XU Energy
omanche Peak Steam
lectric Station
.O. Box 1002 (E01)
ilen Rose, TX 76043
el: 254 897 8920
ax: 254 897 6652
ince.terry@txu.com

C. Lance Terry
Senior Vice President &
Principal Nuclear Officer

Ref: 10CFR50.90

CPSES-200300266
Log # TXX-03026
File # 00236

June 6, 2003

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
LICENSE AMENDMENT REQUEST (LAR) 02-06
REVISION TO TECHNICAL SPECIFICATIONS ASSOCIATED
WITH DC ELECTRICAL POWER SYSTEMS

REF: Technical Specifications Task Force (TSTF) Standard Technical Specification (TS) Change Traveler TSTF-360, Revision 1, "DC Electrical Rewrite"

Gentlemen:

Pursuant to 10 CFR 50.90, TXU Generation Company LP (TXU Energy) hereby requests an amendment to the CPSES Unit 1 Operating License (NPF-87) and CPSES Unit 2 Operating License (NPF-89) by incorporating the attached changes to the CPSES Unit 1 and 2 Technical Specifications (TS). These changes would apply to both units.

This License Amendment Request (LAR) proposes changes to TS Section 3.8.4, "DC Sources - Operating," TS Section 3.8.5, "DC Sources - Shutdown," and TS Section 3.8.6, "Battery Cell Parameters," and adds a new TS Section 5.5.19 Administrative Controls program for the maintenance and monitoring of the station safety-related batteries that is based on the recommendations of Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995. Upon approval, corresponding changes will be made to the associated TS Bases sections and are included here for information. The changes proposed in this amendment request are in accordance with

D029

those provided in NRC approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-360, Revision 1 (Reference 1), "DC Electrical Rewrite," and incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants," except where modified primarily to account for plant-specific differences. A table summarizing the differences between TSTF-360, Revision 1, and those proposed in this LAR is provided for reviewer information. Further, the changes proposed in this LAR are consistent with similar changes approved by the NRC for Clinton Power Station Unit 1 in Amendment 142 to Facility Operating License No. NPF-62, "Clinton Power Station, Unit 1 - Issuance of Amendment (TAC No. MB3071)," dated February 15, 2002. They are also consistent with changes approved for Byron Station Units 1 and 2 in Amendment No. 129 to Facility Operating License Nos. NPF-37 and NPF-66 and Braidwood Station Units 1 and 2 in Amendment No. 124 to Facility Operating License Nos. NPF-72 and NPF-77, "Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2 - Issuance of Amendments (TAC NOS. MB4450, MB4451, MB4448, AND MB4449)," dated September 19, 2002.

This LAR proposes changes that would adopt the current NUREG-1431, Revision 2, Standard Technical Specifications model for the DC Electrical Power Subsystems. These changes would provide new Conditions and Required Actions allowing inoperable DC subsystem batteries and battery chargers to be addressed separately. The proposed changes would also provide new actions for the restoration of inoperable battery chargers, as well as provide alternate battery charger testing criteria.

Changes are also proposed that would reorganize and revise the TS associated with the monitoring and maintenance of the station batteries. These changes include the addition of specific Required Actions and Surveillance Requirements associated with out-of-limits conditions for battery cell float voltage, float current (in lieu of specific gravity monitoring), electrolyte level, and electrolyte temperature, and the relocation of battery maintenance and monitoring activities to owner-controlled programs based on the recommendations of industry standard IEEE 450-1995. These changes would provide for better control of these requirements, assure that each battery is maintained at acceptable levels of performance, allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function, and allow the TS to focus on parameter value degradations that approach levels that may impact battery operability.

In summary, the proposed changes would provide increased operational flexibility and allow more efficient application of plant resources to safety significant activities.

TXU Energy is submitting this license amendment request in conjunction with an industry consortium of six plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The STARS group consists of the six plants operated by TXU Energy, Union Electric Company, Wolf Creek Nuclear Operating Corporation, Pacific Gas and Electric Company, STP Nuclear Operating Company, and Arizona Public Service Company.

Comanche Peak is the lead STARS plant for this amendment request. Diablo Canyon will also submit a similar License Amendment Request in parallel with this LAR. The parallel submittal of these LARs is intended to reduce the overall NRC resources required to evaluate and approve the requests. As an aid to the reviewers, brackets have been included in the Description and Assessment, Enclosure 1, to indicate where differences exist between the lead plant submittal and the parallel STARS group license amendment request. The submittal cover letter and the proposed TS Bases changes are each plant-specific.

Enclosure 1 to this LAR provides a detailed description of the proposed changes, a technical analysis of the proposed changes, a significant hazard consideration, a regulatory analysis of the proposed changes, and an environmental evaluation. Enclosure 2 provides the affected TS pages with marked-ups to reflect the proposed changes. Enclosure 3 provides the affected TS Bases pages marked-up to reflect the corresponding changes to the Bases. TS Bases changes are provided for reviewer information and will be implemented pursuant to TS 5.5.14, "Technical Specifications Bases Control Program." Enclosure 4 provides a retyped (clean copy) of the affected TS pages. Enclosure 5 provides retyped TS Bases pages which incorporate the proposed changes. Enclosure 6 provides a table of plant-specific LAR differences from the changes provided in TSTF-360, Revision 1. Enclosure 7 is a single line diagram of the CPSES 125 Volt DC System.

The changes requested by this LAR are not required to address an immediate safety concern. TXU Energy requests approval of the proposed License Amendment by June 1, 2004 and that it become effective upon NRC issuance, with implementation to follow within 60 days from the date of issuance.

In accordance with 10CFR50.91(b), TXU Energy is providing the State of Texas with a copy of this proposed amendment.

This communication contains the following new commitment to be implemented following NRC approval of the License Amendment Request:

Commitment Number	**Description**
27277	A "Battery Monitoring and Maintenance Program" will be implemented to control the items relocated from current TS Table 3.8.6-1, "Battery Cell Parameters Requirements," and the relocated Surveillance Requirement (SR) activities from TS 3.8.4 that perform preventive maintenance on the safety-related batteries. The Battery Monitoring and Maintenance Program will be based on the recommendations of Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," and will implement the requirements of new TS Administrative Controls Program 5.5.19.

The commitment number is used by TXU Energy for internal tracking of CPSES commitments.

Should you have any questions, please contact Mr. M. J. Riggs at (254) 897-5218.

I state under penalty of perjury that the foregoing is true and correct.

Executed on June 6, 2003.

Sincerely,

TXU Generation Company LP

By: TXU Generation Management Company LLC
Its General Partner

C. L. Terry
Senior Vice President and Principal Nuclear Officer

MJR/mr

Enclosures
1. Description and Assessment
2. Markup of Technical Specifications Pages
3. Markup of Technical Specifications Bases pages (for information)
4. Retyped Technical Specification Pages
5. Retyped Technical Specification Bases Pages (for information)
6. Table of Differences between the Plant-Specific Proposed Changes and TSTF-360, Revision 1 (for information)
7. Simplified Single Line Diagram of the CPSES 125 Volt DC Electric System

c - T. P. Gwynn, Region IV (w/o encl.)
W. D. Johnson, Region IV (w/o encl.)
D. H. Jaffe, NRR
Resident Inspectors, CPSES (w/o encl.)

Mr. Authur C. Tate (w/o encl.)
Bureau of Radiation Control
Texas Department of Public Health
1100 West 49th Street
Austin, Texas 78704

ENCLOSURE 1 to TXX-03026

DESCRIPTION AND ASSESSMENT

LICENSEE'S EVALUATION

1.0 DESCRIPTION

TXU Energy requests an amendment to the CPSES Unit 1 Operating License (NPF-87) and CPSES Unit 2 Operating License (NPF-89). The proposed amendment will revise the CPSES Unit 1 and 2 Technical Specifications (TS) Section 3.8.4, "DC Sources - Operating," TS Section 3.8.5, "DC Sources - Shutdown," and TS Section 3.8.6, "Battery Cell Parameters," and add a new subsection 5.5.19, "Battery Monitoring and Maintenance Program," to TS Section 5.0 Administrative Controls which is based on the recommendations of Institute of Electrical and Electronics Engineers (IEEE) Standard 450, 1995.

The proposed changes provide new Conditions and Required Actions allowing inoperable DC subsystem batteries and battery chargers to be addressed separately. The proposed changes also provide new actions for the restoration of inoperable battery chargers, as well as provide alternate battery charger testing criteria.

In addition, changes are proposed that revise the TS associated with the monitoring and maintenance of the station batteries. These included the addition of specific Required Actions and Surveillance Requirements associated with out-of-limits conditions for battery cell float voltage, float current (in lieu of specific gravity monitoring), electrolyte level, and electrolyte temperature, and the relocation of battery maintenance and monitoring activities to a new program based on the recommendations of IEEE 450-1995. These changes will provide for better control of these requirements, assure that each battery is maintained at acceptable levels of performance, allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function, and allow the TS to focus on parameter value degradations that approach levels that may impact battery operability.

The proposed changes are based on NRC-approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-360, Revision 1, "DC Electrical Rewrite," as incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants," dated June 2001. A table of plant-specific differences from the proposed changes approved in TSTF-360, Revision 1, is provided in Enclosure 6.

As a result of this License Amendment Request and for consistency with the commitment to IEEE-450-1995, the CPSES Final Safety Analysis Report will be revised to reflect the updated TS Bases reference change from IEEE-485-1978 to IEEE-485-1983.

2.0 PROPOSED CHANGES

The following is a list summarizing the overall proposed changes to the DC Electrical Power Systems TS. For ease of reference, this list is numbered to correspond with the list of changes provided in TSTF-360, Revision 1, and is referred to throughout this section.

(1) Provide new Conditions and Required Actions specific to the battery chargers and batteries in each DC electrical power subsystem.
(2) Relocate preventive maintenance type Surveillance Requirements to licensee-controlled programs.
(3) Add alternate criteria for battery charger testing.
(4) Replace battery specific gravity monitoring with float current monitoring.
(5) Relocate the following to a licensee controlled program based on IEEE-450, and/or to the TS Bases, including:
    (a) Category A and B limits for battery cell float voltage and electrolyte level, along with the associated compensatory actions;
    (b) Category C specific value limit for electrolyte level;
    (c) The specific value limit for electrolyte temperature; and
    (d) Specific value for the minimum battery charging float voltage, and
    (e) New TS Administrative Control Program [5.5.19] to reference actions for cell voltage and electrolyte level.
(6) Add specific Required Actions and increased Completion Times for out-of-limits conditions for battery cell float voltage, float current, electrolyte level, and electrolyte temperature and the associated SRs.
(7) Provide enhanced Bases for the proposed changes.
(8) Eliminate the "once per 60 month" restriction on replacing the battery service test with the battery modified performance test.

Additional administrative, renumbering, and editorial type changes are also associated with the above list of proposed changes and include:

(9) Move SR 3.8.4.8 to TS Section 3.8.6 on battery operability.
(10) Delete the reference to "Cell" from Section Headings of LCO 3.8.6.

The following paragraphs describe the proposed changes as they apply to individual TS Sections 3.8.4 "DC Sources – Operating," TS 3.8.5 "DC Sources – Shutdown," TS 3.8.6 "Battery Cell Parameters," and TS Section 5.0 Administrative Controls.

TS 3.8.4 "DC Sources – Operating"

Proposed Change (1)

New Conditions and their associated Required Actions are added to TS LCO 3.8.4. These Conditions and Required Actions will provide compensatory actions specific to the battery chargers and batteries in each DC electrical power subsystem.

a) New TS 3.8.4 Condition A addresses the condition where [one or two required battery chargers] in one DC electrical power subsystem become inoperable. Required Actions are proposed that provide a tiered response that focuses on returning the [one or two batteries affected by the one or two inoperable required chargers in the same train] to the fully charged state and restoring a fully qualified charger [for each associated battery] to operable status in a reasonable time.

   TS 3.8.4 Required Action A.1 requires that the battery terminal voltage [associated with each inoperable required battery charger] be restored to greater than or equal to the minimum established float voltage within two 2 hours.

   TS 3.8.4 Required Action A.2 requires verification that the battery float current [associated with each inoperable required battery charger] be less than or equal to 2 amps [once per 12 hours].

   The final TS 3.8.4 Required Action A.3 limits the restoration time for the [one or two inoperable required battery chargers on the same train] to [7 days].

b) New TS 3.8.4 Condition B is added to address the condition where [one or two batteries] in one DC electrical power subsystem become inoperable. The associated Required Action B.1 to restore the [affected battery or batteries in the same train] to operable status is unchanged from the actions necessary to meet the current TS 3.8.4 Required Action A.1, to restore the inoperable DC electrical power subsystem to operable status within 2 hours.

c) The current TS 3.8.4 Conditions A and B are renumbered to reflect the addition of the proposed two new Conditions discussed above, and the current TS 3.8.4 Condition A (i.e., new TS 3.8.4 condition C) is clarified by adding the stipulation "for reasons other than Condition A or B."

Proposed Change (2)

Preventative maintenance type Surveillance Requirements SR 3.8.4.2, SR 3.8.4.3, SR 3.8.4.4, and SR 3.8.4.5 are relocated to licensee-controlled programs based on IEEE-450 practices.

Proposed Change (3)

Alternate battery charger acceptance criteria is added to current SR 3.8.4.6 which is renumbered to be SR 3.8.4.2. This change allows an actual in-service demonstration that the charger can recharge the associated 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.

Proposed Change (5 d)

Surveillance Requirement SR 3.8.4.1 is revised to "Verify battery terminal voltage is greater than or equal to the minimum established float voltage." The current SR 3.8.4.1 specific value of "≥ [128] V" while on float charge will be relocated to the TS Bases.

[Surveillance Requirement SR 3.8.4.6 (renumbered to be SR 3.8.4.2) is revised to refer to the "minimum established charger test voltage" value that will be relocated to the TS Bases similar to the proposed change to SR 3.8.4.1.]

Proposed Change (8)

TSTF-360, Revision 1, includes a proposed change to NOTE 1 of SR 3.8.4.7 (renumbered to be SR 3.8.4.3) that would eliminate the "once per 60 month" restriction on replacing the battery service test with the battery modified performance discharge test. However, this specific TSTF-360 change is not included in this submittal because it has been previously incorporated in SR 3.8.4.7 by [Amendment 75 to the CPSES Technical Specifications].

Proposed Change (9)

The current SR 3.8.4.8, which is a test of battery capacity, is moved to its associated TS Section 3.8.6 on "Battery Parameters," and renumbered to be SR 3.8.6.6.

Renumbering changes to TS 3.8.4

SR 3.8.4.6 is renumbered to be SR 3.8.4.2, and SR 3.8.4.7 is renumbered to be SR 3.8.4.3 due to the relocation of the preventative maintenance type SRs from TS as describe in Proposed Change (2). Similarly, the references to SR 3.8.4.8 and SR 3.8.4.7 in NOTE 1 accompanying current SR 3.8.4.7 are renumbered to be SR 3.8.6.6 and SR 3.8.4.3, respectively.

TS 3.8.5 "DC Sources – Shutdown"

Proposed Change (1)

[TSTF-360, Revision 1, includes changes to TS LCO 3.8.5 that are similar to those in Proposed Change (1) to TS 3.8.4. These changes would add new Conditions and Required Actions specific to inoperable battery chargers during shutdown conditions. However, in accordance with the "Reviewer's Note" provided for LCO 3.8.5 in NUREG-1431, Revision 2, the option to adopt this change to LCO 3.8.5 does not apply to plants having a pre-ITS licensing basis for electrical power requirements during shutdown conditions that required only one DC electrical power subsystem to be operable. Because CPSES, at the time of its conversion to the Improved Standard Technical Specifications (ITS) by Amendment 64, retained its pre-ITS licensing basis that requires only one DC electrical power subsystem to be operable during shutdown conditions, the changes to LCO 3.8.5 included in TSTF-360, Revision 1, are not applicable to CPSES and are not included in this submittal.]

Renumbering changes to TS 3.8.5

Current SR 3.8.5.1 is revised to delete references to the Surveillance Requirements (SRs) relocated from TS 3.8.4 and to update the references contained in the NOTE accompanying SR 3.8.5.1 to correspond to the renumbering changes made in TS 3.8.4.

TS 3.8.6 "Battery Cell Parameters"

Proposed Change (4)

The proposed change replaces the current TS 3.8.6 and Table 3.8.6-1 battery specific gravity monitoring activities and limits with float current monitoring by adding new TS 3.8.6 Condition B and new SR 3.8.6.1.

Proposed Changes (5 a, b, c, d, and e)

The current TS Table 3.8.6-1 specific Category A and B limits for electrolyte level and float voltage, along with their associated compensatory actions, the Category C specific limiting value for electrolyte level, and the specific limiting value for pilot cell electrolyte temperature from the current SR 3.8.6.3, are relocated to licensee-controlled programs based on IEEE-450-1995. The Category C specific value for the minimum battery charging float voltage is relocated to the TS Bases. The associated compensatory actions for battery cell float voltage and electrolyte level not within limits are specified by new TS [5.5.19] administrative control program requirements to be included in a licensee-controlled program based on the recommendations of IEEE-450-1995 or the battery manufacturer. (Category A, B, and C limits on specific gravity are replaced with float current monitoring requirements as described in Proposed Change (4).)

Proposed Change (6)

New Conditions are added to TS LCO 3.8.6 to provide compensatory actions for a specific abnormal battery condition. The proposed changes provide specific Required Actions and increased Completion Times for out-of-limit conditions for cell float voltage, float current, electrolyte level, and electrolyte temperature.

a) TS 3.8.6 Condition A is added to address the condition where [one or two batteries] on one DC electrical power subsystem have one or more battery cells with float voltage less than 2.07 V.

b) TS 3.8.6 Condition B is added to address the condition where [one or two batteries] on one DC electrical power subsystem have float current greater than 2 amps.

c) TS 3.8.6 Condition C is added to address the condition where [one or two batteries] on one DC electrical power subsystem have one or more battery cells with electrolyte level less than the minimum established design limits.

d) TS 3.8.6 Condition D is added to address the condition where [one or two batteries] on one DC electrical power subsystem have pilot cell electrolyte temperature less than the minimum established design limits.

e) TS 3.8.6 Condition E is added to address the condition where [one or more batteries] in redundant DC electrical power subsystems have battery parameters not within limits.

f) Current TS 3.8.6 Condition B is renumbered to Condition F. The current Condition B consists of three separate entry conditions. As part of this proposed change, the last two entry conditions of one or more batteries found with an average electrolyte temperature of less than [70°F], or one or more batteries found with battery cell parameters not within Category C limits, are replaced with a new condition requiring entry when [one or two batteries] on one DC electrical power subsystem have one or more battery cells with float voltage of less than 2.07 V and float current greater than 2 amps.

Also, current Surveillance Requirements SR 3.8.6.1, SR 3.8.6.2, and SR 3.8.6.3 are replaced by new surveillance requirements:

SR 3.8.6.1	Verify each battery float current is ≤ 2 amps.	Frequency: 7 days
SR 3.8.6.2	Verify each battery pilot cell voltage is ≥ 2.07 V.	Frequency: 31 days
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.	Frequency: 31 days

SR 3.8.6.4	Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.	Frequency: 31 days
SR 3.8.6.5	Verify each battery connected cell voltage is ≥ 2.07 V.	Frequency: 92 days

Proposed Change (10)

To reflect the above changes, the word "Cell" is deleted from TS 3.8.6 and the Limiting Condition for Operation (LCO) is revised to delete its reference to Table 3.8.6-1, "Battery Cell Parameters Requirements," which is also deleted.

TS Administrative Controls Section 5.5.19

Proposed Change (5 e)

A new TS [5.5.19] administrative controls program requirement is added to reference actions for battery cell float voltage and electrolyte level and to create a TS "Battery Monitoring and Maintenance Program." This program will provide for restoration and maintenance actions consistent with the recommendations of IEEE Standard 450-1995, or of the battery manufacturer.

In addition, the mark-up of the TS Section [5.5.19] administrative control program description provided by TSTF-360, Revision 1, is modified in this submittal by substituting the phrase "below the top of the plates" in paragraph b. for required actions for battery cells discovered with electrolyte level "below the minimum established design limit."

The mark-up of the TS Section [5.5.19] administrative control program description provided by TSTF-360, Revision 1, is also modified in this submittal by removing the specific reference to the version (year) of IEEE-450. This modification to the proposed change is reasonable based on the specific commitment to IEEE-450-1995 that is provided in this amendment request, and that the committed to version of IEEE-450-1995 is included as a specific reference in the revised Bases. This modification to the proposed Battery Monitoring and Maintenance Program description is consistent with the TSTF Response to NRC Comment #4 on TSTF-360, Revision 0, dated August 11, 2000, which is included in TSTF-360, Revision 1, as Attachment 3. This change will allow for future programmatic upgrades to approved standards without necessitating a License amendment.

Enhanced Bases for the proposed changes

Proposed Change (7)

The proposed changes to TS 3.8.4, TS 3.8.5, and TS 3.8.6 and the accompanying Bases sections incorporate the information and descriptions provided in TSTF-360, Revision 1, as applicable to the plant-specific configuration. The DC Electrical Systems Bases has undergone revisions to include substantial information and basis in support of the proposed changes to the specifications. Enclosure 3 provides the affected TS Bases pages marked-up to reflect the corresponding changes to the Bases. Enclosure 5 provides retyped TS Bases pages which incorporate the proposed changes. The revised Bases sections are provided for information. Changes to the associated Bases will be implemented pursuant to TS 5.5.14, Technical Specifications Bases Control Program.

3.0 BACKGROUND

3.1 Bases for the Current Requirements

TS 3.8.4 "DC Sources – Operating"

[The 125 VDC electrical power system for each unit consists of two independent and redundant safety-related Class 1E DC electrical power subsystems (Train A and Train B). Each subsystem (train) consists of two 125 VDC batteries, the associated battery chargers for each battery, and all the associated control equipment and interconnecting cabling. There are two 100% capacity battery chargers per battery. Normally one charger is operating and the other is kept as spare. A single line diagram of the CPSES 125 V DC system is contained in Enclosure 7.

During normal operation, the 125 VDC loads are powered from the battery chargers with the batteries floating on the system. In case of a loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

The Train A and Train B DC electrical power subsystems provide the control power for its associated Class 1E AC power loads fed from 6.9 kV switchgear, and 480 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses.

The batteries for Train A and Train B DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life and the 100% design demand. Battery size is based on battery end of life capacity at 80% of nameplate rating. The selected battery capacity is in excess of required capacity. The float charge voltage limit of the batteries is 2.13 V per cell, which corresponds to a total minimum voltage output of 128 V per battery discussed in the FSAR, Chapter 8. The criteria for sizing large lead storage batteries are defined in IEEE-485-1978, "Recommended Practice for Sizing Large Lead Acid Storage Batteries for Generating Stations and Substations."

125 VDC batteries of each subsystem (train) are 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 subsystems, such as batteries, battery chargers, or distribution panels.

Each Train A and Train B 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, Section 8.3.2.1, "D-C Power System, Description."

The DC electrical power subsystems are required to be operable to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an Anticipated Operational Occurrence (AOO) or a postulated Design Basis Accident (DBA). Loss of any one train DC electrical power subsystem does not prevent the minimum safety function from being performed. An operable DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es). (Refer to the following Table 1, "DC Sources," from current Bases Table 3.8.4-1, for the specific DC Electrical Subsystem configuration requirements.)

Table 1 "DC Sources"

TRAIN A		TRAIN B	
125 V DC Bus 1ED1(2ED1) Energized From Battery BT1ED1(BT2ED1) and Battery Charger BC1ED1-1 (BC2ED1-1) or BC1ED1-2 (BC2ED1-2)	125 V DC Bus 1ED3(2ED3) Energized From Battery BT1ED3(BT2ED3) and Battery Charger BC1ED3-1 (BC2ED3-1) or BC1ED3-2 (BC2ED3-2)	125 V DC Bus 1ED2(2ED2) Energized From Battery BT1ED2(BT2ED2) and Battery Charger BC1ED2-1 (BC2ED2-1) or BC1ED2-2 (BC2ED2-2)	125 V DC Bus 1ED4(2ED4) Energized From Battery BT1ED4(BT2ED4) and Battery Charger BC1ED4-1 (BC2ED4-1) or BC1ED4-2 (BC2ED4-2)

Equipment numbers listed in parentheses ( ) are for Unit 2.]

TS 3.8.5 "DC Sources – Shutdown"

[One DC electrical power subsystem consisting of two batteries, at least one full capacity battery charger per battery, and the corresponding control equipment and interconnecting cabling within the train, is required to be operable to support one train of the distribution systems required operable by LCO 3.8.10, "Distribution Systems - Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

The required DC electrical power distribution subsystem is supported by one train of DC electrical power system. When the second DC electrical power distribution train (subsystem) is needed to support redundant required systems, equipment and components, the second Train may be energized from any available source. The available source must be Class 1E or another reliable source. The available source must be capable of supplying sufficient DC electrical power such that the redundant components are capable of performing their specified safety function(s) (implicitly required by the definition of operability). Otherwise, the supported components must be declared inoperable and the appropriate conditions of the LCOs for the redundant components must be entered.]

TS 3.8.6 "Battery Cell Parameters"

TS 3.8.6 delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC power source batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for TS 3.8.4, "DC Sources - Operating," and TS 3.8.5, "DC Sources Shutdown."

Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even when Category A and B limits are not met.

The battery cell parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery OPERABILITY is only required when the DC power source is required to be OPERABLE. Refer to the Applicability discussion in the Bases for TS 3.8.4 and TS 3.8.5.

3.2 Need for Revision of the Requirements

The current TS for the DC electrical power subsystem does not contain a separate Action for an inoperable battery. The changes proposed in this amendment request are in accordance with those provided in NRC approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-360, Revision 1, "DC Electrical Rewrite," and incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants." The changes provide new actions for the restoration of an inoperable battery charger and an inoperable battery, as well as alternate battery charger testing criteria. These changes are being proposed to support performance of periodic on-line battery charger maintenance and post-maintenance testing. This potentially reduces demands on plant refueling outages, improving battery charger availability during shutdown.

The proposed changes also provide for the relocation of battery maintenance and monitoring activities to owner-controlled programs based on the recommendations of IEEE 450-1995. This will provide for better control of these requirements, assure that each battery is maintained at acceptable levels of performance, allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function, and allow the TS to focus on parameter value degradations that approach levels that may impact battery operability.

Overall, these changes will provide increased operational flexibility and allow more efficient application of plant resources to safety significant activities.

4.0 TECHNICAL ANALYSIS

4.1 TS Changes

The following subsections provide an analysis of the proposed changes.

Proposed Change (1) New Conditions and Required Actions for battery chargers and batteries

a) [The current TS 3.8.4 Condition A applies to "One DC electrical power subsystem inoperable." Required Actions in response to DC electrical power subsystem inoperabilities are the same regardless of whether the DC subsystem is inoperable as the result of a battery charger, a battery, or the entire subsystem without DC power.] To allow for a range of possible degradations to the DC subsystem, the proposed change revises the current TS 3.8.4 format to add two new Conditions; Condition A that is specific to [one or two required battery chargers on one train] inoperable, and Condition B that is specific to [one or two batteries on one train] inoperable.

The proposed wording of new TS 3.8.4 Condition A, ["One or two required battery chargers on one train inoperable," incorporates the bracketed plant specific wording recommended in TSTF-360, Revision 1, and adds the term "required" to reflect the current CPSES plant specific design and licensing basis. The phrase "one or two required" is used to describe the possible combinations of inoperable required battery chargers in one DC subsystem (train) that in either case would result in the same DC subsystem inoperable. The proposed new Condition A for one or two required battery chargers is thus equivalent to the current TS 3.8.4 DC electrical power subsystem Condition A requirements for inoperable battery chargers in the same train, wherein one of the two fully qualified battery chargers associated with each battery is required operable and in service for each of the two batteries that together comprise one train of DC electrical power.]

[The current TS 3.8.4 Condition A Completion Time limits the restoration time for an inoperable DC electrical power subsystem to 2-hours based on Regulatory Guide 1.93, "Availability of Electric Power Sources." Consequently, the current Completion Time limits restoration time for an inoperable battery charger to the same time as for an inoperable battery or for a de-energized DC electrical power distribution subsystem. The primary role of the battery charger is in support of maintaining the operability of its associated battery. This is accomplished by the charger being of sufficient size to carry the normal steady state DC loads, with sufficient additional capacity to provide some minimal over-potential to the associated battery. Also, a secondary safety significant function can be attributed to carrying the post-accident DC load after restoration of AC power (typically 10-13 seconds, the time required for the EDG to tie on to its emergency bus). In analyzed post-accident scenarios, there is no safety related criteria for recharging a fully discharged battery in any specific time period.

The proposed new TS 3.8.4 Condition A adds new Required Actions and Completion Times that would allow a reasonable time of [7] days to restore the inoperable required battery charger [or chargers] in one DC electrical power subsystem to operable status, while: a) focusing efforts on retaining battery capabilities; b) continuing to require full charger operability that is based on the margin afforded in the design capacity of the battery charger and consistent with the current basis for charger operability; and c) complying with the 2-hour restoration time for a deenergized DC electrical distribution subsystem, as provided in TS 3.8.9. This time is contingent on a focused and tiered approach to assuring adequate battery capability is maintained.

In the event of an inoperable battery charger, the first priority for the operator is to minimize the associated battery discharge. The proposed TS 3.8.4 Required Action A.1 ensures that the associated battery discharge is terminated within 2 hours by requiring that battery terminal voltage be restored to a value greater than or equal to the battery minimum established float voltage within 2 hours. This assumes that the batteries are still capable of performing their required function. During this 2 hours, if the affected train batteries were not capable of performing their required function, the other train is available to perform the required function. The time allows for restoring the inoperable required battery charger or for providing an alternate means of restoring battery terminal voltage to a value greater than or equal to the minimum established float voltage. Since the focus of the proposed allowance is that battery capacity be preserved and assured, the means of accomplishing this is left to plant capabilities. In most cases, a spare battery charger would be employed within the initial 2-hours, in other cases other means, including a degraded normally in service battery charger, can continue to float the battery. Presuming that the associated battery discharge, if it had been occurring, is terminated and that the associated DC bus remains energized, as required by separate LCO 3.8.9, then there is reasonable basis for extending the allowed restoration time for a required inoperable battery charger beyond the 2-hour limit of the first tier Required Action A.1 to the proposed [7] days.

The second tier TS 3.8.4 Required Action A.2 proposes that within 12-hours that it be established that the associated battery has sufficient capacity to perform its assumed duty cycle as measured by float current less than or equal to 2 amps. This allows time for some recharging of lost capacity that may have occurred during the initial 2 hours. A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion of its recharge cycle. The time to return a battery to its fully charged state under this condition is a function of the amount of the previous discharge and the recharge characteristic of the battery. In this condition, there is good assurance of fully recharging the battery within the proposed 12 hours. [The affected battery float current would continue to be verified less than or equal 2 amps every 12 hours until the required battery charger is restored to operable status.]

The third tier TS 3.8.4 Required Action A.3 would provide [7] days for the required battery chargers in one DC electrical power subsystem be restored to operable status. Given the choice between a required plant shutdown in this condition, as per current requirements, versus an allowance for a 12 hour determination period, at the end of which it is reasonable to conclude that the associated battery can be shown to have its assumed capacity, followed by a [7-day] restoration period, the proposed change is an acceptable relaxation to the existing specification.

b) The proposed wording of new TS 3.8.4 Condition B, ["One or two batteries on one train inoperable," similarly incorporates the plant specific wording recommended in TSTF-360, Revision 1, to describe the possible combinations of either one or both inoperable batteries on one train that in either case would result in the associated DC subsystem inoperable.]

The proposed new TS 3.8.4 Condition B is added to separately address the condition of [one or two batteries] in one DC electrical power subsystem inoperable. For an inoperable battery, the associated DC bus is being supplied by its associated battery charger. Any event that results in a loss of the AC bus supporting the associated battery charger will also result in a loss of DC power to the loads fed from the affected DC bus. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed, and diesel generator output circuit breakers, etc) may rely upon one of the batteries of the affected DC subsystem. The proposed Completion Time for restoration of the inoperable batteries is unchanged from the existing 2-hour limit for restoration of the DC electrical power subsystem (even assuming the required charger associated with each battery is operable) and allows sufficient time to effect restoration of the inoperable [one or two batteries in one train], given that the majority of the conditions that lead to battery inoperability (e.g., loss of the associated battery charger or battery cell voltages less than 2.07 V) are identified, along with specific actions and completion times, in the DC Electrical Power Systems TS Sections 3.8.4, 3.8.5, and 3.8.6.

c) The current TS 3.8.4 Condition A is renumbered to Condition C and revised to "One DC electrical power subsystem inoperable for reasons other than Condition A or B." Because the combined scope of the proposed new and revised Conditions is the same as currently addressed by TS 3.8.4 Condition A, the proposed change to reformat the existing Condition A is considered editorial. The 2-hour Completion Time for new Condition C is unchanged from the current TS 3.8.4 Condition A Completion Time which is based on Regulatory Guide 1.93, "Availability of Electrical Power Sources."

   Consistent with the above changes, the current TS 3.8.4 Condition B is also renumbered to new Condition D. This change is an editorial change.

Proposed Change (2) Relocation of preventive maintenance Surveillance Requirements to a licensee-controlled program

In accordance with SR 3.0.1, when any SR is not met, the LCO is not met. This is based on the premise that SRs represent the minimum acceptable requirements for operability of the required equipment. However, for current SR 3.8.4.2, SR 3.8.4.3, SR 3.8.4.4, and SR 3.8.4.5, failure to meet the SR does not necessarily mean that the equipment is not capable of performing its safety function, and the corrective action is generally a routine or preventive maintenance activity. For example, the Bases of SR 3.8.4.4 identify removal of visible corrosion and tightening of terminal connections as a preventive maintenance SR. SR 3.8.4.3, requiring visible inspection for physical damage or deterioration that could potentially degrade battery performance, is not required for the battery to perform its safety function, but again reflects ongoing preventive maintenance activities. Although excessive corrosion or loose terminals could impact battery operability, the maintenance activities will prevent degradation which could affect battery operability. These activities are inappropriate for Operability SRs and are generally better controlled under the maintenance programs for batteries. With regard to the resistance verifications of SR 3.8.4.2 and SR 3.8.4.5, the values are nominal values and represent values at which some action should be taken, not necessarily when the operability of the battery is in question. The safety analyses do not assume a specific battery resistance value, but typically assume the batteries will supply adequate power. Therefore, the key issue is the overall battery resistance. Between surveillances, the resistance of each connection varies independently from all the others. Some of these connection resistances may be higher or lower than others, and the battery may still be able to perform its function and should not be considered inoperable solely because one connector's resistance is high. Overall resistance is a direct impact on operability and is adequately determined as acceptable through completion of the battery service and discharge tests. Therefore, these activities are more appropriately controlled under the maintenance program for batteries. Furthermore, these surveillances are recommended by IEEE Standard 450, and as such, will continue to be addressed by the plant program based on IEEE-450 practices that is being committed to with the adoption of these changes (but not detailed by the new TS Section 5.0 Program).

The new Battery Monitoring and Maintenance Program described in proposed TS Section [5.5.19] is discussed under Proposed Change (5 e).

The proposed changes also include renumbering of the SRs remaining in TS Section 3.8.4 and revising current SR 3.8.5.1 to similarly renumber the references to the TS Section 3.8.4 SRs. These changes are editorial and do not alter the existing requirements.

<u>Proposed Change (3)</u> Addition of alternate testing criteria for battery charger testing

SR 3.8.4.6 (renumbered to be SR 3.8.4.2) requires verification of specific parameters for battery charger performance testing. This test is intended to confirm the charger design capacity. Alternate acceptance criteria are proposed that allow an actual in-service 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. This meets the intent of the existing test and allows for a normal in-place demonstration of the charger capability thereby minimizing the time when the charger would be disconnected from the DC bus.

<u>Proposed Change (4)</u> Replacement of battery specific gravity monitoring with float current monitoring

This change proposes to replace the requirements of current TS 3.8.6 battery specific gravity monitoring with new TS 3.8.6 conditions and surveillance requirements utilizing a suitable operability limit based on float current monitoring to ensure the battery state-of-charge is sufficient to perform its design duty cycle. This has been the focus of significant discussions within the IEEE-450 committee and the NRC technical staff. Due to the technical nature of the rationale, specific justification has been drafted to address this change. TSTF-360, Revision 1, provides this justification in Attachment 1, "Battery Primer," and Attachment 2, "White Paper by Kyle Floyd." These Attachments to TSTF-360 and the details included in the proposed Bases provide the justification supporting this change. In summary, the justification discusses the use of battery float current as an indicator of full charge and the charging characteristics of lead-acid batteries. It concludes that the level of charge may be evaluated by measuring current at a specific voltage, typically the float voltage in normal operation, and that at low float voltage, 2 amps is appropriate for cells with 8 hour capacities of 1000 AH or larger.

Proposed Change (5) Relocate the following to a licensee controlled program based on IEEE-450, and/or to the TS Bases

(a) Category A and B limits for battery cell float voltage and electrolyte level, along with the associated compensatory actions

Current TS Table 3.8.6-1 contains Categories of limitations on battery cell float voltage, electrolyte level, and specific gravity parameters. The Category A and B limits reflect nominal fully charged battery parameter values. Significant margin above that required for declaration of an operable battery is provided in these values. These Category A and B values represent appropriate monitoring levels and appropriate preventive maintenance level for long term battery quality and extended battery life. As such, they do not reflect the 10 CFR 50.36, "Technical specifications," criteria for LCOs of the "the lowest functional capability or performance levels of equipment required for the safe operation of the facility." This change proposes that these values and the actions associated with restoration be relocated to a licensee controlled program that is under the control of 10 CFR 50.59, "Changes, tests, and experiments." This program complies with the recommendations of IEEE-450, 1995. The battery parameter values will continue to be controlled at an acceptable level, and required remedial actions will be implemented in accordance with the plant corrective action program. Furthermore, the batteries and their preventive maintenance and monitoring are under the regulatory requirements of the Maintenance Rule, 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants." This relocation will continue to assure the batteries are maintained at acceptable levels of performance, and allow the TS to focus on battery parameter degradations that approach levels that may impact battery operability.

(b) Category C specific value limit for electrolyte level, and
(c) The specific value limit for electrolyte temperature

These changes propose that the specific limiting values from current TS 3.8.6 Condition B and Table 3.8.6-1 for battery electrolyte temperature and level be relocated to a licensee-controlled program that is under the control of 10 CFR 50.59. New TS 3.8.6 Conditions C and D will require the electrolyte temperature and level to be greater than or equal to minimum established design limits. Depending on the available excess capacity of the

associated battery, the minimum temperature necessary to support operability of the battery can vary. As such, these values do not reflect the 10 CFR 50.36 criteria for LCOs of "the lowest functional capability or performance levels of equipment required for safe operation of the facility," and relocation to a licensee controlled program will allow the flexibility to monitor and control this limit at values directly related to the battery's ability to perform its assumed function.

(d) Specific value for the minimum battery charging float voltage

This change proposes to relocate the current TS Table 3.8.6-1 specific Category A and B limit of "[2.13] Volts" for the minimum operating battery float voltage for each connected cell, to the revised TS Bases for SR 3.8.4.1 which is subject to the change control requirements of 10 CFR 50.59. Correspondingly, the minimum battery terminal voltage of "≥ [128] V on float charge", which is the equivalent of [2.13] Volts per cell for a 60 cell battery, is relocated to the TS Bases for SR 3.8.4.1 and the surveillance requirement revised to "Verify battery terminal voltage is greater than or equal to the minimum established float voltage." Similarly, TS 3.8.4 Condition A is revised to require the battery charger to supply battery terminal voltage greater than or equal to the "minimum established float voltage."

[SR 3.8.4.6 (renumbered to SR 3.8.4.2) is also revised to require the minimum battery charger surveillance test voltage to be greater than or equal to the "minimum established charger test voltage." The existing SR 3.8.4.6 battery charger surveillance test voltage value will be relocated to the TS Bases for SR 3.8.4.2. The charger test voltage is a CPSES plant specific value greater than or equal to the minimum established float voltage.]

Consistent with the recommendations of IEEE Standard 450-1995, the "minimum established float voltage" is established based on the battery manufacturer's recommendations to ensure the battery is maintained fully charged with sufficient over potential to maintain the battery plates in a condition that supports maintaining the grid life of the battery cells. As such, the minimum established float voltage does not reflect the 10 CFR 50.36 criteria for LCOs of "the lowest functional capability or performance levels of equipment required for safe operation of the facility," and can be adequately controlled outside of the TS.

(e) New TS Administrative Control Program [5.5.19] to reference actions for cell voltage and electrolyte level

This change proposes that the TS 3.8.6 Actions related to the following two parameters be specified by a new Administrative Controls program TS [5.5.19], "Battery Monitoring and Maintenance Program." This program complies with the recommendations of IEEE Standard 450-1995, and include actions to (1) restore battery cells with float voltage < 2.13 V, and (2) equalize and test battery cells that had been discovered with electrolyte level below the top of the plates.

Paragraph b. of the new TS [5.5.19] administrative controls program description provided in TSTF-360, Revision 1, is modified in this submittal for required actions for battery cells discovered with electrolyte level below the "minimum established design limit." The phrase "below the top of the plates" is substituted for consistency with IEEE-450-1995, Annex D, section D.1. This change is appropriate because the recommended actions of IEEE-450 include that an equalizing charge be performed if electrolyte level is below the top of the plates, while the minimum established design limit is a level which is above the top of the plates.

The specific reference to the version of IEEE-450 is not included in the TS [5.5.19] program description to allow future programmatic upgrades to approved standards without necessitating a License amendment. CPSES is presently committed to IEEE-450-1995 as documented in the TS Bases. Changes to the TS Bases are evaluated in accordance with the provisions of 10 CFR 50.59, "Changes, tests, and experiments." Thus, adequate control over changes to the applicable IEEE Standard 450 exists to allow the specific IEEE-450 reference to be contained in the TS Bases. Eliminating the "year" reference to the applicable IEEE Standard 450 in the TS and maintaining it in the TS Bases is consistent with similar changes previously approved by the NRC in Amendment No. 129 to Facility Operating License No. NPF-37 and Amendment No. 129 to Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively, and Amendment No. 124 to Facility Operating License No. NPF-72 and Amendment No. 124 to Facility Operating License No. NPF-77 for the Braidwood Station, Unit Nos. 1 and 2, in letter "Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2 - Issuance of Amendments (TAC NOS. MB4450, MB4451, MB4448, AND MB4449)," dated September 19, 2002 and in TSTF-363, "Revise Topical Report references in ITS 5.6.5, COLR."

<u>Proposed Change (6)</u> Addition of specific Required Actions and increased Completion Times for out-of-limits conditions for battery cell float voltage, float current, electrolyte level, and electrolyte temperature and the associated SRs

New TS 3.8.6 specific Required Actions are proposed for parameters that have a unique impact on the battery and its continued operability. The proposed change provides specific TS 3.8.6 Required Actions and increased Completion Times for out-of-limit conditions for cell voltage, float current, electrolyte level, and electrolyte temperature. These allowed times recognize the margins available, the minimal impact on the battery capacity and the capability to perform its intended function, and the likelihood of effecting restoration in a timely fashion avoiding an unnecessary plant shutdown. In addition, SRs are proposed to verify that the batteries are maintained within the established limitations.

The bases for the specific TS 3.8.6 Required Actions, Completion Times, and Surveillance Requirements are as follows:

a) New TS 3.8.6 Condition A addresses a condition where [one or two batteries in a specific train] have one or more battery cells with float voltage less than 2.07 V. If a battery cell is found to be less than 2.07 V, the battery cell must be considered degraded. This is consistent with the recommendations of IEEE-450 which states that a cell voltage of 2.07 V (typical for nominal 1.215 specific gravity cells) or below under float conditions and not caused by elevated temperature of the cell indicates internal cell problems and may require cell replacement. Cell voltage by itself, however, is not an indication of the state of charge of the battery. A cell parameter slightly outside of specification is an indication of an insignificant or small loss of capability and is not intended to reflect battery inoperability. Hence, verification within 2 hours of the required battery charger operability by monitoring the battery terminal voltage (i.e., performance of SR 3.8.4.1), and determining the overall battery state of charge by monitoring the battery float charge current (i.e., performance of SR 3.8.6. 1), is considered a reasonable allowed time to complete these actions and assure that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries being less than 2.07 V, and continued operation is permitted for a limited period up to 24 hours. 24 hours is considered a reasonable time to effect restoration of the out-of-limit condition.

b) New TS 3.8.6 Condition B addresses a condition where a battery is found with a float current of greater than 2 amps, and indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours, verification of the required battery charger operability is made by monitoring the battery terminal voltage (i.e., performance of SR 3.8.4.1). If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. If the battery charger is found to be inoperable, LCO 3.8.4 Condition A would be entered. If the battery charger is operating in the current limit mode after 2 hours, this is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of previous discharge, and the recharge characteristic of the battery. Because the charge time can be extensive, and if there is not adequate assurance that it can be recharged within the 12 hours allowed by Required Action B.2, the battery must therefore be declared inoperable.

c) New TS 3.8.6 Condition C addresses a condition where a battery is found with the electrolyte level in one or more cells to be less than the minimum established design limits. With the electrolyte level in one or more cells found above the top of the battery plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days, the minimum established design limits for electrolyte level must be restored in order to restore its margin.

With electrolyte level below the top of the plates a potential exists for dryout and plate degradation. TS 3.8.6 Required Actions C.1 and C.2 restore the level and ensure that the cause of the loss of electrolyte level is not due to a leak in the battery casing. These actions are only required if the level in the battery is found below the top of the battery plates.

In addition, the Battery Monitoring and Maintenance Program described in the proposed TS Section [5.5.19] will require actions, consistent with IEEE Standard 450-1995, to equalize and test battery cells that have been discovered with an electrolyte level below the top of the plates.

d) New TS 3.8.6 Condition D addresses the condition where a battery is found with a pilot cell electrolyte temperature less than the minimum established design limits. A low electrolyte temperature limits the current and power available from the battery. However, since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended functions. Therefore, the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met, and the proposed 12 hours provides a reasonable time to restore the temperature within established limits.

e) New TS 3.8.6 Condition E addresses the condition where one or more batteries in redundant trains are found with battery parameters not within established design limits. Given that batteries in redundant subsystems are involved in this condition, there is not sufficient assurance that overall battery capacity has not been affected to the degree that the batteries can still perform their required function. With redundant DC electrical power subsystem batteries involved, this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer completion times specified for battery parameters when only the battery or batteries on one DC electrical power subsystem are not within limits are therefore not appropriate, and the parameters must be restored to within limits in at least one DC electrical power subsystem (train) within 2 hours.

f) New TS 3.8.6 Condition F revises current Condition B to address the condition where Required Actions for Condition A, B, C, D, or E are not met. Given this condition, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding battery must be declared inoperable. Additionally, upon discovering [one or more batteries in one train] with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps indicates that battery capacity may not be sufficient to perform the intended functions and the corresponding battery must be declared inoperable immediately.

New SR 3.8.6.1 will require verification of each battery float current to be less than or equal to 2 amps every 7 days, and is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. The use of float current to determine the state of charge of the battery and the 7-day frequency for performance of this verification is consistent with IEEE Standard 450-1995.

New SR 3.8.6.2 and SR 3.8.6.5 verify that the float voltage of pilot cells and all connected cells, respectively, are equal to or greater than the short term absolute minimum voltage of 2.07 V, representing the point where battery operability is in question. Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to a minimum established float voltage, which is established and controlled in accordance with the proposed Battery Monitoring and Maintenance Program specified in TS Section [5.5.19]. The Battery Monitoring and Maintenance Program will provide necessary actions if the battery is found at a float voltage less than the minimum established float voltage but greater than the short term absolute minimum voltage of 2.07 V. The Frequency for cell voltage verification every 31 days for pilot cells and 92 days for each connected cell is consistent with IEEE Standard 450-1995.

SR 3.8.6.3 verifies the connected cell electrolyte level of each battery to be greater than or equal to minimum established design limits established in the proposed Battery Monitoring and Maintenance Program provided in TS Section [5.5.19]. Operation of the batteries at electrolyte levels greater than the minimum established design limit ensures that the plates do not suffer physical damage and continue to maintain adequate electron transfer capability. The Frequency of every 31 days is consistent with IEEE Standard 450-1995.

SR 3.8.6.4 verifies the temperature of each battery pilot cell to be greater than or equal to the minimum established design limits established in the proposed Battery Monitoring and Maintenance Program provided in TS Section [5.5.19]. Maintaining the electrolyte temperature above this level ensures that the battery can provide the required current and voltage to meet the design requirements, since temperatures lower than assumed in the battery sizing calculations act to inhibit or reduce the overall battery capacity. The Frequency of every 31 days is consistent with IEEE Standard 450-1995.

<u>Proposed Change (7)</u> Enhanced Bases for the proposed changes

The accompanying Bases section for the proposed changes to TS 3.8.4, TS3.8.5, and TS 3.8.6 are provided here for information. The Bases sections have been revised to incorporate the information and discussion presented in TSTF-360, Revision 1, with the exceptions noted and described previously in this Enclosure. Changes to the associated Bases will be implemented pursuant to TS 5.5.14, Technical Specifications Bases Control Program.

Proposed Change (8) Elimination of the "once per 60 month" restriction on replacing the battery service test with the battery modified performance test

[TSTF-360, Revision 1, includes a proposed change to NOTE 1 of SR 3.8.4.7 (renumbered to be SR 3.8.4.3) that would eliminate the "once per 60 month" restriction on replacing the battery service test with the battery modified performance discharge test. However, this specific TSTF-360 change is not included in this submittal because it has been previously incorporated in SR 3.8.4.7 by Amendment 75 to the CPSES Technical Specifications.]

Proposed Change (9) Move of SR 3.8.4.8 to TS Section 3.8.6 on battery operability

This proposed change is an administrative change that will move current surveillance requirement SR 3.8.4.8, which is a test of battery capacity, to be directly associated with TS Section 3.8.6 on Battery Parameters, which defines the operability requirements of the DC electrical power system batteries. The proposed change is acceptable because movement of this SR does not alter the test requirements or test performance frequency. Failure to satisfy the test will be addressed by the conditions and required actions of DC electrical power subsystem TS LCOs 3.8.4, 3.8.5 and 3.8.6.

Proposed Change (10) Deletion of the reference to "Cell" in LCO 3.8.6

This proposed change to TS LCO 3.8.6 is an editorial change. This LCO is intended to require and define the operability requirements of the DC electrical power subsystem batteries, and is not limited to Battery Cell Parameters or performance.

4.2 Summary

The proposed changes to the DC electrical power subsystems specifications TS 3.8.4, TS 3.8.5, and TS 3.8.6, and the addition of new TS administrative control program [5.5.19] requirements for a "Battery Maintenance and Monitoring Program" based on the recommendations of Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, are consistent, except for noted plant-specific difference, with the considerations and proposed changes provided in NRC-approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-360, "DC Electrical Rewrite", Revision 1, as incorporated in recently issued NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 2. Each of these proposed changes have been evaluated and determined not to adversely affect nuclear safety or continued safe plant operations.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

TXU Energy has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed change affects TS sections 3.8.4 "DC Sources – Operating," TS 3.8.5 "DC Sources – Shutdown," TS 3.8.6 "Battery Cell Parameters," and TS Administrative Controls section 5.5.

The proposed change restructures the TS for the DC electrical power subsystem and adds new Conditions and Required Actions with increased Completion Times to address battery charger inoperability. Neither the DC electrical power subsystem nor associated battery chargers are initiators of any accident sequence analyzed in the updated Final Safety Analysis Report (FSAR). Operation in accordance with the proposed TS ensures that the DC electrical power subsystem is capable of performing its function as described in the FSAR, therefore the mitigative functions supported by the DC electrical power subsystem will continue to provide the protection assumed by the analysis.

The relocation of preventive maintenance surveillance, and certain operating limits and actions to a newly-created, licensee-controlled TS [5.5.19], "Battery Monitoring and Maintenance Program," will not challenge the ability of the DC electrical power subsystem to perform its design function. The maintenance and monitoring required by current TS, which are based on industry standards, will continue to be performed. In addition, the DC electrical power subsystem is within the scope of 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which will ensure the control of maintenance activities associated with the DC electrical power subsystem.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change does not involve any physical alteration of the units. No new equipment is being introduced, and installed equipment is not being operated in a new or different manner. There are no setpoints at which protective or mitigative actions are initiated that are affected by the proposed changes. The operability of the DC electrical power subsystem in accordance with the proposed TS is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant. These proposed changes will not alter the manner in which equipment operation is initiated, nor will the function demands on credited equipment be changed. No alteration in the procedures, which ensure the unit remains within analyzed limits, is proposed, and no change is being made to procedures relied upon to respond to an off-normal event. As such, no new failure modes are being introduced. The proposed changes do not alter assumptions made in the safety analyses.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The proposed change will not adversely affect operation of plant equipment and will not result in a change to the setpoints at which protective actions are initiated. Sufficient DC capacity to support operation of mitigation equipment is ensured. The changes associated with the new Battery Maintenance and Monitoring Program will ensure that the station batteries are maintained in a highly reliable manner. The equipment fed by the DC electrical system will continue to provide adequate power to safety related loads in accordance with analysis assumptions.

Therefore, the proposed changes do not involve a significant reduction in the margin of safety.

Based on the above evaluation, TXU Generation Company LP concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10CFR50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50, Appendix A, General Design Criteria (GDC) 17, "Electric power systems"

NRC Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," March 10, 1971

NRC Regulatory Guide 1.32, Revision 2,"Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," dated February 1977

[NRC Regulatory Guide 1.75, Revision 1, "Physical Independence of Electric Systems," dated January 1975]

NRC Regulatory Guide 1.129, Revision 1, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants," dated February 1978

IEEE 308-1974, "Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations"

IEEE-450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications"

Analysis

The CPSES design of the Class 1E 125-VDC systems is in accordance with the requirements of GDC-17, GDC-18, NRC Regulatory Guides 1.6, 1.32, [1.75] and IEEE 308.

Redundant power supplies and equipment satisfy GDC 17 for a single failure.

The overall system design including function requirements, redundancy, capacity, and availability is in conformance with IEEE 308 criteria for Class 1E systems with the exception of battery performance discharge test intervals which is in accordance with IEEE 450-1995. The battery charger supply capacity is in accordance with Regulatory Guide 1.32.

Periodic inspection and testing of the DC systems are performed to monitor the condition of the equipment to ensure reliable operation. Visual inspections, liquid level, specific gravity, and cell voltage checks, and performance discharge tests are performed at regular intervals on each battery. Maintenance and testing procedures and criteria for replacement are in accordance with IEEE 450-1995, and Regulatory Guide 1.129. Visual checks and performance tests are also scheduled for the battery chargers. The periodic tests of Class 1E DC equipment are performed to satisfy the requirements of GDC 18 and 21.

The proposed changes to the DC Electrical Power Systems specifications remain consistent with the applicable regulatory requirements by continuing to require full charger operability that is based on the margin afforded in the design capacity of the battery charger and to verify that the batteries are maintained within the established limitations to ensure that the batteries have sufficient capacity to perform the assumed duty cycle.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

TXU Energy has determined that the proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area, as defined in 10CFR20, or would change an inspection or surveillance requirement. TXU Energy has evaluated the proposed changes and has determined that the changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amount of effluent that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22 (c)(9). Therefore, pursuant to 10CFR51.22 (b), an environmental assessment of the proposed change is not required.

7.0 REFERENCES

1. Industry/Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-360, Revision 1, "DC Electrical Rewrite," dated November 3, 2000 (including Attachment 1, "Battery Primer For Nuclear Power Plants," dated 01/07/2000, Attachment 2, "Kyle Floyd White Paper, A proposed Method for Selecting the Return to Service Current Limit for Safety-Related Batteries, Draft C for SCC-29 Meeting," dated 3/29/2000, Attachment 3, "Forwarding Response to Battery TSTF Proposal," dated 9/18/2000, and Attachment 4, "Response to NEI Comments (9/18/00) on Revised Version of TSTF-360 (Battery TS)," dated 10/18/2000)

2. Industry/Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-204, Revision 3, "Revise DC Sources - Shutdown and Inverters - Shutdown to Address Specific Subsystem Requirements," approved January 10, 2000

3. Industry/Technical Specification Task Force Standard Technical Specification Change Traveler TSTF-363, Revision 0, "Revise Topical Report references in ITS 5.6.5, COLR," approved April 13, 2000

4. NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants," dated June 2001

5. Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix A, General Design Criteria (GDC) 17, "Electric power systems"

6. Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," dated March 10, 1971

7. Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," Revision 2, dated February 1977

8. Regulatory Guide 1.129, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants," dated [February 1978]

9. IEEE Standard 308-[1974], "Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations"

10. IEEE Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," dated 1995

11. IEEE Standard 485-1983, "IEEE Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations," dated [June 1983]

12. NRC letter "Conversion to Improved Technical Specification for Comanche Peak Steam Electric Station, Units 1 and 2 - Amendment No. 64 to Facility Operating License Nos. NPF-87 and NPF-89 (TAC Nos. M98778 and M98779)," dated February 26, 1999

13. Comanche Peak Steam Electric Station Final Safety Analysis Report, Docket Nos. 50-445 and 50-446

14. Letter from J. M. Heffley (AmerGen, An Exelon/British Energy Company) to USNRC, "Clinton Power Station, Unit 1 – Request for Amendment to Technical Specifications Associated With DC Electrical Power," dated August 21, 2001

15. Letter from J. B. Hopkins (NRC) to O. D. Kingsley (Exelon Generation Company, LLC), "Clinton Power Station, Unit 1 – Issuance of Amendment," dated February 15, 2002

16. Letter from K. R. Jury (Mid-West Regional Operating Group) to USNRC, "Braidwood Station / Byron Station - Request for License Amendment for Technical Specifications - DC Electrical Power Systems," dated March 8, 2002

17. Letter from NRC, "Byron Station, Units 1 and 2, and Braidwood Station, Unit 1 and 2 - Issuance of Amendments (TAC NOS. MB4450, MB4451, MB4448, AND MB4449)," dated September 19, 2002

8.0 PRECEDENTS

The changes proposed in this LAR are consistent with similar changes previously requested by AmerGen Energy Company, LLC, for Clinton Power Station Unit 1, in the letter "Clinton Power Station, Unit 1 – Request for Amendment to Technical Specifications Associated With DC Electrical Power," dated August 21, 2001 and approved by the NRC in Amendment 142 to Facility Operating License No. NPF-62 for Clinton Power Station Unit 1, "Clinton Power Station, Unit 1 - Issuance of Amendment (TAC No. MB3071)," dated February 15, 2002.

Also, the changes proposed in this LAR are consistent with similar TSTF-360, Revision 1, changes previously requested by Exelon Generation Company, LLC, for Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2 in the letter "Request for License Amendment for Technical Specifications - DC Electrical Power Systems," dated March, 8 2002 and approved by the NRC in Amendment No. 129 to Facility Operating License No. NPF-37 and Amendment No. 129 to Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively, and Amendment No. 124 to Facility Operating License No. NPF-72 and Amendment No. 124 to Facility Operating License No. NPF-77 for the Braidwood Station, Unit Nos. 1 and 2, "Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2 - Issuance of Amendments (TAC NOS. MB4450, MB4451, MB4448, AND MB4449)," dated September 19, 2002.

This LAR requests to eliminate the "year" reference to the applicable IEEE Standard 450 in the new TS [5.5.19] Battery Monitoring and Maintenance Program and maintain the year reference in the TS Bases. This exception to the TSTF-360, Revision 1, Westinghouse Owners Group TS markup inserts was approved for Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2 in the NRC letter dated September 19, 2002.

ENCLOSURE 2 to TXX-03026

PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)

Pages 3.8-24
3.8-25
3.8-26
3.8-27
3.8-27a
3.8-28
3.8-29
3.8-30
3.8-30a
3.8-30b
3.8-31
3.8-31a
3.8-31b
3.8-32
3.8-33
5.0-28a

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources — Operating

LCO 3.8.4 The Train A and Train B DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or two required battery chargers on one train inoperable.	A.1	Restore affected battery(ies) terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	A.2	Verify affected battery(ies) float current ≤ 2 amps.	Once per 12 hours
	AND		
	A.3	Restore required battery charger(s) to OPERABLE status.	7 days
B. One or two batteries on one train inoperable.	B.1	Restore affected battery(ies) to OPERABLE status.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
AC. One DC electrical power subsystem inoperable for reasons other than Condition A or B.	AC.1	Restore DC electrical power subsystem to OPERABLE status.	2 hours
BD. Required Action and Associated Completion Time not met.	BD.1	Be in MODE 3.	6 hours
	AND		
	BD.2	Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ~~≥ 128 V on float charge~~ greater than or equal to the minimum established float voltage.	7 days

(continued)

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 ≤ 150x10^{-6} ohm for inter-cell connections, ≤ 150x10^{-6} ohm for inter-rack connections, ≤ 150x10^{-6} ohm for inter-tier connections, and ≤ 150x10^{-6} ohm for terminal connections.	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.	18 months
SR 3.8.4.4	Remove visible terminal corrosion, verify battery cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	18 months
SR 3.8.4.5	Verify battery connection resistance is ≤ 150x10^{-6} ohm for inter-cell connections, ≤ 150x10^{-6} ohm for inter-rack connections, ≤ 150x10^{-6} ohm for inter-tier connections, and ≤ 150x10^{-6} ohm for terminal connections.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.62	Verify each battery charger supplies ≥ 300 amps at ~~≥ 130 V~~ greater than or equal to the minimum established ~~float~~ charger test 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
SR 3.8.4.73	-----NOTES----- 1. The modified performance discharge test in SR 3.8.4.86.6 may be performed in lieu of ~~the service test in~~ SR 3.8.4.73. 2. Verify requirement during MODES 3, 4, 5, 6 or with core off-loaded. ----- 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

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
<< MOVE TO TS SECTION 3.8.6 >>		
SR 3.8.4.8	---NOTE--- Verify requirement during MODES 3, 4, 5, 6 or with core off loaded. --- 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 AND 18 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating AND 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The Train A or Train B DC electrical power subsystem shall be OPERABLE to support one train of the DC electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystems inoperable.	A.1 Declare affected required feature(s) inoperable.	Immediately
	<u>OR</u>	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	<u>AND</u>	
	A.2.3 Initiate action to suspend operations involving positive reactivity additions.	Immediately
	<u>AND</u>	
		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2.4	Initiate action to restore required DC electrical power subsystem to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	------------------------------NOTE------------------------------ The following SRs are not required to be performed: SR 3.8.4.~~6~~2~~,~~ and SR 3.8.4.~~7~~3~~, and SR 3.8.4.8~~. -- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 ~~SR 3.8.4.4~~ ~~SR 3.8.4.7~~ SR 3.8.4.2 ~~SR 3.8.4.5~~ ~~SR 3.8.4.8.~~ SR 3.8.4.3. ~~SR 3.8.4.6~~	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery ~~Cell~~ Parameters

LCO 3.8.6 Battery ~~cell~~ parameters for Train A and Train B batteries shall be within ~~the~~ limits ~~of Table 3.8.6-1~~.

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each battery.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two batteries on one train with one or more battery cells float voltage < 2.07 V.	A.1 Perform SR 3.8.4.1	2 hours
	AND	
	A.2 Perform SR 3.8.6.1	2 hours
	AND	
	A.3 Restore affected cell(s) float voltage ≥ 2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps.	B.1 Perform SR 3.8.4.1	2 hours
	AND	
	B.2 Restore affected battery(ies) float current to ≤ 2 amps.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
---NOTE--- Required Action C.2 shall be completed if electrolyte level was below the top of plates.	---NOTE--- Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates.	
C. One or two batteries on one train with one or more cells electrolyte level less than minimum established design limits.	C.1 Restore affected cell(s) electrolyte level to above the top of the plates.	8 hours
	AND	
	C.2 Verify no evidence of leakage.	12 hours
	AND	
	C.3 Restore affected cell(s) electrolyte level to greater than or equal to minimum established design limits.	31 days
D. One or two batteries on one train with pilot cell electrolyte temperature less than minimum established design limits.	D.1 Restore battery pilot cell(s) electrolyte temperature to greater than or equal to minimum established design limits.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more batteries in redundant trains with battery parameters not within limits.	E.1 Restore battery parameters for batteries in one train to within limits.	2 hours
~~A. One or more batteries with one or more battery cell parameters not within Category A or B limits.~~	~~A.1 Verify pilot cell electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.~~	~~1 hour~~
	~~AND~~	
	~~A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits.~~	~~24 hours~~ ~~AND~~ ~~Once per 7 days thereafter~~
	~~AND~~	
	~~A.3 Restore battery cell parameters to Category A and B limits of Table 3.8.6-1.~~	~~31 days~~

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
BF. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two batteries on one train with one or more battery cells float voltage < 2.07 V and float current > 2 amps. ~~One or more batteries with average electrolyte temperature of the representative cells < 70°F.~~ ~~OR~~ ~~One or more batteries with one or more battery cell parameters not within Category C values.~~	BF.1 Declare associated battery(ies) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	-----NOTE----- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1 ----- Verify each battery float current is ≤ 2 amps.	7 days
SR 3.8.6.2	Verify each battery pilot cell voltage is ≥ 2.07 V.	31 days
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.4	Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.5	Verify each battery connected cell voltage is ≥ 2.07 V.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (Continued)

SURVEILLANCE	FREQUENCY
<< THIS SR MOVED FROM TS SECTION 3.8.4 >>	
SR 3.8.4.86.6 -----NOTE----- Verify requirement during MODES 3, 4, 5, 6 or with core off-loaded. ----- 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 AND 18 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating AND 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating
SR 3.8.6.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (Continued)

SURVEILLANCE	FREQUENCY
~~SR 3.8.6.2 Verify battery cell parameters meet Table 3.8.6-1 Category B limits.~~	~~92 days~~ ~~AND~~ ~~Once within 7 days after a battery discharge < 110 V~~ ~~AND~~ ~~Once within 7 days after a battery overcharge > 150 V~~
~~SR 3.8.6.3 Verify average electrolyte temperature of representative cells is ≥ 70°F.~~	~~92 days~~

Table 3.8.6-1 (page 1 of 1)
Battery Cell Parameters Requirements

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE LIMITS FOR EACH CONNECTED CELL
Electrolyte Level	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 V	≥ 2.13 V	> 2.07 V
Specific Gravity[(b)]	≥ 1.200[(c)]	≥ 1.195 AND Average of all connected cells > 1.205	Not more than 0.020 below average of all connected cells AND Average of all connected cells ≥ 1.195[(c)]

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum during equalizing charges provided it is not overflowing.

(b) Corrected for electrolyte temperature and level. Level correction is not required, however, when battery charging current is < 2 amps when on float charge.

(c) A battery charging current of < 2 amps when on float charge is acceptable for meeting specific gravity limits.

5.5 Programs and Manuals (continued)

5.5.19 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450~~-1995~~, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," or of the battery manufacturer ~~including~~ for the following:

a. Actions to restore battery cells with float voltage < 2.13 V, and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the ~~minimum established design limit~~ top of the plates.

ENCLOSURE 3 to TXX-03026

PROPOSED TECHNICAL SPECIFICATIONS BASES CHANGES (MARK-UP)
(For Information Only)

Pages B3.8-47	Pages B3.8-56
B3.8-48	B3.8-57
B3.8-49	B3.8-58
B3.8-50	B3.8-59
B3.8-51	B3.8-60
B3.8-52	B3.8-61
B3.8-53	B3.8-62
B3.8-54	B3.8-63
B3.8-55	B3.8-64
B3.8-55a	B3.8-65
B3.8-55b	B3.8-66
B3.8-55c	B3.8-66a
B3.8-55d	B3.8-66b
B3.8-55e	B3.8-66c
	B3.8-66d
	B3.8-66e
	B3.8-66f
	B3.8-66g

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources — Operating

BASES

BACKGROUND

The station DC electrical power system provides control power to selected equipment. It also provides both motive and control power to selected safety related equipment and preferred AC vital bus power (via inverters). As required by 10 CFR 50, Appendix A, GDC 17 (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 DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The 125 VDC electrical power system consists of two independent and redundant safety related Class 1E DC electrical power subsystems (Train A and Train B). Each subsystem consists of two 125 VDC batteries, the associated battery chargers for each battery, and all the associated control equipment and interconnecting cabling.

There are two 100% capacity battery chargers per battery. ~~Normally one~~One charger for each battery is required operating and the other is kept as a spare. If the spare battery charger is substituted, then the requirements of independence and redundancy between subsystems are maintained.

During normal operation, the 125 VDC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

The Train A and Train B DC electrical power subsystems provide the control power for its associated Class 1E AC power loads fed from 6.9 kV switchgear, and 480 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses.

The DC power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System — Operating," and LCO 3.8.10, "Distribution Systems — Shutdown."

(continued)

BASES

BACKGROUND (continued)

<< This paragraph is moved further down in this same section. >>

125 VDC batteries of each subsystem (train) are 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 subsystems, such as batteries, battery chargers, or distribution panels.

Each battery has adequate capacity to ~~carry the required load continuously for at least 4 hours as discussed in the FSAR, Chapater 8 (Ref. 4).~~ meet the duty cycle(s) discussed in the FSAR, Chapter 8 (Ref. 4). The battery is designed with additional capacity above that required by the design duty cycle to allow for temperature variations and other factors.

The batteries for Train A and Train B DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity ~~at end of~~ life and the 100% design demand. ~~Battery size is based on battery end of life capacity at 80% of nameplate rating. The selected battery capacity is in excess of required capacity. The float charge voltage limit of the batteries is 2.13 V per cell, which corresponds to a total minimum voltage output of 128 V per battery discussed in the FSAR, Chapter 8 (Ref. 4). The criteria for sizing large lead storage batteries are defined in IEEE-485 (Ref. 5).~~ The minimum design voltage limit is 105/~~210~~ V.

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately ~~120 V for a [58] cell battery (i.e., cell voltage of~~ 2.065 volts per cell (Vpc). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with ~~its open circuit voltage ≥ 2.065 Vpc~~ cell float voltage ≥ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. The battery float charge voltage limit is established as 2.13 V per cell, which corresponds to a total minimum float voltage output of 128 V for a 60 cell battery. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 4).

BASES

Each Train A and Train B DC electrical power subsystem battery charger 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 excess 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 (Ref. 4).

The battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead-calcium batteries have recharge efficiencies of greater than 95%, so once at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 56) and in the FSAR, Chapter 15 (Ref. 67), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources OPERABLE during accident conditions in the event of: a. An assumed loss of all offsite AC power or all onsite AC power; and b. A worst case single failure. The DC sources satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).
LCO	The DC electrical power subsystems, each subsystem consisting of two batteries, a battery charger for each battery and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the train are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Loss of any one train of DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4). An OPERABLE DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es). (Reference Table B 3.8.4-1).
APPLICABILITY	The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that: a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA. The DC electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources — Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1, A.2, and A.3

Condition A represents one train with one or two required battery chargers inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). The ACTIONS provide a tiered response that focus on returning the affected one or two batteries to the fully charged state and restoring a fully qualified charger for each battery to OPERABLE status in a reasonable time period. Required Action A.1 requires that the terminal voltage of the affected battery(ies) be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the required charger(s) to OPERABLE status or providing an alternate means of restoring the associated battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the terminal voltage of the affected battery(ies) to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the affected battery will be restored to its fully charged condition (Required Action A.2) from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If established battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the current-limiting mode, a faulty charger is indicated. A faulty charger that is incapable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during the recovery period following a battery discharge event that the DC system is designed for.

If the charger is operating in the current limit mode after 2 hours that is an indication that the battery is partially discharged and its capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action A.2).

BASES (continued)

Required Action A.2 requires that the affected battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 2 amps, then Condition D is entered as a result of the Required Action and Completion Time not met. At the same time, this indicates there may be additional battery problems. Without adequate assurance that the battery can be recharged within 12 hours, the affected battery must also be declared inoperable and LCO 3.8.4 Condition B entered for the inoperable battery, which is consistent with battery parameter requirements and actions of LCO 3.8.6 (Condition B and F).

Required Action A.3 limits the restoration time for the inoperable required battery charger to 7 days. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The 7 day completion time reflects a reasonable time to effect restoration of the qualified battery charger to operable status.

B.1

Condition B represents one train with one or two batteries inoperable. With one or two batteries inoperable, the affected DC bus(es) are being supplied by their associated OPERABLE battery charger(s). Any event that results in a loss of the AC bus supporting the battery charger(s) will also result in loss of or degraded DC to that train. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers, etc.) likely rely upon DC power being supplied from the batteries. In addition, the energization transients of any DC loads that are beyond the capability of the associated battery charger(s) and normally require the assistance of the batteries will not be able to be brought online. The 2 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

AC.1

Condition CA represents one train with a loss of ability to respond to an event, and a loss of ability to remain energized during normal operation. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the

BASES (continued)

affected train. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system train.

If one of the required DC electrical power subsystems is inoperable ~~(e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery)~~, the other DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure ~~would~~ could, however, result in the ~~complete~~ loss of the ~~other 125 VDC electrical power subsystem with attendant loss of ESF functions,~~ minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 78) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

<u>D~~B~~.1 and D~~B~~.2</u>

If the inoperable DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 78).

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the ~~charging system and the ability of the batteries to perform their intended function.~~ battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger ~~is supplying the~~ supplies a ~~connected loads and~~ continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer. The minimum established float voltage is ~~(~~2.13 Vpc or 128 V at the battery terminals~~)~~. This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). ~~The voltage requirements are based on the nominal design voltage of the battery (voltage per cell ≥ 2.13V) and are consistent with the initial state of charge conditions assumed in the battery sizing calculations.~~ The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 8~~9~~).

~~SR 3.8.4.2~~

~~Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each intercell, interrack, intertier, and terminal connection, provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.~~

~~The Surveillance Frequency for these inspections, which can detect conditions that can cause power losses due to resistance heating, is 92 days. This Frequency is considered acceptable based on operating experience related to detecting corrosion trends.~~

~~SR 3.8.4.3~~

~~Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.~~

~~The presence of physical damage or deterioration does not necessarily represent a failure of this SR, provided an evaluation determines that the physical damage or deterioration does not affect the OPERABILITY of the battery (its ability to perform its design function).~~

BASES

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 anti-corrosion 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.

SR 3.8.4.62

This SR requires that each battery charger be capable of supplying 300 amps and 130 V for ≥ 8 hours. These requirements are based on verifies the design capacity of the battery chargers (Ref. 4). According to Regulatory Guide 1.32 (Ref. 910), 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 ensures that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying 300 amps at the minimum established float charger test voltage of 130 volts or greater for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. 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 combined 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 will need to be supplemented with additional loads. The duration for this test may be longer than the charger sizing criteria 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.

BASES

The Surveillance Frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 18 month intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

SR 3.8.4.73

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 FSAR Chapter 8, (Ref.erence 4).

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.~~7~~3 (continued)

The Surveillance Frequency of 18 months is consistent with the recommendations ~~of~~ Regulatory Guide 1.32 (Ref. 9 ~~10~~) and Regulatory Guide 1.129 (Ref. 10 ~~11~~), which state that the battery service test should be performed during refueling operations or at some other outage, with intervals between tests, not to exceed 18 months.

This SR is modified by two Notes. Note 1 allows the performance of a modified performance discharge test in lieu of a service test.

~~The modified performance discharge test is a simulated duty cycle~~ It may consist~~ing~~ of just two rates; for instance 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~~ must 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.

A modified performance discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load. This will 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 will be identical to those specified for a service test and the test discharge rate will envelope the duty cycle of the service test if the modified perfomance discharge test is performed in lieu of a service test.

Exchange paragraph order, then move both paragraphs to Bases for SR 3.8.4.8 (renumbered to SR 3.8.6.6). Next page.

~~The SR is modified by Note 2.~~ Note 2 says to verify the requirement during MODES 3, 4, 5, 6 or with the core off-loaded. This note does not prohibit the application of LCO 3.0.5 or the performance of this SR to restore equipment operability. Note 2 neither approves nor prohibits testing in MODES 1 and 2; however, for testing that is performed in MODES 1 and 2 (e.g., for post work testing) the testing may not be credited to satisfy the SR. Only the testing performed in MODES 3, 4, 5, 6 or with core off-loaded can be credited to satisfy the SR.

(continued)

BASES

<< Move entire revised Bases for SR 3.8.4.8 to Bases for SR 3.8.6.6. >>

SURVEILLANCE REQUIREMENTS (continued)

Incert two paragraphs moved from Bases for SR 3.8.4.7. (prevous page)

SR 3.8.6.6 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 3.8.6.6 4.8; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.8 while satisfying the battery service test requirements of SR 3.8.4.37 at the same time.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 3 9) and IEEE-485 (Ref. 4 5). 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. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

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 18 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. 9), when the battery capacity drops by more than 10% relative to its average capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. This frequency is consistent with the recommendations in IEEE-450 (Ref. 9).

This SR is modified by a Note. This Note says to verify the requirement during MODES 3, 4, 5, 6 or with the core off-loaded. This note does not prohibit the application of LCO 3.0.5 or the performance of this SR to restore equipment operability. The Note neither approves nor prohibits testing in MODES 1 and 2; however, for testing that is performed in MODES 1 and 2 (e.g., for post work testing) the testing may not be credited to satisfy the SR. Only the testing performed in MODES 3, 4, 5, 6 or with core off-loaded can be credited to satisfy the SR.

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-1974.
4. FSAR, Chapter 8.
~~5. IEEE-485-1978.~~
~~6~~5. FSAR, Chapter 6.
~~7~~6. FSAR, Chapter 15.
~~8~~7. Regulatory Guide 1.93, December 1974.
~~9~~8. IEEE-450-1995.
~~10~~9. Regulatory Guide 1.32, February 1977.
~~11~~10. Regulatory Guide 1.129, February 1978.

Table B 3.8.4-1
DC SOURCES (Page 1 of 1)

TRAIN A		TRAIN B	
125 V DC Bus 1ED1(2ED1) Energized From Battery BT1ED1(BT2ED1) and Battery Charger BC1ED1-1 (BC2ED1-1) or BC1ED1-2 (BC2ED1-2)	125 V DC Bus 1ED3(2ED3) Energized From Battery BT1ED3(BT2ED3) and Battery Charger BC1ED3-1 (BC2ED3-1) or BC1ED3-2 (BC2ED3-2)	125 V DC Bus 1ED2(2ED2) Energized From Battery BT1ED2(BT2ED2) and Battery Charger BC1ED2-1 (BC2ED2-1) or BC1ED2-2 (BC2ED2-2)	125 V DC Bus 1ED4(2ED4) Energized From Battery BT1ED4(BT2ED4) and Battery Charger BC1ED4-1 (BC2ED4-1) or BC1ED4-2 (BC2ED4-2)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources — Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources — Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 5 and 6 ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

In addition to the requirements established by the technical specifications, the plant staff must also manage shutdown tasks and electrical support to maintain risk at an acceptably low value.

As required by the technical specifications, one train of the required equipment during shutdown conditions is supported by one train of AC

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	and DC power and distribution. The availability of additional equipment, both redundant equipment as required by the technical specifications and equipment not required by the specifications, contributes to risk reduction and this equipment should be supported by reliable electrical power systems. Typically the Class 1E power sources and distribution systems of the unit are used to power this equipment because these power and distribution systems are available and reliable. When portions of the Class 1E power or distribution systems are not available (usually as a result of maintenance or modifications), other reliable power sources or distribution are used to provide the needed electrical support. The plant staff assesses these alternate power sources and distribution systems to assure that the desired level of minimal risk is maintained (frequently referred to as maintaining a desired defense in depth). The level of detail involved in the assessment will vary with the significance of the equipment being supported. In some cases, prepared guidelines are used which include controls designed to manage risk and retain the desired defense in depth. The DC sources satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).
LCO	One DC electrical power subsystem consisting of two batteries, at least one full capacity battery charger per battery, and the corresponding control equipment and interconnecting cabling within the train, are required to be OPERABLE to support one train of the distribution systems required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents). The required DC electrical power distribution subsystem is supported by one train of DC electrical power system. When the second DC electrical power distribution train (subsystem) is needed to support redundant required systems, equipment and components, the second Train may be energized from any available source. The available source must be Class 1E or another reliable source. The available source must be capable of supplying sufficient DC electrical power such that the redundant components are capable of performing their specified safety

(continued)

BASES

LCO (continued)	function(s) (implicitly required by the definition of OPERABILITY). Otherwise, the supported components must be declared inoperable and the appropriate conditions of the LCOs for the redundant components must be entered.

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6, provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.4.

ACTIONS

A.1, A2.1, A.2.2, A.2.3, and A.2.4

By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions). The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained.

(continued)

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, and A.2.4 (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the unit safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.3 ~~8~~. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of ~~SR 3.8.4.6, SR 3.8.4.7 and SR 3.8.4.8~~ SR 3.8.4.2 and SR 3.8.4.3. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 15.

BASES

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Cell Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage, and specific gravity for the DC power subsystem source batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." In addition to the limitations of this Specification, the Battery Monitoring and Maintenance Program also implements a program specified in Specification 5.5.19 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice For Maintenance, Testing, And Replacement Of Vented Lead-Acid Batteries For Stationary Applications" (Ref.4).

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 120 V for a [58] cell battery (i.e., cell voltage of 2.065 volts per cell (Vpc). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with its open circuit voltage ≥ 2.065 Vpc cell float voltage ≥ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 2).

BASES

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 23), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

Battery cell parameters satisfy the Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Battery parameter Electrolyte limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met. Additional preventative maintenance, testing, and monitoring performed in accordance with the CPSES Battery Monitoring and Maintenance Program is conducted as specified in Specification 5.5.19.

APPLICABILITY

The battery cell parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery parameter limits are electrolyte is only required when the DC power source is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

BASES

ACTIONS

A.1, A.2, and A.3

With one or more cells in one or more batteries in one train < 2.07 V, the battery cell is degraded. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (SR 3.8.4.1) and of the overall battery state of charge by monitoring the battery float charge current (SR 3.8.6.1). This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries < 2.07 V, and continued operation is permitted for a limited period up to 24 hours.

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed the appropriate Conditions(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed when in Condition A, then there is not assurance that there is still sufficient battery capacity to perform the intended function. In this case the battery must be declared inoperable ~~immediately~~ and Condition F must be entered.

B.1 and B.2

One or more batteries in one train with float current > 2 amps indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Condition A addressed charger inoperability. If the charger is operating in the current limit mode after 2 hours that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2). The battery must therefore be declared inoperable.

(continued)

BASES

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than 2.07 V and float current greater than 2 amps, the associated "OR" statement in Condition F is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than 2.07 V there is good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.2) from any discharge that might have occurred due to a temporary loss of the battery charger.

A discharged battery with float voltage (the charger setpoint) across its terminals indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, this is not an indication of a substantially discharged battery and 12 hours is a reasonable time prior to declaring the battery inoperable.

Since Required Action B.1 only specifies "perform," a failure of SR 3.8.4.1 acceptance criteria does not result in the Required Action not met. However, if SR 3.8.4.1 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

(continued)

BASES

C.1, C.2, and C.3

With one or more batteries in one train with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days the minimum established design limits for electrolyte level must be re-established.

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential (as well as provisions in Specification 5.5.19, Battery Monitoring and Maintenance Program). They are modified by a note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. Required Action C.2 for visual inspection of the battery to verify no leakage, and the parallel program requirement of 5.5.19.b to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from Annex D of IEEE Standard 450-1995. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the batteries may have to be declared inoperable and the affected cells replaced.

D.1

With one or more batteries in one train with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met.

(continued)

BASES

E.1

With one or more batteries in redundant trains with battery parameters not within limits there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved, this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer completion times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one train within 2 hours.

~~A.1, A.2, and A.3~~

~~With one or more cells in one or more batteries not within limits (i.e., Category A limits not met, Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1 in the accompanying LCO, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met and operation is permitted for a limited period.~~

~~The pilot cell electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check will provide a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cells. One hour is considered a reasonable amount of time to perform the required verification.~~

~~Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at 7 day intervals until the parameters are restored to Category A or B limits. This periodic verification is consistent with the normal Frequency of pilot cell Surveillances.~~

(continued)

BASES

ACTIONS

A.1, A.2 and A.3 (continued)

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. With the consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable prior to declaring the battery inoperable.

FB.1

With one or more batteries with any one or more battery cell parameters, is outside the allowances of the Required Actions for Condition A, B, C, D, or E, Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding DC battery electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as not completing the Required Actions of Condition A within the required Completion Time or average electrolyte temperature of representative cells falling below 70°F, are also cause for immediately declaring the associated DC electrical power subsystem inoperable. discovering one or more batteries in one train with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref.4). The 7 day Frequency is consistent with IEEE-450 (Ref.4).

BASES

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTION A are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of 2 amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 132 V for 60 cells at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. The minimum float voltage required by the battery manufacturer is 2.13 Vpc which corresponds to 128 V for 60 cells at the battery terminals. This voltage maintains the battery plates in a condition that support maintaining the battery cell grid life. Float voltages in the range of less than 2.13 Vpc, but greater than 2.07 Vpc, are addressed in Specification 5.5.19. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 70°F). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 4).

BASES

[The current Bases for SR 3.8.4.8 is modified and renumbered to SR 3.8.6.6]

[The new bases also includes two paragraphs with changes moved from the current Bases for SR 3.8.4.7]

SR 3.8.4.86.6

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 3.8.6.6~~3.8.4.8~~; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3. ~~SR 3.8.4.8 while satisfying the requirements of SR 3.8.4.7 at the same time.~~

A modified performance discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load. This will 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 will be identical to those specified for a service test and the test discharge rate will envelope the duty cycle of the service test if the modified performance discharge test is performed in lieu of a service test.

It may consist~~The modified performance discharge test is a simulated duty cycle consisting~~ of just two rates; for instance 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 must ~~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.

BASES

[The current Bases for SR 3.8.4.8 is modified and renumbered to SR 3.8.6.6 - continued]

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 43) and IEEE-485 (Ref. 54). 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. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

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 18 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. 493), when the battery capacity drops by more than 10% relative to its average capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. This frequency is consistent with the recommendations in IEEE-450 (Ref. 493).

This SR is modified by a Note. This Note says to verify the requirement during MODES 3, 4, 5, 6 or with the core off-loaded. This note does not prohibit the application of LCO 3.0.5 or the performance of this SR to restore equipment operability. The Note neither approves nor prohibits testing in MODES 1 and 2; however, for testing that is performed in MODES 1 and 2 (e.g., for post work testing) the testing may not be credited to satisfy the SR. Only the testing performed in MODES 3, 4, 5, 6 or with core off-loaded can be credited to satisfy the SR.

~~SR 3.8.6.1~~

~~This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 3), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.2

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 3). In addition, within 7 days of a battery discharge < 110 V or a battery overcharge > 150 V, the battery must be demonstrated to meet Category B limits. Transients, such as motor starting transients, which may momentarily cause battery voltage to drop to ≤110 V, do not constitute a battery discharge provided the battery terminal voltage and float current return to pre-transient values. This inspection is also consistent with IEEE-450 (Ref. 3), which recommends special inspections following a severe discharge or overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such discharge or overcharge.

SR 3.8.6.3

This Surveillance verification that the average temperature of 12 connected representative cells is > 70ºF, is consistent with a recommendation of IEEE-450 (Ref. 3), that states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.

Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on manufacturer recommendations.

Table 3.8.6-1

This table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designated pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

The Category A limits specified for electrolyte level are based on manufacturer recommendations and are consistent with the guidance in IEEE-450 (Ref. 3), with the extra 3 inch allowance above the high water level indication for operating margin to account for temperatures and charge effects. In addition to this allowance, footnote a to Table 3.8.6-1 permits the electrolyte level to be above the specified maximum level during equalizing charge, provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 3) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on the recommendations of IEEE-450 (Ref. 3), which states that prolonged operation of cells < 2.13 V can reduce the life expectancy of cells.

The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 3), the specific gravity readings are based on a temperature of 77°F (25°C).

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3□F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. Float voltage is corrected for average electrolyte temperature. The Category B limit specified for specific gravity for each connected cell

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~Table 3.8.6-1 (continued)~~

~~is ≥ 1.195 (0.020 below the manufacturer fully charged, nominal specific gravity) with the average of all connected cells > 1.205 (0.010 below the manufacturer fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell will not mask overall degradation of the battery.~~

~~Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.~~

~~The Category C limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limits for float voltage is based on IEEE-450 (Ref. 3), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.~~

~~The Category C limit of average specific gravity ≥ 1.195 is based on manufacturer recommendations (0.020 below the manufacturer recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no less than 0.020 below the average of all connected cells. This limit ensures that the effect of a highly charged or new cell does not mask overall degradation of the battery.~~

~~Footnote (b) to Table 3.8.6-1 is applicable to Category A, B, and C specific gravity and requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current is < 2 amps on float charge. This current provides, in general, an indication of overall battery condition.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charger current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 3). Footnote (c) to Table 3.8.6-1 allows the float charge current to be used as an alternate to specific gravity for satisfying Category A and Category C specific gravity limits.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 8.
32. FSAR, Chapter 15.
43. IEEE-450-1995.
5. IEEE-485, June 1983.

ENCLOSURE 4 to TXX-03026

RETYPED TECHNICAL SPECIFICATION PAGES

Pages iii
3.8-24
3.8-25
3.8-26
3.8-27
3.8-28
3.8-29
3.8-30
3.8-31
3.8-32
3.8-33
5.0-28a

TABLE OF CONTENTS (continued)

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources — Operating

LCO 3.8.4 The Train A and Train B DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or two required battery chargers on one train inoperable.	A.1	Restore affected battery(ies) terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	<u>AND</u>		
	A.2	Verify affected battery(ies) float current ≤ 2 amps.	Once per 12 hours
	<u>AND</u>		
	A.3	Restore required battery charger(s) to OPERABLE status.	7 days
B. One or two batteries on one train inoperable.	B.1	Restore affected battery(ies) to OPERABLE status.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One DC electrical power subsystem inoperable for reasons other than Condition A or B.	C.1	Restore DC electrical power subsystem to OPERABLE status.	2 hours
D. Required Action and Associated Completion Time not met.	D.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	D.2	Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.4.2	Verify each battery charger supplies ≥ 300 amps at greater than or equal to the minimum established charger test voltage for ≥ 8 hours. <u>OR</u> 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
SR 3.8.4.3	-------------------------------NOTES------------------------------- 1. The modified performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3. 2. Verify requirement during MODES 3, 4, 5, 6 or with core off-loaded. --- 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

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The Train A or Train B DC electrical power subsystem shall be OPERABLE to support one train of the DC electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystems inoperable.	A.1 Declare affected required feature(s) inoperable.	Immediately
	<u>OR</u>	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	<u>AND</u>	
	A.2.3 Initiate action to suspend operations involving positive reactivity additions.	Immediately
	<u>AND</u>	
		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.4 Initiate action to restore required DC electrical power subsystem to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	-------------------------------NOTE------------------------------- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. --- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3.	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Parameters

LCO 3.8.6 Battery parameters for Train A and Train B batteries shall be within limits.

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each battery.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two batteries on one train with one or more battery cells float voltage < 2.07 V.	A.1 Perform SR 3.8.4.1	2 hours
	<u>AND</u>	
	A.2 Perform SR 3.8.6.1	2 hours
	<u>AND</u>	
	A.3 Restore affected cell(s) float voltage ≥ 2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps.	B.1 Perform SR 3.8.4.1	2 hours
	<u>AND</u>	
	B.2 Restore affected battery(ies) float current to ≤ 2 amps.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
---------------NOTE------------------ Required Action C.2 shall be completed if electrolyte level was below the top of plates. ---	------------------NOTE------------------- Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates. ---	
C. One or two batteries on one train with one or more cells electrolyte level less than minimum established design limits.	C.1 Restore affected cell(s) electrolyte level to above the top of the plates. AND C.2 Verify no evidence of leakage. AND C.3 Restore affected cell(s) electrolyte level to greater than or equal to minimum established design limits.	8 hours 12 hours 31 days
D. One or two batteries on one train with pilot cell electrolyte temperature less than minimum established design limits.	D.1 Restore battery pilot cell(s) electrolyte temperature to greater than or equal to minimum established design limits.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more batteries in redundant trains with battery parameters not within limits.	E.1 Restore battery parameters for batteries in one train to within limits.	2 hours
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two batteries on one train with one or more battery cells float voltage < 2.07 V and float current > 2 amps.	F.1 Declare associated battery(ies) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	-------------------------------NOTE------------------------------- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1 --- Verify each battery float current is ≤ 2 amps.	7 days
SR 3.8.6.2	Verify each battery pilot cell voltage is ≥ 2.07 V.	31 days
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.4	Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.5	Verify each battery connected cell voltage is ≥ 2.07 V.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (Continued)

SURVEILLANCE		FREQUENCY
SR 3.8.6.6	------------------------------NOTE------------------------------ Verify requirement during MODES 3, 4, 5, 6 or with core off-loaded. -- 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> 18 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

5.5 Programs and Manuals (continued)

5.5.19 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," or of the battery manufacturer for the following:

a. Actions to restore battery cells with float voltage < 2.13 V, and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates.

ENCLOSURE 5 to TXX-03026

RETYPED TECHNICAL SPECIFICATION BASES PAGES
(For Information Only)

Pages	**B iii**	**Pages**	**B3.58**
	B3.8-47		**B3.8-59**
	B3.8-48		**B3.8-60**
	B3.8-49		**B3.8-61**
	B3.8-50		**B3.8-62**
	B3.8-51		**B3.8-63**
	B3.8-52		**B3.8-64**
	B3.8-53		**B3.8-65**
	B3.8-54		**B3.8-66**
	B3.8-55		**B3.8-67**
	B3.8-56		**B3.8-68**
	B3.8-57		

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources — Operating

BASES

BACKGROUND

The station DC electrical power system provides control power to selected equipment. It also provides both motive and control power to selected safety related equipment and preferred AC vital bus power (via inverters). As required by 10 CFR 50, Appendix A, GDC 17 (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 DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The 125 VDC electrical power system consists of two independent and redundant safety related Class 1E DC electrical power subsystems (Train A and Train B). Each subsystem consists of two 125 VDC batteries, the associated battery chargers for each battery, and all the associated control equipment and interconnecting cabling.

There are two 100% capacity battery chargers per battery. One charger for each battery is required operating and the other is kept as a spare (refer to Table B 3.8.4-1, DC Sources). If the spare battery charger is substituted, then the requirements of independence and redundancy between subsystems are maintained.

During normal operation, the 125 VDC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

The Train A and Train B DC electrical power subsystems provide the control power for its associated Class 1E AC power loads fed from 6.9 kV switchgear, and 480 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses.

The DC power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System — Operating," and LCO 3.8.10, "Distribution Systems — Shutdown."

125 VDC batteries of each subsystem (train) are separately housed in a ventilated room apart from its charger and distribution centers. Each

(continued)

BASES

BACKGROUND (continued)

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 subsystems, such as batteries, battery chargers, or distribution panels.

Each battery has adequate capacity to meet the duty cycle(s) discussed in the FSAR, Chapter 8 (Ref. 4). The battery is designed with additional capacity above that required by the design duty cycle to allow for temperature variations and other factors.

The batteries for Train A and Train B DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life and the 100% design demand. The minimum design voltage limit is 105 V.

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 2.065 volts per cell (Vpc). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with cell float voltage ≥ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. The battery float charge voltage limit is established as 2.13 V per cell, which corresponds to a total minimum float voltage output of 128 V for a 60 cell battery. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 4).

Each Train A and Train B DC electrical power subsystem battery charger 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 excess 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 (Ref. 4).

The battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

(continued)

BASES

BACKGROUND (continued)

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead-calcium batteries have recharge efficiencies of greater than 95%, so once at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 5), and in the FSAR, Chapter 15 (Ref. 6), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

The DC sources satisfy Criterion 3 of 10CFR50.36(c)(2)(ii) .

LCO

The DC electrical power subsystems, each subsystem consisting of two batteries, a battery charger for each battery and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the train are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Loss of any one train of DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

(continued)

BASES

LCO (continued)

An OPERABLE DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es). (Reference Table B 3.8.4-1)

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA.

The DC electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources—Shutdown."

ACTIONS

A.1, A.2, and A.3

Condition A represents one train with one or two required battery chargers inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). The ACTIONS provide a tiered response that focus on returning the affected one or two batteries to the fully charged state and restoring a fully qualified charger for each battery to OPERABLE status in a reasonable time period. Required Action A.1 requires that the terminal voltage of the affected battery(ies) be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the required charger(s) to OPERABLE status or providing an alternate means of restoring the associated battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the terminal voltage of the affected battery(ies) to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the affected battery will be restored to its fully charged condition (Required Action A.2) from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

(continued)

BASES

ACTIONS (continued)

If established battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the current-limiting mode, a faulty charger is indicated. A faulty charger that is incapable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during the recovery period following a battery discharge event that the DC system is designed for.

If the charger is operating in the current limit mode after 2 hours that is an indication that the battery is partially discharged and its capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action A.2).

Required Action A.2 requires that the affected battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 2 amps, then Condition D is entered as a result of the Required Action and Completion Time not met. At the same time, this indicates there may be additional battery problems. Without adequate assurance that the battery can be recharged within 12 hours, the affected battery must also be declared inoperable and LCO 3.8.4 Condition B entered for the inoperable battery, which is consistent with battery parameter requirements and actions of LCO 3.8.6 (Condition B and F).

Required Action A.3 limits the restoration time for the inoperable required battery charger to 7 days. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The 7 day completion time reflects a reasonable time to effect restoration of the qualified battery charger to operable status.

B.1

Condition B represents one train with one or two batteries inoperable. With one or two batteries inoperable, the affected DC bus(es) are being supplied by their associated OPERABLE battery charger(s). Any event that results in a loss of the AC bus supporting the battery charger(s) will also result in loss of or degraded DC to that train. Recovery of the AC

(continued)

BASES

ACTIONS (continued)

bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers, etc.) likely rely upon DC power being supplied from the batteries. In addition, the energization transients of any DC loads that are beyond the capability of the associated battery charger(s) and normally require the assistance of the batteries will not be able to be brought online. The 2 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

C.1

Condition C represents one train with a loss of ability to respond to an event, and a loss of ability to remain energized during normal operation. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected train. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system train.

If one of the required DC electrical power subsystems is inoperable, the other DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of the minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 7) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

D.1 and D.2

If the inoperable DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 7).

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger supplies a continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer. The minimum established float voltage is 2.13 Vpc or 128 V at the battery terminals. This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 8).

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32 (Ref. 9), 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 each battery charger be capable of supplying 300 amps at the minimum established charger test voltage of 130 volts or greater for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. 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 combined 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 will need to be supplemented with additional loads. The

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

duration for this test may be longer than the charger sizing criteria 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.

The Surveillance Frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 18 month intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

SR 3.8.4.3

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 FSAR Chapter 8 (Ref. 4).

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 9) and Regulatory Guide 1.129 (Ref. 10), which state that the battery service test should be performed during refueling operations or at some other outage, with intervals between tests, not to exceed 18 months.

This SR is modified by two Notes. Note 1 allows the performance of a modified performance discharge test in lieu of a service test.

Note 2 says to verify the requirement during MODES 3, 4, 5, 6 or with the core off-loaded. This note does not prohibit the application of LCO 3.0.5 or the performance of this SR to restore equipment operability. Note 2 neither approves nor prohibits testing in MODES 1 and 2; however, for testing that is performed in MODES 1 and 2 (e.g., for post work testing) the testing may not be credited to satisfy the SR. Only the testing performed in MODES 3, 4, 5, 6 or with core off-loaded can be credited to satisfy the SR.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-1974.
4. FSAR, Chapter 8.
5. FSAR, Chapter 6.
6. FSAR, Chapter 15.
7. Regulatory Guide 1.93, December 1974.
8. IEEE-450-1995.
9. Regulatory Guide 1.32, February 1977.
10. Regulatory Guide 1.129, February 1978.

Table B 3.8.4-1
DC SOURCES (Page 1 of 1)

TRAIN A		TRAIN B	
125 V DC Bus 1ED1(2ED1) Energized From Battery BT1ED1(BT2ED1) and Battery Charger BC1ED1-1 (BC2ED1-1) or BC1ED1-2 (BC2ED1-2)	125 V DC Bus 1ED3(2ED3) Energized From Battery BT1ED3(BT2ED3) and Battery Charger BC1ED3-1 (BC2ED3-1) or BC1ED3-2 (BC2ED3-2)	125 V DC Bus 1ED2(2ED2) Energized From Battery BT1ED2(BT2ED2) and Battery Charger BC1ED2-1 (BC2ED2-1) or BC1ED2-2 (BC2ED2-2)	125 V DC Bus 1ED4(2ED4) Energized From Battery BT1ED4(BT2ED4) and Battery Charger BC1ED4-1 (BC2ED4-1) or BC1ED4-2 (BC2ED4-2)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources — Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources — Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 5 and 6 ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

In addition to the requirements established by the technical specifications, the plant staff must also manage shutdown tasks and electrical support to maintain risk at an acceptably low value.

As required by the technical specifications, one train of the required equipment during shutdown conditions is supported by one train of AC

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

and DC power and distribution. The availability of additional equipment, both redundant equipment as required by the technical specifications and equipment not required by the specifications, contributes to risk reduction and this equipment should be supported by reliable electrical power systems. Typically the Class 1E power sources and distribution systems of the unit are used to power this equipment because these power and distribution systems are available and reliable. When portions of the Class 1E power or distribution systems are not available (usually as a result of maintenance or modifications), other reliable power sources or distribution are used to provide the needed electrical support. The plant staff assesses these alternate power sources and distribution systems to assure that the desired level of minimal risk is maintained (frequently referred to as maintaining a desired defense in depth). The level of detail involved in the assessment will vary with the significance of the equipment being supported. In some cases, prepared guidelines are used which include controls designed to manage risk and retain the desired defense in depth.

The DC sources satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

One DC electrical power subsystem consisting of two batteries, at least one full capacity battery charger per battery, and the corresponding control equipment and interconnecting cabling within the train, are required to be OPERABLE to support one train of the distribution systems required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

The required DC electrical power distribution subsystem is supported by one train of DC electrical power system. When the second DC electrical power distribution train (subsystem) is needed to support redundant required systems, equipment and components, the second Train may be energized from any available source. The available source must be Class 1E or another reliable source. The available source must be capable of supplying sufficient DC electrical power such that the redundant components are capable of performing their specified safety

(continued)

BASES

LCO (continued)	function(s) (implicitly required by the definition of OPERABILITY). Otherwise, the supported components must be declared inoperable and the appropriate conditions of the LCOs for the redundant components must be entered.

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6, provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.4.

ACTIONS

A.1, A2.1, A.2.2, A.2.3, and A.2.4

By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions). The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained.

(continued)

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, and A.2.4 (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the unit safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.3. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SR 3.8.4.2 and SR 3.8.4.3. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 15.

BASES

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage for the DC power subsystem batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." In addition to the limitations of this Specification, the Battery Monitoring and Maintenance Program also implements a program specified in Specification 5.5.19 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice For Maintenance, Testing, And Replacement Of Vented Lead-Acid Batteries For Stationary Applications" (Ref.4).

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 2.065 volts per cell (Vpc). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with cell float voltage ≥ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

Battery parameters satisfy the Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

Battery parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Battery parameter limits are conservatively established, allowing continued DC electrical system function even with limits not met. Additional preventative maintenance, testing, and monitoring performed in accordance with the CPSES Battery Monitoring and Maintenance Program is conducted as specified in Specification 5.5.19.

APPLICABILITY

The battery parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery parameter limits are only required when the DC power source is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

ACTIONS

A.1, A.2, and A.3

With one or more cells in one or more batteries in one train < 2.07 V, the battery cell is degraded. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (SR 3.8.4.1) and of the overall battery state of charge by monitoring the battery float charge current (SR 3.8.6.1). This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries < 2.07 V, and continued operation is permitted for a limited period up to 24 hours.

(continued)

BASES

ACTIONS (continued)

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed the appropriate Conditions(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed when in Condition A, then there is not assurance that there is still sufficient battery capacity to perform the intended function. In this case the battery must be declared inoperable and Condition F must be entered.

B.1 and B.2

One or more batteries in one train with float current > 2 amps indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Condition A addressed charger inoperability. If the charger is operating in the current limit mode after 2 hours that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than 2.07 V and float current greater than 2 amps, the associated "OR" statement in Condition F is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than 2.07 V there is good assurance that, within 12 hours, the battery will be restored to its fully

(continued)

BASES

ACTIONS (continued)

charged condition (Required Action B.2) from any discharge that might have occurred due to a temporary loss of the battery charger. A discharged battery with float voltage (the charger setpoint) across its terminals indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, this is not an indication of a substantially discharged battery and 12 hours is a reasonable time prior to declaring the battery inoperable.

Since Required Action B.1 only specifies "perform," a failure of SR 3.8.4.1 acceptance criteria does not result in the Required Action not met. However, if SR 3.8.4.1 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

C.1, C.2, and C.3

With one or more batteries in one train with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days the minimum established design limits for electrolyte level must be re-established.

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential (as well as provisions in Specification 5.5.19, Battery Monitoring and Maintenance Program). They are modified by a note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. Required Action C.2 for visual inspection of the battery to verify no leakage, and the parallel program requirement of 5.5.19.b to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from Annex D of IEEE Standard 450-1995. They are performed following the restoration of the electrolyte level to above the top of the

(continued)

BASES

ACTIONS (continued)

plates. Based on the results of the manufacturer's recommended testing the batteries may have to be declared inoperable and the affected cells replaced.

D.1

With one or more batteries in one train with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met.

E.1

With one or more batteries in redundant trains with battery parameters not within limits there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer completion times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one train within 2 hours.

F.1

With one or more batteries with any battery parameter, outside the allowances of the Required Actions for Condition A, B, C, D, or E sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding DC battery must be declared inoperable. Additionally, discovering one or more batteries in one train with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 4). The 7 day Frequency is consistent with IEEE-450 (Ref. 4).

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTION A are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of 2 amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 132 V for 60 cells at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. The minimum float voltage required by the battery manufacturer is 2.13 Vpc which corresponds to 128 V for 60 cells at the battery terminals. Float voltages in the range of less than 2.13 Vpc, but greater than 2.07 Vpc, are addressed in Specification 5.5.19. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 4).

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 70°F). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.6

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 3.8.6.6; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3.

A modified performance discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load. This will 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 will be identical to those specified for a service test and the test discharge rate will envelope the duty cycle of the service test if the modified performance discharge test is performed in lieu of a service test.

It may consist of just two rates; for instance 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 must 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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 4) and IEEE-485 (Ref. 5). 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. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

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 18 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. 4), when the battery capacity drops by more than 10% relative to its average capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. This frequency is consistent with the recommendations in IEEE-450 (Ref. 4).

This SR is modified by a Note. This Note says to verify the requirement during MODES 3, 4, 5, 6 or with the core off-loaded. This note does not prohibit the application of LCO 3.0.5 or the performance of this SR to restore equipment operability. The Note neither approves nor prohibits testing in MODES 1 and 2; however, for testing that is performed in MODES 1 and 2 (e.g., for post work testing) the testing may not be credited to satisfy the SR. Only the testing performed in MODES 3, 4, 5, 6 or with core off-loaded can be credited to satisfy the SR.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 8.
3. FSAR, Chapter 15.
4. IEEE-450-1995.
5. IEEE-485-1983.

ENCLOSURE 6 to TXX-03026

TABLE OF PLANT SPECIFIC DIFFERENCES FROM TSTF-360, REVISION 1

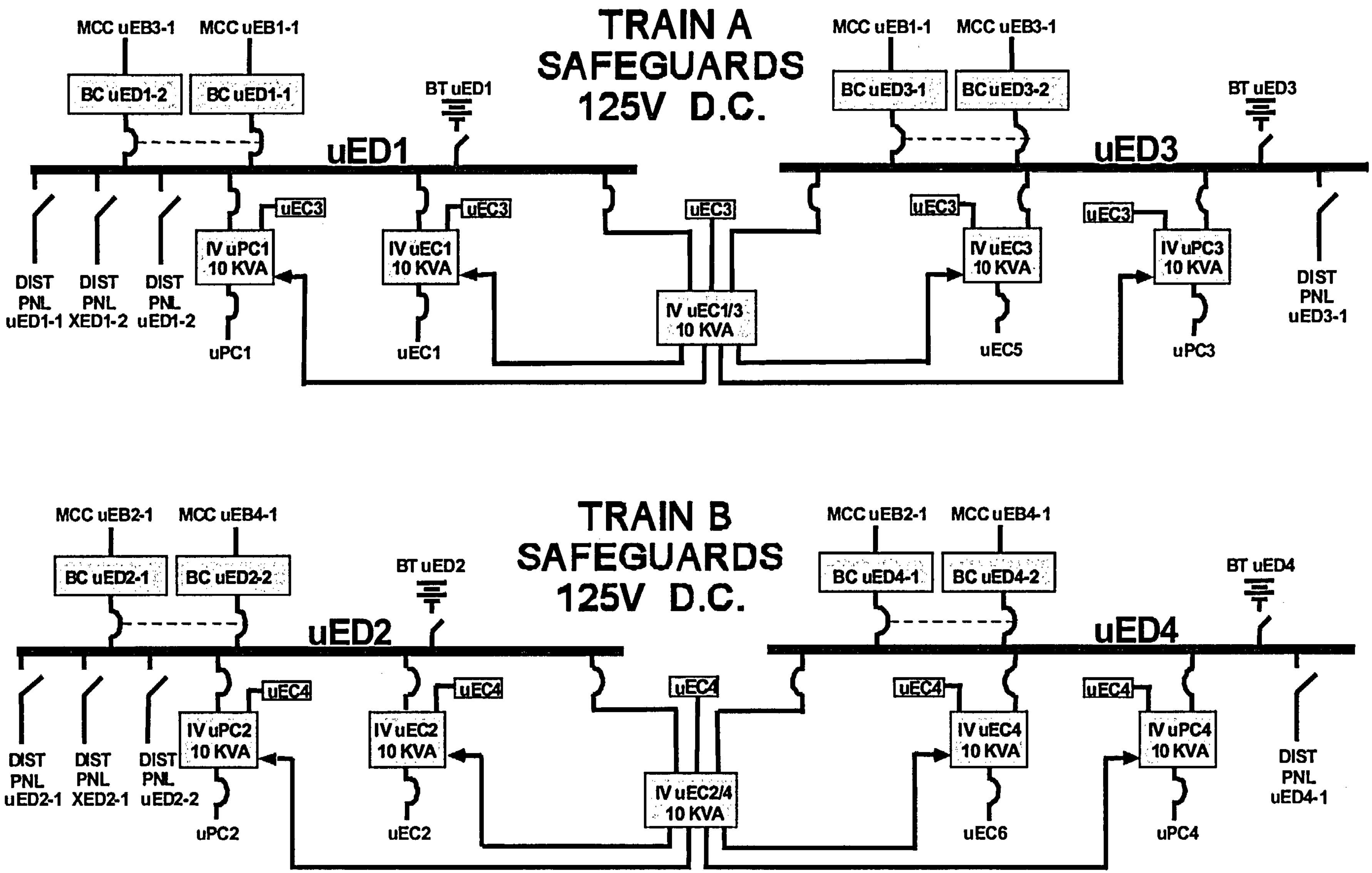
LIST OF STARS PLANT LAR DIFFERENCES FROM TSTF-360, REVISION 1			APPLICABILITY	
DIFF. NO.	LOCATION	DESCRIPTION	COMANCHE PEAK	DIABLO CANYON
3.8.4-01	LCO 3.8.4 Condition A	The word "required" is added to the bracketed condition description wording provided for plants with two batteries in each DC electric power subsystem (train). This difference is needed for clarification because at CPSES each DC electric power subsystem (train) consists of two batteries with each battery provided with two full sized and fully qualified battery chargers. Adding the term "Required" refers to the battery charger presently in service for each battery in each DC subsystem as specified in TS Bases Table B 3.8.4-1. This change is specific to the CPSES plant configuration and is consistent with the current CPSES plant-licensing basis.	Yes	No
3.8.4-02	LCO 3.8.4 Required Actions A.1, A.2, A.3, and B.1	The words "affected" and "required" are added the Required Action statements to clarify that the action is associated with the battery(ies) directly affected by the inoperable required battery charger(s). This difference is plant-specific and is consistent with the current CPSES plant-licensing basis.	Yes	No
3.8.4-03	LCO 3.8.4 Required Action A.2 Completion Time	The Completion Time for LCO 3.8.4 Required Action A.2 is revised from "Once per 12 hours" to "12 hours" to verify battery float current less than or equal 2 amps. This change is applicable only to DCPP.	No	Yes
3.8.4-04	LCO 3.8.4 Required Action A.3 Completion Time	The Completion Time for LCO 3.8.4 Required Action A.3 is revised from "7 days" to "14 days" based on the current plant-specific design and licensing basis for DCPP. This difference from TSTF-360, Revision 1, is applicable only to DCPP.	No	Yes
3.8.4-05	LCO 3.8.4 Condition D	LCO 3.8.4 Condition D for more than one full capacity charger receiving power simultaneously from a single 480 V vital bus, including its associated Required Action and Completion Time, is retained by DCPP based on its current plant-specific design and licensing basis. This difference from TSTF-360, Revision 1, is applicable only to DCPP.	No	Yes

3.8.4-06	SR 3.8.4.2 First test option	The first performance option of this surveillance test is also revised to replace the TSTF-360, Revision 1, bracketed value of "≥ [400] amps" for the battery charger test current with the current CPSES plant-specific value of "≥ 300 amps" presently required by SR 3.8.4.6. This difference is only applicable to CPSES and is consistent with the current CPSES plant design and license bases.	Yes	No
3.8.4-07	SR 3.8.4.2 First test option	SR 3.8.4.2 is revised to replace the bracketed value for the battery charger test duration of "≥ [8] hours" with the plant-specific value of "≥ 4 hours." This change is specific to DCPP.	No	Yes
3.8.4-08	SR 3.8.4.3 Note 2	Note 2 is different from the corresponding Note provided in TSTF-360, Revision 1, because the current SR 3.8.4.7 surveillance test requirement at CPSES is not changed, but only renumbered to SR 3.8.4.3. Thus, Note 2 is also retained unchanged This difference is consistent with the current CPSES licensing basis and is applicable only to CPSES.	Yes	No
3.8.4-09	SR 3.8.4.2 and SR 3.8.4.3	This difference from TSTF-360, Revision 1, is reflective of the current 24 month surveillance test frequency applicable to DCPP.	No	Yes
3.8.5-01	LCO 3.8.5 (entire specification)	This difference from TSTF-360, Revision 1, is based on and consistent with the REVIEWER'S NOTE for standard TS LCO 3.8.5 as provided in NUREG-1431, Revision 2. CPSES would retain its current LCO 3.8.5 requirements and APPLICABILITY that require only one DC electrical power subsystem train to be operable during shutdown conditions. Hence, the TSTF-360, Revision 1, changes to LCO 3.8.5 (Action A and the bracketed optional wording in Condition B) are not proposed, with the exception that the SR 3.8.5.1 references to the Section 3.8.4 surveillance test requirements be revised to reflect the proposed changes to the Section 3.8.4 Surveillance Requirements, consistent with the changes proposed in TSTF-360, Revision 1. This difference is based on the current CPSES licensing basis and is also applicable to DCPP.	Yes	Yes
3.8.6-01	LCO 3.8.6 Condition A, B, and C	The LCO 3.8.6 Condition A, B, and C is revised from "one battery on one train" to "one battery" to reflect the plant-specific design of three Class 1E batteries and one battery per DC electrical power subsystem. This is a DCPP only change.	No	Yes

3.8.6-02	LCO 3.8.6 Required Actions B.2	The word "affected" is added to the Required Action B.2 statement to clarify that the action is associated with the battery(ies) discovered with float current > 2 amps. This difference is consistent with similar changes proposed for the Required Actions of LCO 3.8.4. This difference is plant-specific and is consistent with the current CPSES plant licensing basis.	Yes	No
3.8.6-03	LCO 3.8.6 Required Actions C.1 and C.3	The phrase "affected cell(s)" is added for clarification in regard to restoration of cell electrolyte level. This difference is consistent with the current CPSES plant licensing basis and is applicable to both CPSES and DCPP.	Yes	Yes
3.8.6-04	LCO 3.8.6 Condition E	The LCO 3.8.6 Condition E is revised from "one or more batteries in redundant trains" to "two or more batteries" to reflect the plant-specific design of three Class 1E batteries and one battery per DC electrical power subsystem. This is a DCPP only change.	No	Yes
3.8.6-05	SR 3.8.6.6 Note	The Note accompanying SR 3.8.6.6 is different from the corresponding Note provided in TSTF-360, Revision 1, because the current SR 3.8.4.8 surveillance test requirement at CPSES is not changed, but only renumbered to SR 3.8.6.6. Thus, the current Note is also retained unchanged This difference is consistent with the current CPSES licensing basis and is applicable only to CPSES.	Yes	No
5.5-01	5.5.19 (5.5.17 for DCPP) Battery Monitoring and Maintenance Program	Different from TSTF-360, Revision 1, the TS Administrative Control Program 5.5.19 for CPSES (and 5.5.17 for DCPP) "Battery Maintenance and Monitoring Program," reference to the IEEE-450 version year 1995 is moved to the Bases. The supporting justification for this difference is provided in Enclosure 1 as part of Proposed Change (5 e). This change is applicable to both CPSES and DCPP.	Yes	Yes
5.5-02	5.5.19 (5.5.17 for DCPP) Battery Monitoring and Maintenance Program	Different from TSTF-360, Revision 1, the TS Administrative Control Program 5.5.19 for CPSES (and 5.5.17 for DCPP) "Battery Maintenance and Monitoring Program," paragraph b., the phrase "below the minimum established design limit" is replaced by "below the top of the plates." The minimum established design limit is a level above the top of the plates. This change is needed to be consistent with IEEE-450-1995, Annex D. This change is applicable to both CPSES and DCPP.	Yes	Yes

ENCLOSURE 7 to TXX-03026

SIMPLIFIED SINGLE LINE DIAGRAM
CPSES 125 VOLT DC SYSTEM
(For Information Only)


TRAIN A
SAFEGUARDS
125V D.C.
MCC uEB3-1
MCC uEB1-1
BC uED1-2
BC uED1-1
BT uED1
uED1
uEC3
IV uPC1
10 KVA
IV uEC1
10 KVA
DIST PNL uED1-1
DIST PNL XED1-2
DIST PNL uED1-2
uPC1
uEC1
IV uEC1/3
10 KVA
MCC uEB1-1
MCC uEB3-1
BC uED3-1
BC uED3-2
BT uED3
uED3
IV uEC3
10 KVA
IV uPC3
10 KVA
DIST PNL uED3-1
uEC5
uPC3
TRAIN B
SAFEGUARDS
125V D.C.
MCC uEB2-1
MCC uEB4-1
BC uED2-1
BC uED2-2
BT uED2
uED2
uEC4
IV uPC2
10 KVA
IV uEC2
10 KVA
DIST PNL uED2-1
DIST PNL XED2-1
DIST PNL uED2-2
uPC2
uEC2
IV uEC2/4
10 KVA
MCC uEB2-1
MCC uEB4-1
BC uED4-1
BC uED4-2
BT uED4
uED4
IV uEC4
10 KVA
IV uPC4
10 KVA
DIST PNL uED4-1
uEC6
uPC4