TABLE OF CONTENTS (cont'd)

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LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.9 AUXILIARY ELECTRICAL SYSTEM	4.9 AUXILIARY ELECTRICAL SYSTEM
Applicability:	Applicability:
Applies to the auxiliary electrical power system.	Applies to the periodic testing requirements of the auxiliary electrical systems.
Objective:	Objective:
To assure an adequate supply of electrical power for operation of those systems required for safety.	Verify the operability of the auxiliary electrical system.
Specification:	Specification:
A. Auxiliary Electrical Equipment	A. Auxiliary Electrical Equipment
1. The reactor shall not be made critical from a Cold Shutdown Condition unless all of the following conditions are satisfied:	1. Emergency Buses Undervoltage Relays
a. Both off-site sources (345 KV and 69 KV) and the startup transformer and emergency transformer are available and capable of automatically supplying power to the 4160 Volt emergency buses 1F and 1G.	a. Loss of voltage relays Once every 18 months, loss of voltage on emergency buses is simulated to demonstrate the load shedding from emergency buses and the automatic start of diesel generators.
b. Both diesel generators shall be operable and there shall be a minimum of 45,000 gal. of diesel fuel in the fuel oil storage tanks.	b. Undervoltage relays Once every 18 months, low voltage on emergency buses is simulated to demonstrate disconnection of the emergency buses from the offsite power source. The undervoltage relays shall be calibrated once every 18 months.
c. The 4160V critical buses 1F and 1G and the 480V critical buses 1F and 1G are energized.	
1. The loss of voltage relays and their auxiliary relays are operable.	
2. The undervoltage relays and their auxiliary relays are operable.	
d. The four unit 125V/250V batteries and their chargers shall be operable.	
e. The power monitoring system for the inservice RPS MG set or alternate source shall be operable.	

3.9.B

B. Operation with Inoperable Equipment

Whenever the reactor is in Run Mode or Startup Mode with the reactor not in a Cold Condition, the availability of electric power shall be as specified in 3.9.A.1, except as specified in 3.9.B.1.

1. Incoming Power

a. From and after the date incoming power is not available from a startup or emergency transformer, continued reactor operation is permissible under this condition for seven days. At the end of this period, provided the second source of incoming power has not been made immediately available, the NRC must be notified of the event and the plan to restore this second source. During this period, the two diesel generators and associated critical buses must be demonstrated to be operable.

b. From and after the date that incoming power is not available from both start-up and emergency transformers (i.e., both failed), continued operation is permissible, provided the two diesel generators and associated critical buses are demonstrated to be operable, all core and containment cooling systems are operable, reactor power level is reduced to 25% of the rated and NRC is notified within 24 hours of the situation, the precautions to be taken during this period and the plans for prompt restoration of incoming power.

4.9.A (cont'd.)

3.9.B (cont'd.)

2. Diesel Generators

a. From and after the date that one of the diesel generators or an associated critical bus is made or found to be inoperable for any reason, continued reactor operation is permissible in accordance with Specification 3.5.F.1 if Specification 3.9.A.1 is satisfied.

b. From and after the date that both diesel generators are made or found to be inoperable for any reason, continued reactor operation is permissible only during the succeeding 24 hours in accordance with Specification 3.5.F.2 if Specification 3.9.A.1 is satisfied.

c. From and after the date that one of the diesel generators or associated critical buses and either the emergency or startup transformer power source are made or found to be inoperable for any reason, continued reactor operation is permissible in accordance with Specification 3.5.F.1, provided the other off-site source, startup transformer or emergency transformer is available and capable of automatically supplying power to the 4160V critical buses and the NRC is notified within 24 hours of the occurrence and the plans for restoration of the inoperable components.

4.9.A (cont'd)

2. Diesel Generators

a. Each diesel-generator shall be started manually and loaded to not less than 50% of rated load for no less than 2 hours once each month to demonstrate operational readiness.

During the monthly generator test the diesel generator starting air compressor shall be checked for operation and its ability to recharge air receivers. The operation of the diesel fuel oil transfer pumps and fuel oil day tank level switches shall be demonstrated, and the diesel starting time to reach rated voltage and frequency shall be logged.

b. Once every 18 months the condition under which the diesel generator is required will be simulated and a test conducted to demonstrate that it will start and accept the emergency load within the specified time sequence. The results shall be logged.

c. Specification 4.9.A.2.c deleted.

d. Once a month the quantity of diesel fuel available shall be logged.

e. Every three months and upon delivery a sample of diesel fuel shall be checked for quality. The quality shall be within the acceptable limits specified in Table 1 of ASTM D975-68 for Nos. 1D or 2D and logged.

f. At least once per 18 months, during shutdown, each diesel generator shall be given an inspection in accordance with instructions based on the manufacturer's recommendations.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.9.B (cont'd.)	4.9.A (cont'd.)
3. DC Power	3. DC Power
a. From and after the date that one of the four unit 125 volt or 250 volt batteries is made or found to be inoperable for any reason, restore the inoperable battery to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the followirg 24 hours.	a. Every week, the following parameters shall be verified: 1. The parameters of each designated pilot cell meet the Category A limits in Table 3.9.1. 2. The total terminal voltage for each 125-volt battery is greater than or equal to 125 volts on float charge, and for each 250-volt battery the terminal voltage is greater than or equal to 250 volts on float charge. b. Every quarter, and within 7 days after a battery discharge causing battery terminal voltage below 105 volts for a 125-volt battery or 210 volts for a 250-volt battery, or battery overcharge with battery terminal voltage above 140 volts for a 125-volt battery or 280 volts for a 250-volt battery, by verifying that: 1. The parameters for cell-to-cell meet the Category B limits in Table 3.9.1. 2. There is no abnormal corrosion at either terminal or connectors which could affect connection resistance, or the connection resistance of these items is less than or equal to 150×10^{-6} ohm. 3. The electrolyte temperatures in a representative sample of cells, consisting of at least every sixth cell, are within $\pm 5^{\circ}F$. c. Once each operating cycle: 1. The cells, cell plates, and battery racks shall be visually inspected. 2. The cell-to-cell and terminal connections shall be verified to be clean, tight, and free of corrosion.

3.9.B.3 (cont'd.)

b. From and after the date that a unit battery charger is made or found to be inoperable, restore the inoperable battery charger to OPERABLE status or replace with the spare battery charger within 4 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

4.9.A.3 (cont'd.)

3. The resistance of each cell-to-cell and terminal connection shall be verified to be less than or equal to 150×10^{-6} ohm.

4. Each 125 volt battery charger will supply 200 amperes at 125 volts for at least 4 hours, and each 250 volt battery charger will supply 200 amperes at 250 volts for at least 4 hours.

d. Once each operating cycle, during shutdown, one of the following tests will be performed:

1. A battery service test to verify that battery capacity is adequate to supply the emergency load profile.

2. A performance discharge test, in lieu of the above service test, once every five years to verify that battery capacity is at least 85% of the manufacturer's rating.

3. A performance discharge test, in lieu of the above service test, when the battery shows signs of degradation or has been in service seventeen years or longer.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.9.B (cont'd.)	4.9.A (cont'd.)
4. Power Monitoring System for RPS System	4. Power Monitoring System for RPS System
a. With one RPS electric power monitoring channel for an inservice RPS MG set or alternate power supply inoperable, restore the inoperable channel to operable status within 72 hours or remove the associated RPS MG set or alternate power supply from service.	The above specified RPS power monitoring system instrumentation shall be determined operable:
b. With both RPS electric power monitoring channels for an inservice RPS MG set or alternate power supply inoperable, restore at least one to operable status within 30 minutes or remove the associated RPS MG set or alternate power supply from service.	a. At least once per operating cycle by demonstrating the operability of over-voltage, under-voltage and under-frequency protective instrumentation by performance of a channel calibration including simulated automatic actuation of the protective relays, tripping logic and output circuit breakers and verifying the following set-points.
	1. Over-voltage $\leq$ 132 VAC, with time delay $\leq$ 2 sec.
	2. Under-voltage $\geq$ 108 VAC, with time delay $\leq$ 2 sec.
	3. Under-frequency $\geq$ 57 Hz, with time delay $\leq$ 2 sec.

TABLE 3.9.1

BATTERY SURVEILLANCE REQUIREMENTS

Parameter	CATEGORY A[1] (WEEKLY)	CATEGORY B[2] (QUARTERLY)	
	Limits for each designated pilot cell	Limits for each connected cell	Allowable[3] value for each connected cell
Electrolyte Level	≥Minimum level indication mark, and ≤ ¼" above maximum level indication mark	≥Minimum level indication mark, and ≤ ¼" above maximum level indication mark	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 volts	≥ 2.13 volts[4]	≥ 2.10 volts
Specific Gravity[5]	≥1.195[6]	≥ 1.190 Average of all connected cells ≥ 1.200	Not more than 0.020 below the average of all connected cells Average of all connected cells ≥ 1.190[6]

[1] For any Category A parameter(s) outside the limit(s) shown, the battery may be considered OPERABLE provided that within 24 hours all the Category B measurements are taken and found to be within their allowable values, and provided all Category A and B parameter(s) are restored to within limits within the next 6 days.

[2] For any Category B parameter(s) outside the limit(s) shown, the battery may be considered OPERABLE provided that the Category B parameters are within their allowable values and provided that Category B parameter(s) are restored to within limits within 7 days.

[3] Any Category B parameter not within its allowable value indicates an inoperable battery.

[4] May be corrected for average electrolyte temperature.

[5] Corrected for electrolyte temperature and level.

[6] Or battery charger current is less than 2 amperes when on float charge.

3.9 BASES

The general objective of this Specification is to assure an adequate source of electrical power to operate the auxiliaries during plant operation, to operate facilities to cool and lubricate the plant during shutdown and to operate the engineered safeguards following the accident. There are three sources of ac electrical energy available; namely, the startup transformer, the emergency transformer and two diesel generators. The dc supply is required for switch gear and engineered safety feature systems. This supply consists of two 125V DC and two 250V DC batteries and their related chargers. Specification 3.9.A states the required availability of ac and dc power; i.e., active off-site ac sources and the required amount of on-site ac and dc sources.

Auxiliary power for CNS is supplied from the startup transformer and the normal transformer. Both of these transformers are sized to carry 100% of the station auxiliary load. The emergency transformer is about one third the size of these two transformers and is equal in size to both emergency diesel generators.

The startup transformer and the emergency transformers are the offsite power sources. Their voltage is monitored by undervoltage relays which provide low voltage protection for the emergency buses. Whenever the voltage setpoint and time delay limit for the undervoltage relays have been exceeded, the emergency buses are automatically disconnected from the offsite power source.

If the startup or emergency transformer is lost, the unit can continue to operate since the unit auxiliary transformer is in service, and the emergency or startup transformer and the diesels are available.

If both the startup and emergency transformers become inoperable, the power level must be reduced to a value where by the unit can safely reject the load and continue to supply auxiliary electric power to the station.

In the normal mode of operation, the startup and emergency transformers are energized and two diesel generators are operable. One diesel generator may be allowed out of service based on the availability of power from the startup transformer and the fact that one diesel generator carries sufficient engineered safeguards equipment to cover all breakers. With the startup transformer and one diesel generator out of service, the off site transmission line corresponding to the emergency transformer must be available. Upon the loss of one on-site and one off-site power source, power would be available from the other immediate off-site power source and the two operable on-site diesels to carry sufficient engineered safeguards equipment to cover all breaks. In addition to these two power sources, removal of the Isolated Phase Bus "quick" disconnect links would allow backfeed of power through the main transformer to the unit auxiliary transformer and provide power to carry the full station auxiliary load. The time required to perform this operation is comparable to the time the reactor could remain on RCIC operation before controlled depressurization need be initiated.

3.9 BASES (cont'd)

The D. C. Power Systems allowable out-of-service time is based on NRC Regulatory Guide 1.93, "Availability of Electrical Power Sources." The two-hour limit to restore battery operability minimizes reactor operation while in a degraded condition.

4.9 BASES

The monthly test of the diesel generator is conducted to check for equipment failures and deterioration. Testing is conducted up to equilibrium operating conditions to demonstrate proper operation at these conditions. The diesel generator will be manually started, synchronized and connected to the bus and load picked up. The diesel generator should be loaded to at least 50% of rated load to prevent fouling of the engine. It is expected that the diesel generator will be run for at least two hours. Diesel generator experience at other generating stations indicates that the testing frequency is adequate and provides a high reliability of operation should the system be required.

Each diesel generator has two air compressors and two air receivers for starting. It is expected that the air compressors will run only infrequently. During the monthly check of the diesel generator, each receiver in each set of receivers will be drawn down below the point at which the corresponding compressor automatically starts to check operation and the ability of the compressors to recharge the receivers.

The diesel generator fuel consumption rate at full load is approximately 275 gallons per hour. Thus, the monthly load test of the diesel generators will test the operation and the ability of the fuel oil transfer pumps to refill the day tank and will check the operation of these pumps from the emergency source.

The test of the diesel generator during the refueling outage will be more comprehensive in that it will functionally test the system; i.e. it will check diesel generator starting and closure of diesel generator breaker and sequencing of load on the diesel generator. The diesel generator will be started by simulation of a loss-of-coolant accident. In addition, an undervoltage condition will be imposed to simulate a loss of off-site power.

Periodic tests between refueling outages verify the ability of the diesel generator to run at full load and the core and containment cooling pumps to deliver full flow. Periodic testing of the various components, plus a functional test once-a-cycle, is sufficient to maintain adequate reliability.

The diesel fuel oil quality must be checked to ensure proper operation of the diesel generators. Water content should be minimized because water in the fuel could contribute to excessive damage to the diesel engine.

4.9 BASES (cont'd)

When it is determined that some auxiliary electrical equipment is out of service, the increased surveillance required in Section 4.5.F is deemed adequate to provide assurance that the remaining equipment will be operable.

The surveillance requirements for demonstrating the OPERABILITY of the unit batteries are in accordance with the recommendations of NRC Regulatory Guide 1.129, "Maintenance Testing and Replacement of Large Lead Storage Batteries for Nuclear Power Plants, dated February 1978 and IEEE Std 450-1987, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations."

Once each operating cycle, during shutdown, either a service test or performance discharge is performed on the 125 V and the 250 V batteries. The performance discharge test is performed in lieu of the service test when a battery shows signs of degradation. Degradation is indicated when battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 85% of the manufacturer's rating.

Replacement criteria for 125V and 250V station batteries is ≤85% capacity factor and the maximum time for replacement should be one (1) year. This will assure that the remaining battery capacity is adequate to meet load requirements.

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 of the battery to handle high discharge rates and compares the battery capacity at that time with the rated capacity.

Table 3.9.1 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 ensure that their float voltage and specific gravity are characteristic of a charged cell with adequate capacity, and 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 3.9.1 is permitted for up to 7 days. During this 7-day period: (1) the allowable values 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 0.020 below the average specific gravity of all connected cells 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 2.10 volts, ensures the battery's capability to perform its design function.

The Reactor Protection System (RPS) is equipped with a seismically qualified, Class 1E power monitoring system. This system consists of eight Electrical Protection Assemblies (EPA) which isolate the power sources from the RPS if the input voltage and frequency are not within limits specified for safe system operation. Isolation of RPS power causes that RPS division to fail safe.