NMC
Committed to Nuclear Excellence

Point Beach Nuclear Plant
Operated by Nuclear Management Company, LLC

July 15, 2005

NRC 2005-0091
10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266 and 50-301
License Nos. DPR-24 and DPR-27

License Amendment Request 239
Technical Specification Surveillance Requirements SR 3.8.4.6 and SR 3.8.4.7, DC Sources – Operating

References: (1) Letter from NMC to NRC dated April 8, 2004 (NRC 2004-0034)
(2) Letter from NMC to NRC dated November 15, 2004 (NRC 2004-0120)
(3) NRC Request for Additional Information (RAI) dated June 9, 2005

In Reference 1, Nuclear Management Company, LLC (NMC), submitted a request for an amendment to the Technical Specifications (TS) for Point Beach Nuclear Plant, Units 1 and 2. Reference 2 provided additional information in support of the proposed amendment.

The proposed amendment would revise TS Surveillance Requirements (SR) 3.8.4.6 and SR 3.8.4.7, DC Sources – Operating, to revise the values for battery charger currents, add a new allowance for the method of verifying battery charger capacity, and remove a restriction on the conduct of a modified performance discharge test. The proposed changes are based on NUREG-1431, *Standard Technical Specifications, Westinghouse Plants*, Revision 3.

In Reference 3, the Nuclear Regulatory Commission (NRC) staff requested additional information regarding the proposed amendment. The NMC response is provided in Enclosure 1. Following further discussions with the NRC staff, NMC has decided to more closely align SR 3.8.4.6 with NUREG-1431. This supplement revises the proposed SR 3.8.4.6 as submitted in Reference 1. To facilitate NRC staff review of the proposed amendment, the marked up and clean TS pages are resubmitted in their entirety, incorporating the proposed revision.

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Enclosure 2 provides a description and analysis of the revised SR. Enclosures 3 and 4 provide the existing TS and Bases pages, respectively, marked up to show the proposed change. Enclosure 5 provides revised (clean) TS and Bases pages.

NMC has determined that this supplement to the proposed amendment remains bounded by the No Significant Hazards Consideration Determination submitted on April 8, 2004 (Reference 1).

This letter contains no new commitments or revisions to existing commitments.

In accordance with 10 CFR 50.91, a copy of this supplemental application, with attachments, is being provided to the designated Wisconsin Official.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on July 15, 2005.

FOR

Dennis L. Koehl
Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

Enclosures (5)

cc: Regional Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

ENCLOSURE 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
LICENSE AMENDMENT REQUEST 239
TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS
SR 3.8.4.6 AND SR 3.8.4.7, DC SOURCES – OPERATING

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

The following information is provided in response to the Nuclear Regulatory Commission (NRC) staff's request for additional information (RAI) regarding Nuclear Management Company (NMC) letter dated April 8, 2004, which proposed an amendment to the license for Point Beach Nuclear Plant (PBNP) Units 1 and 2, to revise TS Surveillance Requirements (SR) 3.8.4.6 and SR 3.8.4.7, DC Sources – Operating. The NRC staff's questions are restated below with the NMC response following.

NRC Question 1:

In your November 15, 2004, response to a staff request for additional information (RAI), you stated that proposed battery charger testing limits provide ample margin between the set capacity of the chargers and the surveillance requirements (SRs) to account for drift in the charger output from the setpoint. You also stated that these setpoints were based on not exceeding the current rating of the 480 VAC charger supply breakers.
(1) Explain how charger output drift is an issue with battery charger testing.
(2) With regard to the battery chargers, describe how the functionality of the 480 VAC supply breakers is verified.

NMC Response:

(1) The potential for charger output drift needs to be taken into consideration. If the setpoint for current limit drifts high it could challenge the AC input breaker capacity and result in it tripping, which would complicate returning the battery charger to service. If the setpoint were to drift low, it could prevent the charger from providing the minimum current necessary to recharge a battery while carrying DC bus loads.

(2) The functionality of the 480 VAC supply breaker is verified during battery charger testing in that the breaker demonstrates that it is capable of supplying the maximum current demand of the charger when it is at its current limit.

NRC Question 2:

In your November 15, 2004, response to a staff RAI, you stated:

> Upon loss of offsite power, the chargers' AC contactors open. Manual operator action is required to restart the chargers. The system design is such that a coincident safety injection signal would prevent restoration of the battery chargers unless offsite power is restored to the safeguards buses. This is done to minimize the loading on the standby emergency power supply during the period immediately following a safety injection signal during a design basis accident. In this case, restoration of the chargers is completed by operators when adequate power is confirmed to be available.
>
> The TS Bases are being revised to clarify this description. The revised Bases will read, "The battery chargers are interlocked such that a loss of offsite power will disconnect the battery chargers from their 480 VAC source. A coincident safety injection signal would prevent restoration of the battery chargers unless offsite power is restored to the safeguard buses."

As stated in the Point Beach Final Safety Analysis Report (FSAR), safety-related batteries D-05, D-06, D-105, and D-106 have been sized to carry their expected shutdown loads following a plant trip/loss-of-coolant accident (LOCA) and loss of offsite power or following a station blackout period for one-hour without battery terminal voltage falling below 105 volts (for battery considerations) and while maintaining voltage at the fed components sufficient for them to operate.

Describe when and how the battery chargers would be connected to the emergency diesel generators during/following a plant trip/LOCA given a loss of offsite power event.

NMC Response:

During/following a plant trip/LOCA given a loss of offsite power event, the battery chargers are automatically disconnected from their respective 480 VAC bus supplies because their associated contactor/starters drop out from under voltage. In the event that a coincident SI signal is generated, SI contacts in their associated contactor/starters prevent their restarting until permitted (SI signal cleared) to minimize loading on emergency diesel generators. Within one hour the chargers' 480 VAC bus supplies are restored and after verifying adequate power is available the chargers are manually restarted by control room operators by closing in the contactor/starters via their respective start switches at the 125VDC System Monitoring / Control Section of Auxiliary Safety Instrument Panel 2C20.

NRC Question 3:

When was the phrase 'normal loads' added to the Point Beach FSAR? In comparison with the existing wording in the Technical Specification SR 3.8.4.6, how is the proposed change conservative?

NMC Response:

The phrase 'normal loads' has been present in the PBNP FSAR since this document's submittal as the Final Facility Description and Safety Analysis Report (FFDSAR) in support of initial plant licensing.

The change to SR 3.8.4.6 allows PBNP to meet the SR via two options.

In the first option, the proposed change increases the current that battery chargers D-07, D-08 and D-09 are required to demonstrate from greater than or equal to 203 amps to greater than or equal to 320 amps. Likewise it increases the current that battery chargers D-107, D-108 and D-109 are required to demonstrate from greater than or equal to 273 amps to greater than or equal to 420 amps. This will confirm that the battery chargers are capable of supplying an even greater current to recharge their associated batteries. The higher current translates to a faster battery recovery time, which is conservative.

PBNP is proposing to add a second option that would allow the station to satisfy SR 3.8.4.6 consistent with the allowance provided in the corresponding section of NUREG-1431. This allowance has been accepted by the staff as being conservative. This proposed change is described in detail in Enclosure 2

ENCLOSURE 2

DESCRIPTION AND JUSTIFICATION
SUPPLEMENT 1 TO LICENSE AMENDMENT REQUEST 239
TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS
SR 3.8.4.6 AND SR 3.8.4.7, DC SOURCES – OPERATING

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

This supplement to the proposed amendment would modify the second option in Technical Specification (TS) Surveillance Requirements (SR) 3.8.4.6, DC Sources – Operating, to conform to the corresponding option in NUREG-1431, *Standard Technical Specifications, Westinghouse Plants*, Revision 3.

SR 3.8.4.6 is proposed for modification as follows (deletions are marked as strikethrough, additions are double-underlined). The section preceding the "OR" remains as proposed in the original submittal. The section following the "OR" is revised by this supplement.

> Verify battery chargers D-07, D-08, and D-09 each supply ~~≥ 203~~ 320 amps at greater than or equal to the minimum established float voltage ~~≥ 125 V~~ for ≥ 8 hours, and battery chargers D-107, D-108, and D-109 each supply ~~≥ 273~~ 420 amps at greater than or equal to the minimum established float voltage ~~≥ 125 V~~ for ≥ 8 hours.
>
> OR
>
> Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.

SR 3.8.4.6, as proposed, provides two options. The first option requires that battery chargers D-07, D-08, and D-09 be capable of supplying 320 amps at the minimum established float voltage for 8 hours, and battery chargers D-107, D-108, and D-109 be capable of supplying 420 amps at the minimum established float voltage for eight hours. The proposed change to the first option in SR 3.8.4.6, and its justification, remains the same as stated in the original submittal. The phraseology is consistent with Standard TS (NUREG-1431).

An additional allowance is proposed as an alternative method for satisfying SR 3.8.4.6. This alternative option requires that each battery charger be capable of recharging the battery after a service test, coincident with supplying the largest combined demands of the various continuous steady state loads. The duration for this test may be longer than the charger design capacity test discussed in the first option since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is two amps.

The alternate acceptance criteria would allow an actual inservice demonstration that the charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state. The proposed allowance meets the intent of the existing test and allows for normal in-place demonstration of the charger capability, thereby minimizing the time when the charger would be disconnected from the DC bus. This additional allowance is consistent with the Standard TS.

Technical Specification Bases changes are also being made to reflect the proposed Technical Specifications changes, provide additional clarification, and to correct editorial errors in references.

The proposed changes are consistent with NUREG-1431, *Standard Technical Specifications, Westinghouse Plants*, Revision 3.

ENCLOSURE 3

PROPOSED TECHNICAL SPECIFICATION CHANGES

LICENSE AMENDMENT REQUEST 239

TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS

SR 3.8.4.6 AND SR 3.8.4.7, DC SOURCES – OPERATING

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

(2 pages follow)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. OR Verify battery connection resistance is within limits.	92 days
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	12 months
SR 3.8.4.4	Remove visible terminal corrosion, and verify battery cell to cell and terminal connections are coated with anti-corrosion material.	12 months
SR 3.8.4.5	Verify battery connection resistance is within limits.	12 months
SR 3.8.4.6	Verify battery chargers D-07, D-08, and D-09 each supply ≥ ~~203~~ 320 amps at greater than or equal to the minimum established float voltage ~~≥ 125 V~~ for ≥ 8 hours, and battery chargers D-107, D-108, and D-109 each supply ≥ ~~273~~ 420 amps at greater than or equal to the minimum established float voltage ~~≥ 125 V~~ for ≥ 8 hours. OR Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.7	---------------NOTES--------------- The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of ~~the service test in~~ SR 3.8.4.7 ~~once per 60 months~~. --- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	18 months
SR 3.8.4.8	Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	60 months <u>AND</u> 12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating <u>AND</u> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

ENCLOSURE 4

PROPOSED TECHNICAL SPECIFICATION BASES CHANGES

LICENSE AMENDMENT REQUEST 229

TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS

SR 3.8.4.6 AND SR 3.8.4.7, DC SOURCES – OPERATING

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

(6 pages follow)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources-Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital instrument bus power (via inverters). As required by the Point Beach Design Criteria (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The safety-related 125 VDC system consists of four main distribution buses: D01, D02, D03, and D04, in addition to two swing buses (D301 and D302) each capable of supplying one of the four 125 VDC buses.

Each of the four main distribution buses is powered by a battery charger (D07, D08, D107 and D108) and a station battery (D05, D06, D105, and D106). The function of the battery chargers is to supply their respective DC loads, while maintaining the batteries at full charge. All of the battery chargers are powered from the 480 VAC Engineered Safety Feature (ESF) system.

The battery chargers are interlocked such that a loss of offsite power ~~combined with a safety injection signal~~ will disconnect the battery chargers from their 480 VAC source. A coincident safety injection signal would prevent restoration of the battery chargers unless offsite power is restored to the safeguards buses. This limits the loading on the standby emergency power supply during the period immediately following a safety injection signal. During this period, the 125 VDC loads are supplied by their associated station battery until such time as power to the chargers is restored.

Two swing battery chargers are available through one of the swing DC distribution buses. Swing charger D09 is connected to swing DC distribution bus D301 and can provide a source of DC power to distribution buses D01 or D02. Likewise, swing charger D109 is connected to swing DC distribution bus D302 and can provide a source of DC power to distribution buses D03 or D04. In addition, there exists a swing safety-related battery D305 which is connected to swing DC distribution bus D301. This swing battery is capable of being aligned to any one of the four main distribution buses to take the place of the normal battery. Interlocks exist on swing DC distribution buses D301 and D302 which prevent the paralleling of redundant DC buses.

The station batteries have been sized to carry their expected shutdown

BACKGROUND (continued)

loads following a plant trip/LOCA and loss of offsite power, or following a station blackout for a period of one hour, without battery terminal voltage falling below 105 volts (for battery considerations) and while maintaining voltage at the fed components sufficient for them to operate. ~~Major battery loads, with their approximate operating times, are listed in FSAR Table 8.7-1~~ Load profiles for batteries D05, D06 and D305 are shown in FSAR Figure 8.7-2 and for batteries D105 and D106 in FSAR Figure 8.7-3 (Ref. 2). The swing station battery, D305, has been sized to provide an equivalent voltage at each of the four main DC buses. The swing battery chargers and the swing battery allow the normally on-line battery chargers and batteries to be removed from service for maintenance or testing that can not be performed with the equipment on-line.

Each 125 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E distribution subsystems.

The batteries are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. Battery size is based on 125% of required capacity. The voltage limit is 2.13 V per cell; however, to ensure that the battery is maintained in a charged state, the charger voltage is maintained greater than 129.8 V for batteries D05 and D06 (59 cell batteries), and 132.0 V for batteries D105 and D106 (60 cell batteries). This corresponds to a minimum nominal cell voltage of 2.20 V per cell. ~~minimum cell voltage is 2.17 V per cell, which corresponds to a minimum voltage of 128 V for batteries D05 and D06, and 130.2 V for batteries D105 and D106.~~ The criteria for sizing large lead storage batteries are defined in IEEE-~~450~~ 485 (Ref. ~~6~~3).

Each DC electrical power subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger also has sufficient capacity to restore the battery from the design minimum charge to its fully charged state within 24 hours while supplying normal steady state loads discussed in the FSAR, Chapter 8.7 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 4), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anticorrosion material is used to help ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection. The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR provided visible corrosion is removed during performance of SR 3.8.4.4.

The connection resistance limits for SR 3.8.4.5 shall be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer.

The Surveillance Frequencies of 12 months is consistent with IEEE-450 (Ref. 6), which recommends cell to cell and terminal connection resistance measurement on a yearly basis.

SR 3.8.4.6

[*Existing first section moved to next paragraph*]This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32 (Ref. 7), the battery charger supply is ~~required~~ recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure~~s~~ that these requirements can be satisfied.

This SR provides two options. One option requires that battery chargers D-07, D-08, and D-09 be capable of supplying ~~203~~ 320 amps at the minimum established float voltage ~~125 V~~ for ≥8 hours, and battery chargers D-107, D-108, and D-109 be capable of supplying ~~273~~ 420 amps at the minimum established float voltage ~~125 V~~ for ≥8 hours. The~~se~~ ampere and voltage requirements are based on the design capacity of the chargers (Ref. 2). The amperage requirements are based on the chargers' maximum current limit with a 30 amp margin to the respective chargers' current limit setpoint. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

The other option requires that each battery charger be capable of recharging the battery after a service test, coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the battery service test and may need to be supplemented with additional loads. The duration for this test may be longer than the charger design capacity test discussed in the first option since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is ≤ 2 amps.

SR 3.8.4.7

A battery service test is a special test of battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length should correspond to the design duty cycle requirements as specified in Reference ~~1~~2.

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 7) and Regulatory Guide 1.129 (Ref. 8).

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note which allows the performance of a modified performance discharge test in lieu of a service test~~once per 60 months~~.

The modified performance discharge test is a simulated duty cycle consisting of just two rates; the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test. [*This paragraph is moved to the Bases for SR 3.8.4.8 as indicated therein (after the paragraph below)*]

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test. [*This paragraph is moved to SR 3.8.4.8 (before above)*]

SR 3.8.4.8

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

~~A battery modified performance discharge test is described in the Bases for SR 3.8.4.7.~~ Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.8 while satisfying the requirements of SR 3.8.4.7 at the same time.

[*Insert specified items from SR 3.8.4.7*]

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 6) and IEEE-485 (Ref. 3). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery

BASES

SURVEILLANCE REQUIREMENTS (continued)

rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

The Surveillance Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 6), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 6).

REFERENCES

1. FSAR. Chapter 8.0.
2. FSAR. Chapter 8.7.
3. IEEE-485-1978.
4. FSAR. Chapter 14.
5. Regulatory Guide 1.93, December 1974.
6. IEEE-450-1987.
7. Regulatory Guide 1.32, February 1977.
8. Regulatory Guide 1.129, December 1974.

ENCLOSURE 5

REVISED TECHNICAL SPECIFICATION PAGES

LICENSE AMENDMENT REQUEST 239

TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS

SR 3.8.4.6 AND SR 3.8.4.7, DC SOURCES – OPERATING

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

(7 pages follow)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. OR Verify battery connection resistance is within limits.	92 days
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	12 months
SR 3.8.4.4	Remove visible terminal corrosion, and verify battery cell to cell and terminal connections are coated with anti-corrosion material.	12 months
SR 3.8.4.5	Verify battery connection resistance is within limits.	12 months
SR 3.8.4.6	Verify battery chargers D-07, D-08, and D-09 each supply ≥ 320 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours, and battery chargers D-107, D-108, and D-109 each supply ≥ 420 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours. OR Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.7	-------------------------NOTES------------------------- The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of SR 3.8.4.7. -- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	 18 months
SR 3.8.4.8	Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	60 months <u>AND</u> 12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating <u>AND</u> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources-Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital instrument bus power (via inverters). As required by the Point Beach Design Criteria (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The safety-related 125 VDC system consists of four main distribution buses: D01, D02, D03, and D04, in addition to two swing buses (D301 and D302) each capable of supplying one of the four 125 VDC buses.

Each of the four main distribution buses is powered by a battery charger (D07, D08, D107 and D108) and a station battery (D05, D06, D105, and D106). The function of the battery chargers is to supply their respective DC loads, while maintaining the batteries at full charge. All of the battery chargers are powered from the 480 VAC Engineered Safety Feature (ESF) system.

The battery chargers are interlocked such that a loss of offsite power will disconnect the battery chargers from their 480 VAC source. A coincident safety injection signal would prevent restoration of the battery chargers unless offsite power is restored to the safeguards buses. This limits the loading on the standby emergency power supply during the period immediately following a safety injection signal. During this period, the 125 VDC loads are supplied by their associated station battery until such time as power to the chargers is restored.

Two swing battery chargers are available through one of the swing DC distribution buses. Swing charger D09 is connected to swing DC distribution bus D301 and can provide a source of DC power to distribution buses D01 or D02. Likewise, swing charger D109 is connected to swing DC distribution bus D302 and can provide a source of DC power to distribution buses D03 or D04. In addition, there exists a swing safety-related battery D305 which is connected to swing DC distribution bus D301. This swing battery is capable of being aligned to any one of the four main distribution buses to take the place of the normal battery. Interlocks exist on swing DC distribution buses D301 and D302 which prevent the paralleling of redundant DC buses.

The station batteries have been sized to carry their expected shutdown loads following a plant trip/LOCA and loss of offsite power, or following

BASES

BACKGROUND (continued)

a station blackout for a period of one hour, without battery terminal voltage falling below 105 volts (for battery considerations) and while maintaining voltage at the fed components sufficient for them to operate. Load profiles for batteries D05, D06 and D305 are shown in FSAR Figure 8.7-2 and for batteries D105 and D106 in FSAR Figure 8.7-3 (Ref. 2). The swing station battery, D305, has been sized to provide an equivalent voltage at each of the four main DC buses. The swing battery chargers and the swing battery allow the normally on-line battery chargers and batteries to be removed from service for maintenance or testing that can not be performed with the equipment on-line.

Each 125 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E distribution subsystems.

The batteries are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. Battery size is based on 125% of required capacity. The voltage limit is 2.13 V per cell; however, to ensure that the battery is maintained in a charged state, the charger voltage is maintained greater than 129.8 V for batteries D05 and D06 (59 cell batteries), and 132.0 V for batteries D105 and D106 (60 cell batteries). This corresponds to a minimum nominal cell voltage of 2.20 V per cell. The criteria for sizing large lead storage batteries are defined in IEEE-485 (Ref. 3).

Each DC electrical power subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger also has sufficient capacity to restore the battery from the design minimum charge to its fully charged state within 24 hours while supplying normal steady state loads discussed in the FSAR, Chapter 8.7 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 4), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the standby emergency power sources, emergency auxiliaries, and control and switching during all MODES of operation.

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SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anticorrosion material is used to help ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection. The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR provided visible corrosion is removed during performance of SR 3.8.4.4.

The connection resistance limits for SR 3.8.4.5 shall be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer.

The Surveillance Frequencies of 12 months is consistent with IEEE-450 (Ref. 6), which recommends cell to cell and terminal connection resistance measurement on a yearly basis.

SR 3.8.4.6

This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32 (Ref. 7), the battery charger supply is recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensures that these requirements can be satisfied.

This SR provides two options. One option requires that battery chargers D-07, D-08, and D-09 be capable of supplying 320 amps at the minimum established float voltage for 8 hours, and battery chargers D-107, D-108, and D-109 be capable of supplying 420 amps at the minimum established float voltage for 8 hours. The ampere and voltage requirements are based on the design capacity of the chargers (Ref. 2). The amperage requirements are based on the chargers' maximum current limit with a 30 amp margin to the respective chargers' current limit setpoint. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

The other option requires that each battery charger be capable of recharging the battery after a service test, coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these

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SURVEILLANCE REQUIREMENTS (continued)

demands occur). This level of loading may not normally be available following the battery service test and may need to be supplemented with additional loads. The duration for this test may be longer than the charger design capacity test discussed in the first option since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is ≤ 2 amps.

SR 3.8.4.7

A battery service test is a special test of battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length should correspond to the design duty cycle requirements as specified in Reference 2.

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 7) and Regulatory Guide 1.129 (Ref. 8).

This SR is modified by a Note which allows the performance of a modified performance discharge test in lieu of a service test.

SR 3.8.4.8

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.8 while satisfying the requirements of SR 3.8.4.7 at the same time.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

The modified performance discharge test is a simulated duty cycle consisting of just two rates; the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test

SURVEILLANCE REQUIREMENTS (continued)

rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 6) and IEEE-485 (Ref. 3). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

The Surveillance Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 6), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 6).

REFERENCES

1. FSAR. Chapter 8.0.
2. FSAR. Chapter 8.7.
3. IEEE-485-1978.
4. FSAR. Chapter 14.
5. Regulatory Guide 1.93, December 1974.
6. IEEE-450-1987.
7. Regulatory Guide 1.32, February 1977.
8. Regulatory Guide 1.129, December 1974.