance test 4.8.1.1.2.e.2 was increased to 5023 volts in response to NRC Information Notice 91-13; Inadequate Testing of Emergency Diesel Generators. A maximum voltage limit is provided to ensure that components electrically connected to the diesel generator are not damaged as a result of the momentary voltage excursion experienced during this test.

The Surveillance Requirement for demonstrating the OPERABILITY of the station batteries are based on 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

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BASES

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

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 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.

The Onsite Power System includes three 4.16 kV ESF buses (3A3-S, 3B3-S, and 3AB3-S). Power for safety related loads is normally supplied by the non-safety related 4.16 kV buses (3A2 and 3B2) of the Offsite Power System. Should offsite power from either of these buses be lost, the Onsite Power System will receive power automatically from the appropriate diesel generator. Non-safety related loads will be automatically disconnected from the safety Onsite Power System. Each ESF bus (3A3-S or 3B3-S) is redundant to the other; each can supply sufficient power to its safety related loads to enable safe shutdown, or to mitigate the consequences of a design basis accident. The third bus, 3AB3-S, may be connected to either 3A3-S or 3B3-S, but never to both. Therefore 3AB3-S is not considered as a third, separate source of ESF power. The three ESF buses and their loads are tested as specified in Surveillance Requirements 4.8.1.1.2.e.3 and 4.8.1.1.2.e.5.

Surveillance requirement 4.8.1.1.2.e.1 requires the verification at least once per 18 months of the diesel generators' ability to reject a load of greater than or equal to 498 Kw while specific voltage and frequency constraints are maintained. The intent of this Surveillance requirement is to require the diesel generator to reject the largest single load. The largest single load on the diesel generator is the Essential Chiller which requires 430 Kw under tornado/missile conditions. The difference between the specified 498 Kw load in the Surveillance requirement and the 430 Kw required by the actual largest single load is a margin of conservatism. A method of rejecting a load greater than or equal to 498 Kw utilizing the wet and dry cooling tower fans has been developed and will satisfy the Surveillance requirement.

The loading range for the diesel generators (4000-4400 Kw) as specified in surveillance requirements is equal to approximately 90 to 100 percent of its continuous rating. This provides for a range to conduct testing without inadvertently overloading of the diesel generators. Inadvertent overloading creates unnecessary wear and mechanical stress that may adversely affect the reliability and longevity of the diesel generators.