SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONAL℠ Company

Dwight E. Nunn
Vice President

December 17, 2004

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

Subject: **Docket Nos. 50-361 and 50-362**
Proposed Change Number (PCN)-548
Battery and DC Sources Upgrades and Cross-Tie
San Onofre Nuclear Generating Station Units 2 and 3

References:
1. March 17, 2004 letter from A.E. Scherer (SCE) to Document Control Desk (NRC), Subject: Letter of Intent to Participate in Probabilistic Risk Assessment Quality Pilot Application Program, San Onofre Nuclear Generating Station Units 2 and 3
2. Memorandum dated November 19, 2003, J.L. Funches, CFO, NRR to James E. Dyer, Director, NRR, "Fee Waiver for Pilot Application of Approach Proposed in DG-1122, "Determining the Technical Adequacy of PRA Results for Risk-Informed Activities," and The Associated Draft Standard Review Plan (SRP) Section"

Dear Sir or Madam:

Pursuant to 10CFR50.90, Southern California Edison (SCE) hereby requests the following amendment to operating licenses NPF-10 and NPF-15 for San Onofre Units 2 and 3, respectively: revise Technical Specifications (TSs) 3.8.1, "AC Sources – Operating," 3.8.4, "DC Sources – Operating," 3.8.5, "DC Sources – Shutdown," 3.8.6, "Battery Cell Parameters," 3.8.7, "Inverters – Operating," and 3.8.9, "Distribution Systems – Operating." This change will also add a new Battery Monitoring and Maintenance Program, section 5.5.2.16.

The proposed change will provide operational flexibility to credit DC electrical subsystem design upgrades that are in progress. These upgrades will provide increased capacity batteries, additional battery chargers, and the means to cross-connect DC subsystems while meeting all design battery loading requirements. With these modifications in place, it will be feasible to perform routine surveillances as well as battery replacements online.

A001

P.O. Box 128
San Clemente, CA 92674-0128
949-368-1480
Fax 949-368-1490

As discussed in Reference 1, this license amendment request to permit an extended Completion Time when batteries are cross-tied is a pilot application of Regulatory Guide 1.200 For Trial Use, "Assessment Results for Risk-Informed Activities," and the associated draft standard review plan, Chapter 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." The NRC has indicated this review of pilot applications is eligible for a waiver of review fees (Reference 2).

The proposed change includes upgrade of the battery maintenance practices to conform to industry standard IEEE 450-2002, in lieu of the current commitment to the 1980 revision, and improved specifications as per Technical Specification Task Force (TSTF)-360, Revision 1, "DC Electrical Rewrite."

Also, the proposed change will revise terminology of trains, channels, systems, and subsystems to make the licenses for San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 consistent with industry convention.

The SONGS DC electrical system is an extremely robust design with four full-capacity battery subsystems providing power to the four independent instrument and DC-power subsystems. For the industry as a whole, two battery trains are permitted by Standard Technical Specifications. With this modification, the routine operation of four battery subsystems will be maintained with an allowance to temporarily operate with three batteries supporting the four subsystems to enable routine testing as well as scheduled or emergent maintenance.

SCE has evaluated these requests under the standards set forth in 10CFR50.92(c) and determined that a finding of "no significant hazards consideration" is justified.

SCE requests the approval of the proposed amendment by October, 2005 to facilitate replacement of existing batteries as part of the design change to support this upgrade. Once approved, the amendment shall be implemented within 60 days. Please note the battery upgrade project will not necessarily be completed prior to implementation of the amendment. The proposed change includes a note to restrict use of the subsystem cross-tie feature until after appropriate project completion and battery testing.

If you have any question or require additional information, please contact Mr. Jack Rainsberry at 949-368-7420.

Sincerely,

Enclosures:

1. Notarized Affidavits
2. Licensee's Evaluation
   Attachments
   A. Existing Technical Specification pages, Unit 2
   B. Existing Technical Specification pages, Unit 3
   C. Proposed Technical Specification pages, Redline and Strikeout, Unit 2
   D. Proposed Technical Specification pages, Redline and Strikeout, Unit 3
   E. Proposed Technical Specification pages, Unit 2
   F. Proposed Technical Specification pages, Unit 3
   G. Proposed Bases pages (for information only), Unit 2
   H. List of Regulatory Commitments
   I. PRA Evaluation
   J. Reviewer Aid: Markup of Common Technical Specification Pages

cc: B. S. Mallett, Regional Administrator, NRC Region IV
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3
B. M. Pham, NRC Project Manager, San Onofre Units 2 and 3
S. Y. Hsu, Department of Health Services, Radiologic Health Branch

ENCLOSURE 1

NOTARIZED AFFIDAVITS

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 2 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-361 Amendment Application No. 229

SOUTHERN CALIFORNIA EDISON COMPANY, et al. pursuant to 10CFR50.90, hereby submit Amendment Application No. 229. This amendment application consists of Proposed Change No. 548 to Facility Operating License No. NPF-10. Proposed Change No. 548 is a request to revise Technical Specifications (TSs) 3.8.1, "AC Sources – Operating," 3.8.4, "DC Sources – Operating," 3.8.5, "DC Sources – Shutdown," 3.8.6, "Battery Cell Parameters," 3.8.7, "Inverters – Operating," and 3.8.9, "Distribution Systems – Operating." This change will also add a new Battery Monitoring and Maintenance Program, section 5.5.2.16. This change will extend the Completion Time for an inoperable subsystem battery by allowing manual cross-connect of distribution subsystems, upgrade to the 2002 Revision of IEEE 450, include improvements included in Revision 1 to Technical Specification Task Force (TSTF) – 360, and make editorial modifications more consistent with industry use.

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me this 17th day of

December, 2004.

By: [signature]
Dwight E. Nunn
Vice President

[signature]
Notary Public

FRANCES M. THURBER
Commission # 1295266
Notary Public - California
San Diego County
My Comm. Expires Mar 23, 2005

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 3 of the San Onofre Nuclear Generating Station	)))))	Docket No. 50-362 Amendment Application No. 213

SOUTHERN CALIFORNIA EDISON COMPANY, et al. pursuant to 10CFR50.90, hereby submit Amendment Application No. 213. This amendment application consists of Proposed Change No. 548 to Facility Operating License No. NPF-15. Proposed Change No. 548 is a request to revise Technical Specifications (TSs) 3.8.1, "AC Sources – Operating," 3.8.4, "DC Sources – Operating," 3.8.5, "DC Sources – Shutdown," 3.8.6, "Battery Cell Parameters," 3.8.7, "Inverters – Operating," and 3.8.9, "Distribution Systems – Operating." This change will also add a new Battery Monitoring and Maintenance Program, section 5.5.2.16. This change will extend the Completion Time for an inoperable subsystem battery by allowing manual cross-connect of distribution subsystems, upgrade to the 2002 Revision of IEEE 450, include improvements included in Revision 1 to Technical Specification Task Force (TSTF) – 360, and make editorial modifications more consistent with industry use.

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me this 17th day of December, 2004.

By: [signature]
Dwight E. Nunn
Vice President

[signature]
Notary Public

FRANCES M. THURBER
Commission # 1295266
Notary Public - California
San Diego County
My Comm. Expires Mar 23, 2005

ENCLOSURE 2

LICENSEE'S EVALUATION

PCN 548

AC Sources, DC Sources, and Battery Parameters

LICENSEE'S EVALUATION

PCN 548

AC Sources, DC Sources and Battery Parameters

SUBJECT: **Proposed Change No. 548 is a request to revise Technical Specifications (TSs) 3.8.1, "AC Sources – Operating," 3.8.4, "DC Sources – Operating," 3.8.5, "DC Sources – Shutdown," 3.8.6, "Battery Cell Parameters," 3.8.7, "Inverters – Operating," and 3.8.9, "Distribution Systems – Operating." This change will also add a new Battery Monitoring and Maintenance Program, section 5.5.2.16. This change will extend the Completion Time for an inoperable subsystem battery by allowing manual cross-connect of distribution subsystems, upgrade to the 2002 Revision of IEEE 450, include improvements included in Revision 1 to Technical Specification Task Force (TSTF) – 360, and make editorial modifications more consistent with industry use.**

1. INTRODUCTION
2. PROPOSED CHANGE
3. BACKGROUND
4. EVALUATION
5. REGULATORY SAFETY ANALYSIS
   - 5.1 NO SIGNIFICANT HAZARDS CONSIDERATION
   - 5.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA
6. ENVIRONMENTAL CONSIDERATION
7. REFERENCES

ATTACHMENTS

A) Existing Technical Specification page, Unit 2
B) Existing Technical Specification page, Unit 3
C) Markup of Technical Specification page, Unit 2
D) Markup of Technical Specification page, Unit 3
E) Retyped Technical Specification page, Unit 2
F) Retyped Technical Specification page, Unit 3
G) Markup of proposed Bases change, Unit 2 (for information only, and representative for Unit 3)
H) List of Regulatory Commitments
I) PRA Evaluation
J) Review Aid: Markup of Common Technical Specification Pages

1.0 INTRODUCTION

The proposed change is intended to provide operational flexibility to credit Direct Current (DC) electrical subsystem design upgrades that are in progress. These upgrades will provide increased capacity batteries, additional battery chargers, and the means to cross-connect DC subsystems. With these modifications in place, it will be feasible to perform routine surveillances as well as battery replacements online.

The proposed change includes upgrade of the battery maintenance practices to conform to industry standard IEEE 450-2002. The proposed change also includes improvements to the various electrical specifications permitted in Technical Specification Task Force (TSTF) – 360, Revision 1, "DC Electrical Rewrite." The proposed change will also revise terminology of trains, channels, systems and subsystems to make the San Onofre Nuclear Generating Station (SONGS) licenses consistent with industry convention.

To facilitate these design upgrades, the proposed change is to amend the Operating Licenses and revise Technical Specification (TS) 3.8.4, "DC Sources – Operating" to extend the Completion Time (CT) for an inoperable subsystem battery by allowing manual cross-connect of DC distribution subsystems A and C, or B and D during Modes 1-4. The proposed changes will also modify Surveillance Requirements (SR) 3.8.4.7, "Battery Service Test" and 3.8.4.8, "Battery Performance Test" to allow a Modified Performance Test and to allow tests to be performed while the unit is on-line; and it will modify TSs 3.8.6, "Battery Cell Parameters," 3.8.7, "Inverters – Operating," and 3.8.9, "Distribution Systems – Operating" to facilitate upgrade of battery testing requirements to IEEE 450-2002 (from the 1980 revision).

The SONGS DC electrical system is an extremely robust design with four full-capacity battery subsystems providing power to the four independent instrument and DC-power subsystems. For the industry as a whole, two battery trains are permitted by Standard Technical Specifications. With this modification, the routine operation with four batteries will be maintained with an allowance to temporarily operate with three battery subsystems to enable routine testing as well as scheduled or emergent maintenance with the Unit in Modes 1-4.

2.0 PROPOSED CHANGE

General description of changes:

Southern California Edison (SCE) is requesting a change to the SONGS 2 and 3 TS 3.8.4, "DC Sources – Operating." These changes specifically include the Limiting Condition for Operation (LCO) 3.8.4. This change will extend the CT for one DC electrical power subsystem inoperable for a period of 30 days during Modes 1-4 for an inoperable DC subsystem, exclusive of the battery charger which has its own LCO, by adding an additional required action to allow manual cross-connect of DC distribution subsystems A and C, or B and D. TS 3.8.4 condition A currently requires that one inoperable battery or associated control equipment or cabling be restored to operable status within 2 hours or be in Mode 3 within 6 hours and Mode 5 within 36 hours. The proposed change would extend the CT by adding a required action to allow manual cross-connect of the inoperable distribution subsystem with an operable subsystem of the same safety train. The proposed change would extend the CT and credit the manual cross-connect of the same train DC distribution subsystems based on a Probabilistic Risk Assessment (PRA) of the cross-connected configuration. The proposed changes would extend the CTs provided the following conditions are met:

1. The inoperable subsystem can be cross-connected within 2 hours.
2. Required battery charger and DC buses are operable.
3. Batteries are sized and tested to accommodate the combined connected load.

The proposed changes will also include changes to existing TS SR 3.8.4.7 (renumbered as SR 3.8.4.3), "Battery Service Test" and SR 3.8.4.8 (relocated as SR 3.8.6.6), "Battery Performance Test" per TSTF 360, Rev. 1. These SRs will be revised to allow the option of a modified performance discharge test as recommended by IEEE 450-2002, IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications. Modified performance discharge tests may be conducted every 30 months and would provide consistent data for trending. If the option to perform the battery capacity test in (renumbered) SR 3.8.6.6 is used, this may be performed in lieu of (renumbered) SR 3.8.4.3 once per 48 months.

Specific description of changes:

The proposed change includes the following specific changes to the existing Technical Specifications.

LCO 3.8.1

1. SR 3.8.1.1 The words in the NOTES "Buses 3A04 and 3D1" and "Buses 3A06 and 3D2" are simplified to "Bus 3A04" and "Bus 3A06," respectively (example for the Unit 2 TS). This is a non-Standard-Technical-Specification (STS) San Onofre specific clarification of which buses are required. The specification of the preferred DC subsystem is no longer required.

LCO 3.8.4

1. The specification of the LCO is revised from the "Train A, Train B, Train C, and Train D" electrical power subsystems to "Train A and Train B." This brings the LCO terminology into conformance with the Standard Technical Specification (STS).

2. A new Condition A (comparable to existing Condition C, which is deleted) is added:

> "Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable."

This makes the Condition more concordant with the STS and clarifies actions to be taken when the battery charger is not OPERABLE. The Required Actions and Completion Times are modified in accordance with TSTF 360 Rev. 1 to validate battery OPERABILITY while in this Condition.

3. A new Condition B (comparable to existing Condition D, which is deleted) is inserted to declare the associated battery inoperable should the battery parameters being monitored in the Required Actions for Condition A not be satisfactory.

4. Existing Condition A is modified, as new Condition C, to specifically cover conditions not included in new Condition A. With the DC electrical power subsystem inoperable, one still has a two hour Completion Time to restore the subsystem to OPERABLE status with a new optional Required Action to cross-connect to the subsystem in the same Train. Once the cross-connection is made, this Required Action is satisfied and new Condition D is entered.

5. New Condition D is inserted to provide an upper limit for the duration of the time when DC subsystems are cross-connected. In routine operation there are two electrical Trains consisting of four batteries of the four DC subsystems powering the four independent instrumentation, control, and power subsystems. For up to 30 days this design conservatism would be reduced to two electrical Trains consisting of three batteries of the four DC battery subsystems fully capable of powering the four instrumentation, control, and power subsystems. A Probabilistic Risk Assessment analysis of this temporary configuration follows (see Attachment I). The 30 day Completion Time is analyzed to permit both preventive and corrective maintenance online as well as online changeout of batteries (and required OPERABILITY tests) without further regulatory action.

New Required Action D has a note:

> "Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-hours."

This note is necessary because all eight battery subsystems (four battery subsystems on two units) are not expected to be installed and tested prior to implementation of this amendment. Accordingly, this note would preclude use of this optional Required Action until the necessary battery subsystem upgrades and testing are complete.

6. Existing Condition B is relabeled Condition E and modified to include the failure to satisfy the new Conditions (added above) as entry conditions to mandate plant shutdown.

7. SR 3.8.4.1 is modified to provide surveillance of "greater than or equal to the minimum established float voltage" from the current requirement of "≥129V on float charge." Also, the frequency is extended from 7 to 31 days. Both changes are consistent with TSTF 360 Rev. 1 and IEEE 450-2002.

8. Existing SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5 are relocated to the Licensee Controlled Specifications per the recommendations of TSTF 360 Rev. 1. These include measures regarded as routine preventive maintenance, such as inspecting for signs of corrosion, physical damage, and electrical resistance measuring.

9. Existing SR 3.8.4.6 is renumbered to SR 3.8.4.2 and
   a. The NOTE "Credit may be taken for unplanned events that satisfy this SR." is deleted as pragmatically unhelpful,
   b. In accordance with the recommendations of TSTF 360 Rev.1, the required duration for this surveillance is reduced from 12 to 8 hours, and
   c. To facilitate upgrade of the batteries, the operability limits are relocated to the Licensee Controlled Specifications (LCS), and the SR revised to:
      - The minimum specified current is changed from "300 amps" to "rated amps,"
      - The minimum specified voltage is changed from "129 V" to "the minimum established float voltage"

10. Existing SR 3.8.4.7 is renumbered to SR 3.8.4.3, and
   a. NOTES 2 and 3 are removed:
      - NOTE 2, "This Surveillance shall not be performed in Mode 1,2,3, or 4," is a restriction that can be removed with the ability to cross-connect DC subsystems in a given Train. While cross-connected, one battery can provide electrical power for both subsystems while the other battery is tested online.
      - NOTE 3, "Credit may be taken for unplanned events that satisfy this SR," is deleted as noted previously (see #9) as unhelpful.
   b. The following change is made per the recommendations of IEEE 450-2002:
      - NOTE 1 is changed to specify "The modified performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3" (and the reference SR numbers are changed consistent with this amendment request).
      - The 24-month frequency to perform this battery capacity test is extended to 30 months.
      - NOTE 2 is added to specify "The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months." This includes the revised reference SR numbers and a reasonable replacement frequency for using SR 3.8.6.6 without the modified performance discharge test option.

11. Existing SR 3.8.4.8 is revised and relocated per TSTF 360 Rev. 1 to be the new SR 3.8.6.6, as a more appropriate location.

LCO 3.8.5

1. The word "The" is added to the beginning of the LCO. This is an editorial change.

2. Conditions and Required Actions are modified consistent with the changes to LCO 3.8.4. The entry Condition for Required Action C is revised from "One..." to "One or more..." per TSTF 360, Rev. 1. Also, proposed Required Action C.2.3 is "Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration." This is consistent with the current licensing basis.

3. SR 3.8.5.1 is modified to reflect changes previously described in 3.8.4, DC Sources – Operating:

   a. The DC sources are OPERABLE when the following SRs are satisfied: 3.8.4.1, 3.8.4.2, and 3.8.4.3.
   b. This SR is modified by a NOTE that the following SRs are not required to be performed: 3.8.4.2 and 3.8.4.3.

LCO 3.8.6

1. General comment: LCO 3.8.6 undergoes the most editorial changes of any LCO in this Amendment Request, in updating to the recommendations of IEEE 450-2002. In maintaining compliance with the upgraded IEEE standard, the equivalent level of operational reliability is assured.

2. The LCO is relabeled from "Battery Cell Parameters" to "Battery Parameters." Similar to the nomenclature change in LCO 3.8.4, the LCO 3.8.6 is changed from:

> "Battery cell parameters for the Train A, Train B, Train C, and Train D batteries shall be within the Category A and B limits of Table 3.8.6-1."
>
> To read:
>
> "Battery parameters for the Train A and Train B batteries shall be within limits."

This modification is more consistent with the STS, and denotes that there are two electrical Trains, A and B. As noted elsewhere, subsystems A and C batteries support Train A; subsystems B and D support Train B.

Note that discussion referring to Table 3.8.6-1 is removed in its entirety. Subsequent discussion in this change will include deletion of this Table, while the Table's requirements are included in new SRs (and any deficiencies in satisfying these are accommodated in the Conditions).

3. Existing Condition A is deleted. This Condition was entered upon failing to

meet the Category A and B values of existing Table 3.8.6-1. In accordance with the recommendations of IEEE 450-2002, this table and specific action levels are superceded by new Conditions.

4. New Condition A is inserted. In this Condition, float voltage of 2.07VDC has not been met (this is the equivalent of the Category C limit in Table 3.8.6-1). This requires performance of SR 3.8.4.1 (battery terminal voltage) and SR 3.8.6.1 (float current or specific gravity verification) within 2 hours in addition to restoration of the affected cell float voltage within 24 hours. Note that IEEE 450-2002 provides float current as an alternate test to verify specific gravity.

5. New Condition B is inserted. In this Condition, float current exceeds 2 amps or specific gravity is less than 1.195 (this is the equivalent to the Category B and C limits in Table 3.8.6-1 for specific gravity, with float current as an alternative parameter). The Required Actions specify performance of SR 3.8.4.1 (battery terminal voltage) within 2 hours and restoration of either float current or specific gravity within 24 hours.

6. New Condition C is added if battery electrolyte level is not maintained (this is the equivalent to Category A, B and C for electrolyte level in Table 3.8.6-1). The overall recovery of electrolyte level within 31 days is consistent with the Completion Time for existing Condition A. However, NOTES are added to Required Actions to denote remedial measures should the electrolyte level fall below the top of the battery plates:

> "Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates."
>
> "Required Action C.2 shall be completed if electrolyte level was below the top of plates."

These NOTES are consistent with IEEE 450-2002 in addition to current TS practices.

New Required Action C.1 directs restoration of the electrolyte level to above the top of the plates within 8 hours. New Required Action C.2 directs completing an investigation of potential battery cell jar leakage within 12 hours. New Required Action C.3, as noted above, is comparable to existing Action A.3, in that it restores electrolyte level to limits within 31 days.

7. New Condition D provides a Required Action and Completion Time should the battery pilot cell temperatures be found low, in accordance with IEEE 450-2002. This surveillance is currently in existing Condition B (for remainder of parameters in Condition B, see item 9, below).

8. New Condition E provides a Required Action and Completion Time should redundant Trains of batteries not be within limits. This is consistent with TSTF 360: "Restore battery parameters for batteries in one train to within limits" with a Completion Time of 2 hours.

9. Existing Condition B is relabeled as Condition F, and
   a. Required Actions and Completion Times A through E not met is specified as the reason for entering this Condition, and
   b. Technical parameter limits in the Condition are re-specified per the recommendations of IEEE 450-2002:
      - "One or more batteries" is reworded as "One or two batteries on one train", for clarity since there are two required batteries on a given train
      - "with average electrolyte temperature of the representative cells <60°F" is replaced with "one or more battery cells float voltage <2.07V and float current >2 amps," and,
      - "parameters not within category C values" is replaced with "cells float voltage <2.07V and specific gravity <1.175."

10. SR 3.8.6.1
    a. In accordance with the recommendations of IEEE 450-2002, this surveillance:
       - rather than meet Table 3.8.6-1 category A limits, is re-specified to verify ≤2 amps float current or verify pilot cell specific gravity ≥1.200 for each battery.
       - the specified frequency for this surveillance is extended from 7 days to 31 days.
    b. This surveillance is modified by a NOTE that this does not need to be met if the float voltage of SR 3.8.4.1 is not being met. That is, one is already in a Condition in LCO 3.8.4, so further performance of this SR is not required.

11. Existing SR 3.8.6.2 is deleted; its verifications are now contained in new SRs 3.8.6.2, 3.8.6.3, and 3.8.6.4.

12. New SR 3.8.6.2 verifies pilot cell voltage ≥2.07V every 31 days. This is the equivalent of the existing Category A limit of Table 3.8.6-1, which is currently surveilled every 92 days and within 7 days after battery discharge or overcharge. This change in surveillance frequency is per the recommendations of IEEE 450-2002.

13. New SR 3.8.6.3 verifies each connected cell electrolyte level every 31 days. This is the equivalent of the current Category B limit of Table 3.8.6-1, which is surveilled every 92 days. This increase in surveillance frequency is per the recommendations of IEEE 450-2002.

14. Existing SR 3.8.6.3 is renumbered to SR 3.8.6.4. This SR replaces verification of average electrolyte temperature of representative cells >60°F with verification of each pilot cell temperature to greater than or equal to minimum established design limits. The specified frequency for this new pilot cell surveillance is once per 31 days per TSTF 360, Rev. 1. These changes are made per the recommendations of IEEE 450-2002.

15. New SR 3.8.6.5 verifies connected cell voltage every 92 days. This is the equivalent of the current Category C limit in Table 3.8.6-1, which is also surveilled every 92 days.

16. New SR 3.8.6.6 is the relocated existing SR 3.8.4.8. This surveillance is modified to allow a modified performance discharge test per TSTF 360, Rev. 1. This change is per the recommendations of IEEE 450-2002.

17. Table 3.8.6-1 is deleted in its entirety. As discussed previously, the limits are incorporated in the previous SRs.

LCO 3.8.7

1. For clarity, the LCO is restated from: "The required Train A, Train B, Train C, and Train D inverters shall be OPERABLE." to read: "The required Channel A, B, C, and D AC inverters shall be OPERABLE." This is an editorial change.

LCO 3.8.9

1. Similar to editorial changes clarifying the two electrical Trains configuration, the LCO is restated from:

"Train A and Train B AC;
Trains A, B, C, and D DC; and
Trains A, B, C, and D AC vital bus electrical power distribution subsystems shall be OPERABLE."

to read:

"Train A and Train B AC,
subsystems A, B, C, and D DC and
Channels A, B, C, and D AC vital bus electrical power distribution systems shall be OPERABLE."

This is an editorial change.

§ 5.5.2.16

1. A new Program is added: "Battery Monitoring and Maintenance Program" as new section 5.5.2.16 to the Procedures, Programs, and Manuals Section of the Technical Specifications. The Program description is verbatim per the recommendations of TSTF 360 Rev. 1, and provides the programmatic changes necessary to warrant the changes previously citing that IEEE standard.

The Bases will similarly be modified to reflect the above changes.

3.0 BACKGROUND

TS 3.8.4 requires the Train A and Train B DC electrical power subsystems to be operable. The 125VDC electrical power system consists of four independent and redundant Class 1E DC electrical power subsystems. Subsystems A and C support the Train A Class 1E Engineered Safety Features (ESF) equipment and subsystems B and D support the Train B Class 1E ESF equipment. Each subsystem consists of one 125VDC battery, a battery charger for the battery, inverter, and miscellaneous connected loads. During normal operation, the 125VDC load is powered from battery chargers that also maintain the batteries in a fully charged condition. In case of loss of AC power to a battery charger, the DC load is automatically powered from the associated battery.

The current DC system configuration has two independent and redundant trains; each train consists of two subsystems with a battery and battery charger power source. Subsystems A and C support Train A and subsystems B and D support Train B. Subsystem C also provides control power for the third of kind Turbine Driven Auxiliary Feedwater Pump P140. Provisions in the existing design allow for temporarily cross-connecting DC subsystems of the same safety train during Modes 5 and 6 to facilitate maintenance on batteries and to maintain operability of the operating unit's 4.16kV Class 1E ESF buses. The Mode 5 and 6 cross-connect design includes permanently installed molded case isolation switches provided for each DC bus that can be connected via temporarily installed cable to a spare breaker on the DC bus. This spare breaker position is also utilized when necessary to connect a spare battery charger via temporary cable to the bus in the event the normal charger is inoperable.

The DC system will be upgraded to replace each of the existing batteries with larger 1800 Amp-hour rated (AH) batteries, add two 400 Amp rated swing battery chargers and 600 Amp, 250 Volt rated circuit breakers or disconnect switches, and upgrade several circuit breakers in DC switchboards and distribution panels (refer to attached Sketches 1 and 2 of Train A and Train B systems, respectively). Also, an additional swing battery charger will be shared between DC subsystems A and C, and a second swing charger will be shared between DC subsystems B and D. Each swing battery charger has mechanically interlocked, dedicated DC circuit breakers to allow it to feed only one subsystem battery at a time. In addition, an additional 600 Amp circuit breaker is interposed between the swing battery charger and the associated battery bank for separation and isolation. SCE has installed a new Class 1E, 1800 AH rated temporary battery bank (B00X) so that replacements of the existing batteries (e.g., at end of battery service life) can also be performed online.

Condition A of TS 3.8.4 currently requires that one (or more) inoperable battery or associated control equipment or cabling be restored to operable status within 2 hours or be in Mode 3 within 6 hours and Mode 5 within 36 hours. Condition A represents a subsystem with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. The basis for the 2-hour completion time is consistent with Regulatory Guide (RG) 1.93 ("Availability of Electric Power Sources") which has its emphasis on assessing unit status and stabilizing the unit to minimize the potential for complete loss of DC power to the affected train.

Current SR 3.8.4.6 will be modified to relocate battery charger operability limits to the Licensee Controlled Specifications. This will facilitate ongoing battery upgrade.

SR 3.8.4.7 currently requires a service test to be performed on a battery every 24 months to verify capability to meet the load profile (battery duty cycle) of the most limiting Design Basis Accident (DBA). The discharge rate and test length correspond to the design duty cycle requirements. The surveillance frequency of 24 months is consistent with the recommendations of Regulatory Guide (RG) 1.32 ("Criteria for Power Systems for Nuclear Power Plants") and RG 1.129 ("Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants") that state that the battery service test should be performed during refueling operations, or at some other outage, with intervals between tests not to exceed 24 months. There is a note to this SR that allows substitution of the battery performance discharge test (SR 3.8.4.8) in lieu of the service test every 48 months to preclude performing both a service test and a performance test in the same cycle.

SR 3.8.4.8 currently requires a battery performance test be performed at a constant current to determine the battery capacity and detect/determine overall battery degradation due to age and usage. The acceptance criteria for this Surveillance are consistent with IEEE-450-2002 and IEEE 485-1997, Recommended Practice for Sizing Lead Acid Batteries for Stationary Applications. These standards recommend that the battery be replaced if its capacity is below 80% of the manufacturer rating. The frequency for this surveillance is every 60 months, or every 12 months if the battery shows signs of degradation or has reached 85% of its expected life.

Due to the design requirements of the DC distribution subsystems the associated batteries must meet duty cycles for several design bases events. IEEE 450-2002 requires that anytime the battery load profile changes that a service test be conducted to that profile to ensure battery adequacy. The modified performance discharge test combines the peak (bounding) service profile test conditions from various duty cycles with the required performance discharge rate. The latest revision of Combustion Engineering Standard Technical Specifications (NUREG-1432, Rev. 3, dated June 2004) endorses this method of testing and eliminates separate service testing requirements.

4.0 EVALUATION

The following discussion provides the engineering evaluation of the proposed changes (a detailed listing of specific changes follows; also, please note Table 1, following page 34, provides a breakdown of IEEE 450-2002 requirements versus the applicable SONGS TS or LCS):

This proposed change to TS 3.8.4 will extend the CT for an inoperable DC subsystem battery, exclusive of the battery charger which has its own LCO, by adding an additional action to allow manual cross-connect of distribution subsystems A and C, or B and D for a period of 30 days during Modes 1-4.

These changes will be implemented provided the following conditions are met:

1. The inoperable subsystem can be cross-connected within 2 hours.
2. Required battery charger and DC buses are operable.
3. Batteries are sized and tested to accommodate the combined connected loads.

The proposed changes to SR 3.8.4.7 and 3.8.4.8 are to eliminate individual service tests and performance tests and replace them with a modified performance test. This modified performance test would combine aspects of the service test and performance test into one test profile. The existing service test assures the battery will meet the duty profile between tests and allows trending of battery terminal voltages for each period of the duty cycle profile. The performance test trends the battery capacity from the factory acceptance tests to end of life. Battery capacity and individual cell voltages are compared to acceptance criteria for determining end of life conditions. The modified performance test would combine the peak (bounding) service profile test conditions from various duty cycles with the required performance discharge rate. This test methodology is endorsed by IEEE 450-2002 and is identified in the CE Standard Technical Specifications (STS). This test would provide better trending data for the battery terminal voltages, individual cell voltages, and capacity.

The proposed change to SR 3.8.6.1 is consistent with the proposed upgrade to the 2002 Revision to IEEE 450. Table 1 summarizes the upgrade of IEEE 450 to the 2002 Revision.

In order to implement the improvements provided by TSTF-360, Rev. 1, the following identifies changes that are made to LCOs 3.8.4, 3.8.5, and 3.8.6 (n.b.: these improvements, (1) through (8), are cited below from TSTF-360, Rev. 1):

(1) Provide a specific Action & increased Completion Time for an inoperable battery charger (extended from 8 to 12 hours in Required Actions A.2).
(2) Relocate preventative maintenance SRs to licensee controlled programs (i.e.: new Licensee Controlled Specification (LCS) 3.8.106).
(3) Provide alternate testing criteria for battery charger testing (> minimum established float current).
(4) Replace battery specific gravity monitoring with float current monitoring (at SONGS, add battery float current monitoring as an alternate Required Action in 3.8.4.A.2 and as an alternate test technique to the specific gravity monitoring in SR 3.8.6.1).
(5) Relocate (to a licensee controlled program (at SONGS, new LCS 3.8.106) based on IEEE-450 and/or the ISTS Bases) and create a program (Battery Monitoring and Maintenance Program, new section 5.5.2.16) to reference actions for cell voltage and electrolyte level:
    (a) Category A & B value limits for cell 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.
(6) Provide specific Actions and increased Completion Times for out-of-limits conditions for cell voltage, electrolyte level, and electrolyte temperature (implemented in LCO 3.8.6).

(7) Enhanced Bases are provided for each above change.
(8) Eliminate the "once per 60 month" restriction on replacing the battery service test with the battery modified performance discharge test (implemented in SR 3.8.6.6).

The following is the rationale provided with TSTF-360, Rev. 1, as applicable to SONGS 2 and 3 to justify the improvements specified in that document. These changes are indexed to conform to implementation to TSTF-360, Rev. 1 (from the "Description" section of TSTF-360, Rev. 1, cited above):

(1) Current NUREG STS (reference: NUREG-1432, Rev. 3, published June 2004) limit restoration time for an inoperable battery charger to the same time as for an inoperable battery or a completely deenergized DC distribution subsystem. The primary role of the battery charger is in support of maintaining 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 battery. A secondary safety significant function can be attributed to carrying the post-accident DC load after restoration of AC power (typically 10-15 seconds - the time required for the Emergency Diesel Generator (EDG) to tie on). In analyzed post-accident scenarios, there is no safety related criteria for recharging a fully discharged battery in any specific time period.

The current 2-hour restoration time is based on Regulatory Guide 1.93, and has been applied equally to a minimal reduction in battery charger design capacity (which even may still support any and all post-accident assumed functions) as well as to a complete disconnected/deenergized DC subsystem. This change is attempting to apply a more reasonable restoration time, 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 -- consistent with the current basis for charger OPERABILITY; and c) the 2-hour restoration time for a deenergized DC distribution subsystem (found in NUREG 1432, STS for Combustion Engineering Plants, LCO 3.8.9).

Refer also to the proposed Bases for LCO 3.8.4 Action A for additional discussion. The proposed ACTION A for LCO 3.8.4 (and similarly for LCO 3.8.5) provides a 2-hour Completion Time followed by a 12-hour repetitive verification of battery capability. These times are contingent on a focused and tiered approach assuring adequate battery capability is maintained. This first priority for the operator is to minimize the battery discharge, which is required to be terminated within 2 hours (Required Action A.1). Presuming that the battery discharge (if occurring) can be terminated and that the DC bus remains energized (as required by a separate LCO), there is a reasonable basis for extending the restoration time for an inoperable charger beyond the 2-hour limit. The second tiered action proposes 12-hours to establish that the battery has sufficient capacity to perform its assumed duty cycle as measured by float current ≤ 2 amps (which may involve some recharging of lost capacity that occurred during the initial 2 hours). Given the choice of a plant shutdown in this condition (as currently required) versus a 12 hour determination (at the end of which it is reasonable to assume the battery can be shown to have its assumed capacity), this appears to be an acceptable relaxation.

Since the focus of this allowance is that battery capacity be preserved and assured, the means of accomplishing this is left to plant capabilities. In many cases there would be spare battery chargers that could be employed within the initial 2-hours; in other cases it may be the degraded, normally in-service charger that can continue to float the battery.

(2) Per 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 SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 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 type activity. For example, the Bases for SR 3.8.4.4 identify removal of visible corrosion and tightening of terminal connections as a preventive maintenance SR (both of which are generally quicker than verifying battery connection resistance). SR 3.8.4.3 (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. 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 bracketed values of resistance specified in the NUREG are vendor recommended values; that is, 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 has a direct impact on operability, however, it is adequately determined as acceptable through completion of the battery service and discharge tests. As such, these activities are also inappropriate for Operability SRs and are generally better controlled under the maintenance programs for batteries.

Accordingly, these surveillances will be relocated to the Licensee Controlled Specifications (LCS). This will enable these activities, although recommended by IEEE-450 but not strictly required to specify Operability, to be maintained.

(3) The NUREG STS (reference: NUREG-1432, Rev. 3, published June 2004) SR 3.8.4.2 requires specific parameters for battery charger performance testing. This test is intended to confirm the charger design capacity.

(4) This change proposes to allow battery specific gravity monitoring or float current monitoring.

(5) (a) NUREG STS (reference: NUREG-1432, Rev. 3, published June 2004) LCO 3.8.6 on battery cell voltage and electrolyte level parameters contains various levels (Categories) of limitations. 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 levels for long term battery quality and extended battery life. As such, they 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." It is proposed that these values, and the actions associated with restoration, be relocated to licensee-controlled programs that are under the control of 10 CFR 50.59. These programs are to be based on the recommendations of IEEE-450, 1995. The parameter values will continue to be controlled at their current level, and actions will be implemented in accordance with the plant corrective action program. Furthermore, the battery and its preventive maintenance and monitoring are under the regulatory requirements of the Maintenance Rule. This relocation will continue to assure the battery is maintained at current levels of performance, and allows the Technical Specifications (and the licensed operators) to focus on parameter value degradations that approach (but continue to provide some margin to) levels that may impact battery operability.

(b)(c) The specific limiting values for the battery electrolyte temperature and level are also relocated to licensee controlled programs that are under the control of 10 CFR 50.59. The TSs will require the electrolyte temperature and level to be greater than or equal to the "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. Relocation to licensee-controlled programs can allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its assumed function.

(d) The specific limiting value for the minimum operating battery charging float voltage is relocated to the LCS, which are under the change control of 10 CFR 50.59. The TSs will require the battery charger to supply battery terminal voltage "greater than or equal to the minimum established float voltage." The battery manufacturer establishes this voltage to provide the optimum charge on the battery. This voltage will maintain the battery plates in a condition that supports maintaining grid life.

As such, the "minimum established float voltage" can be adequately controlled outside of the Technical Specifications.

The Actions related to (1) cell voltage < 2.13 V, (2) restoration, and (3) testing of cells that had electrolyte level below the top of the plates are specified by a new Section 5.0 Program.

(6) The remaining parameter limits are proposed to have more specific actions associated with each parameter that recognizes its unique impact on the battery and its continued operability. The proposed change provides specific Actions and increased Completion Times for out-of-limits conditions for cell voltage, electrolyte level, and electrolyte temperature. These allowed times recognize the margins available, the minimal impact on the battery capacity and capability to perform its intended function, and the likelihood of effecting restoration in a timely fashion and avoiding an unnecessary plant shutdown. The Bases for each Required Action provides specific justification for each proposed action.

(7) Revised Bases for the applicable LCO's, following the models from TSTF- 360, Rev. 1, are attached (Attachment G) for information.

(8) The "once per 60 month" restriction on replacing the battery service test with the battery modified performance discharge test is eliminated. Since the modified performance discharge test completely encompasses the load profile of the battery service test, it adequately confirms the intent of the service test to verify the battery capacity to supply the design basis load profile.

The following item is included in this Amendment Request in addition to the scope of TSTF-360, Rev. 1:

(1) Currently, the existing standard allowed outage time for DC System related inoperabilities is the same 2 hours, regardless of whether the DC inoperability is a single charger, a single battery, or the entire train/division without any DC power. The range of possible degradations to the DC System would seem to dictate the possibility of a range of specific limitations associated with each level of degradation. Proposed above are relaxations in allowed restoration times for inoperable battery chargers, as well as for specific limited off normal conditions for selected battery parameters. The proposed change to Specification 3.8.4 continues to retain the previous 2-hour Completion Time for the inoperability of a battery (even assuming the charger is operable), however, the format is presented such that a separate Action is applicable for the inoperability of the battery alone. The Bases for this Action (Action B of 3.8.4) acknowledges a potential for an individual utility to approach the Staff with specific justification to extend the battery restoration time beyond this 2-hour limit. As such the format is provided to accommodate this potential. In the event the allowed restoration time for an inoperable battery is retained at 2 hours, Condition B and C were combined into a single Condition.

The potential for extending the battery allowed restoration time might be based on several factors. The Bases acknowledges that during the time the battery is inoperable additional single failures are not required to be assumed. Therefore, even in the event of a loss of offsite power (alone or in conjunction with a Design Basis Accident (DBA)), the associated battery charger will be expected to restore power to the DC subsystem after the associated diesel generator is connected. As such, an extension to the 2-hour period could be found acceptable on a plant specific basis.

The following provides a detailed listing of the proposed changes for evaluation:

LCO 3.8.1 The change to this LCO is regarded as acceptable since it is a clarification permitted following equipment upgrade.

1. SR 3.8.1.1 The words in the NOTES "Buses 3A04 and 3D1" and "Buses 3A06 and 3D2" are simplified to "Bus 3A04" and "Bus 3A06," respectively (example for the Unit 2 TS). This is a non-Standard-Technical-Specification (STS) San Onofre specific clarification of which buses are required. With the upgrade of the four batteries, specification of the preferred DC subsystem is no longer required.

LCO 3.8.4 The changes to this LCO are regarded as acceptable since they include already-approved changes per TSTF 360, Rev. 1 and IEEE 450-2002, are permitted following equipment upgrade, or are editorial improvements.

1. The specification of the LCO is revised from the "Train A, Train B, Train C, and Train D" electrical power subsystems to "Train A and Train B." This brings the LCO into conformance with the Combustion Engineering Standard Technical Specification, NUREG-1432, Rev. 3.

2. A new Condition A (comparable to existing Condition C, which is deleted) is added:

> "Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable."

This makes the Condition more concordant with the STS and clarifies actions to be taken when the battery charger is not OPERABLE. The Required Actions and Completion Times are modified in accordance with TSTF 360, Rev. 1 to validate battery OPERABILITY while in this Condition. Note: new Required Action A.2.2 provides the option to verify pilot cell specific gravity ≥ 1.200; this is regarded as a technically acceptable provision not described in TSTF 360 Rev. 1. Also, TSTF 360 Rev. 1 Required Action A.3, "Restore battery charger to OPERABLE status," is not included since this is not part of the current licensing basis and is unnecessary.

3. A new Condition B (comparable to existing Condition D, which is deleted) is inserted to declare the associated battery inoperable should the battery parameters being monitored in the Required Actions for Condition A not be satisfactory. This direction is given, comparable to the existing Condition D, although this requirement is not included in TSTF 360 Rev. 1.

4. Existing Condition A is modified, as new Condition C, to specifically cover Conditions not included in new Condition A. With the DC electrical power subsystem inoperable (exclusive of the battery charger), one still has a two hour Completion Time to restore the subsystem to OPERABLE status with a new optional Required Action to cross-connect to the subsystem in the same Train. Once the cross-connection is made, this Required Action is satisfied and new Condition D is entered. New optional Required Action C.2 has a note that cross-connection:

> "Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-hours"

This note is necessary since all eight battery subsystems (four battery subsystems on two units) are not expected to be installed and tested prior to implementation of this amendment. Accordingly, this note would preclude use of this optional Required Action until the necessary battery subsystem upgrades and testing are complete. The addition of Required Action C.2 ("Cross connect with the same train DC subsystem") is part of the revised design included in this review; this is not included in TSTF-360 Rev. 1.

5. New Condition D is inserted to provide an upper limit for the duration of the time when DC subsystems are cross-connected. In routine operation there are two electrical Trains consisting of four batteries of the four DC subsystems powering the four independent instrumentation, controls, and power subsystems. For up to 30 days this design conservatism would be reduced to two electrical Trains consisting of three batteries of the four DC battery subsystems fully capable of powering the four instrumentation, control, and power subsystems. A Probabilistic Risk Assessment (PRA) analysis of this temporary configuration is provided in Attachment J. The 30-day Completion Time is analyzed to permit both preventive and corrective maintenance online as well as online changeout of batteries (and required commissioning / OPERABILITY tests) without further regulatory action. Similar to item 4, above, Condition D is new to this design with the cross-tie capability; this Condition is not included in TSTF 360 Rev. 1. The PRA demonstrates the acceptability of this configuration for either commissioning new batteries or performing online OPERABILITY tests.

6. Existing Condition B is relabeled Condition E and modified to include the failure to satisfy the new Conditions (added above) as entry conditions to mandate plant shutdown.

7. SR 3.8.4.1 is modified to provide surveillance of "greater than or equal to the minimum established float voltage" from the current requirement of "≥129V on float charge." Also, the frequency is extended from 7 to 31 days. Both changes are consistent with IEEE 450-2002. Note, however, that TSTF 360 Rev. 1 continues to use a 7-day frequency; for this Surveillance Requirement, the frequency from IEEE 450-2002 was used.

8. Existing SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5 are relocated to the Licensee Controlled Specifications per the recommendations of TSTF 360 Rev. 1. These include measures regarded as routine preventive maintenance, such as inspecting

for signs of corrosion, physical damage, and electrical resistance measuring. The frequency for existing SR 3.8.4.2 will be changed to 12 months, consistent with IEEE 450-2002, although TSTF 360 Rev. 1 has this as 18 months.

Also, specified in TSTF 360 Rev 1 for this SR is "Verify each battery charger can recharge the battery to the fully charged state 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 is deleted as not required for the LCO as this is bounded by other SRs. For the proposed SR 3.8.4.3, a frequency of 30 months is specified, which agrees with IEEE 450-2002, whereas TSTF 360 Rev. 1 specifies 18 months.

9. Existing SR 3.8.4.6 is renumbered to SR 3.8.4.2 and
   a. The NOTE "Credit may be taken for unplanned events that satisfy this SR." is deleted as pragmatically unhelpful,
   b. In accordance with the recommendations of TSTF 360 Rev. 1 the required duration for this surveillance is reduced from 12 to 8 hours, and
   c. To facilitate upgrade of the batteries, the operability limits are relocated to the LCS and the SR revised to:
      - The minimum specified current is changed from "300 amps" to "rated amps,"
      - The minimum specified voltage is changed from "129 V" to "the minimum established float voltage"

10. Existing SR 3.8.4.7 is renumbered to SR 3.8.4.3, and
    a. NOTES 2 and 3 are removed:
       - NOTE 2, "This Surveillance shall not be performed in Mode 1,2,3, or 4." is a restriction that can be removed with the ability to cross-connect DC subsystems in a given Train. While cross-connected, one battery can provide electrical power for both subsystems while the other battery is tested online.
       - NOTE 3, "Credit may be taken for unplanned events that satisfy this SR." is deleted as noted previously (see #9) as unhelpful.
    b. The following change is made per the recommendations of IEEE 450-2002:
       - NOTE 1 is changed to specify "The modified performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3" (and the reference SR numbers are changed consistent with this amendment request).
       - The 24-month frequency to perform this battery capacity test is extended to 30 months.
       - NOTE 2 is added to specify "The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months." This includes the revised reference SR numbers and a reasonable replacement frequency for using SR 3.8.6.6 without the modified performance discharge test option.

11. Existing SR 3.8.4.8 is relocated to be the new SR 3.8.6.6, as a more appropriate location (the changes to SR 3.8.4.8 are discussed below).

LCO 3.8.5 The change to this LCO is regarded as acceptable since it incorporates the changes made to LCO 3.8.4, above.

1. The word "The" is added to the beginning of the LCO. This is an editorial change.

2. Conditions and Required Actions are modified consistent with the changes to LCO 3.8.4. The entry Condition for Required Action C is revised from "One..." to "One or more..." per TSTF 360, Rev. 1. Also, proposed Required Action C.2.3 is "Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration." This is consistent with the current licensing basis.

3. SR 3.8.5.1 is modified to reflect changes previously described in 3.8.4, DC Sources – Operating:

   a. The DC sources are OPERABLE when the following SRs are satisfied: 3.8.4.1, 3.8.4.2, and 3.8.4.3.
   b. This SR is modified by a NOTE that the following SRs are not required to be performed: 3.8.4.2 and 3.8.4.3.

LCO 3.8.6 The changes to this LCO are regarded as acceptable since they include already-approved changes per TSTF 360 Rev. 1 and IEEE 450-2002, are permitted following equipment upgrade, or are editorial improvements.

1. General comment: LCO 3.8.6 undergoes the most editorial changes of any LCO in this Amendment Request in updating to the recommendations of IEEE 450-2002. In maintaining concordance with the upgraded IEEE standard, the equivalent level of operational reliability is assured.

2. The LCO is relabeled from "Battery Cell Parameters" to "Battery Parameters." Similar to nomenclature change in LCO 3.8.4, the LCO 3.8.6 is changed from:

> "Battery cell parameters for the Train A, Train B, Train C, and Train D batteries shall be within the Category A and B limits of Table 3.8.6-1."
>
> To read:
>
> "Battery parameters for the Train A and Train B batteries shall be within limits."

This modification is more consistent with the STS, and denotes that there are two electrical Trains, A and B. As noted elsewhere, subsystems A and C batteries support Train A, and subsystems B and D support Train B.

Note that discussion referring to Table 3.8.6-1 is removed. This table, in subsequent discussion, is deleted in its entirety (while its requirements are included in new SRs and deficiencies in satisfying these SRs are accommodated in the Conditions).

3. Existing Condition A is deleted. This Condition was entered upon failing to meet the Category A and B values of existing Table 3.8.6-1. In accordance with the

recommendations of IEEE 450-2002, this table and specific action levels are superceded by new Conditions.

4. New Condition A is inserted: in this Condition, float voltage of 2.07V has not been met (this is the equivalent of the Category C limit in Table 3.8.6-1). This requires performance of SR 3.8.4.1 (battery terminal voltage) and SR 3.8.6.1 (float current or specific gravity verification) within 2 hours in addition to restoration of the affected cell float voltage within 24 hours. Note that IEEE 450-2002 provides that verifying float current is an alternate to verifying specific gravity.

5. New Condition B is inserted: in this Condition, float current exceeds 2 amps or specific gravity is less than 1.195 (this is the equivalent to the Category B and C limits in Table 3.8.6-1 for specific gravity, with float current as an alternative parameter). The Required Actions specify performance of SR 3.8.4.1 (battery terminal voltage) within 2 hours and restoration of either float current or specific gravity within 24 hours. New Required Action B.2.2 specifies "Verify or restore average specific gravity of all connected cells to ≥ 1.195." This provides a technically acceptable alternate verification, albeit not one explicitly specified in TSTF 360 Rev. 1.

6. New Condition C is added if battery electrolyte level is not maintained (this is the equivalent to Category A, B, and C for electrolyte level in Table 3.8.6-1). The overall recovery of electrolyte level within 31 days is consistent with the Completion Time for existing Condition A. However, NOTES are added to the Required Actions to denote remedial measures should the electrolyte level fall below the top of the battery plates:

> "1. Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates."
>
> "2. Required Action C.2 shall be completed if electrolyte level was below the top of plates."

These NOTES are consistent with IEEE 450-2002 and are in addition to current TS practices.

New Required Action C.1 directs restoration of the electrolyte level to above the top of the plates within 8 hours. New Required Action C.2 directs completing an investigation of potential battery cell jar leakage and verifying no evidence of leakage within 12 hours. New Required Action C.3, as noted above, is comparable to existing Action A.3, in that it restores electrolyte level to limits within 31 days.

7. New Condition D provides a Required Action and Completion Time should the battery pilot cell temperature be found low, in accordance with IEEE 450-2002. This surveillance is currently in existing Condition B (for remainder of parameters in Condition B, see item 9, below).

8. New Condition E provides a Required Action and Completion Time should redundant Trains of batteries not be within limits. This is consistent with TSTF 360 Rev. 1: "Restore battery parameters for batteries in one train to within limits." with a Completion Time of 2 hours.

9. Existing Condition B is relabeled as Condition F, and
   a. Required Actions and Completion Times A through E not met is specified as the reason for entering this Condition, and
   b. Technical parameter limits in the Condition are re-specified per the recommendations of IEEE 450-2002:
      - "One or more batteries" is reworded as "One or two batteries on one train", for clarity since there are two required batteries on a given train.
      - "with average electrolyte temperature of the representative cells <60°F" is replaced with "one or more battery cells float voltage <2.07V and float current >2 amps," and,
      - "parameters not within category C values" is replaced with "cells float voltage <2.07V and specific gravity <1.175."

10. SR 3.8.6.1
    a. In accordance with the recommendations of IEEE 450-2002, this surveillance:
       - rather than meet Table 3.8.6-1 category A limits, is re-specified to verify ≤2 amps float current or verify pilot cell specific gravity ≥1.200.
       - for clarity, "each" is added to the Surveillance (as revised, this now reads "Verify each battery float current...").
       - the specified frequency for this surveillance is extended from 7 days to 31 days. (Note: while this is concordant with IEEE 450-2002, TSTF 360 Rev. 1 specifies 7 days for this frequency).
    b. This surveillance is modified by a NOTE that this does not need to be met if the float voltage of SR 3.8.4.1 is not being met. That is, one is already in a Condition in LCO 3.8.4, so further performance of this SR is not required.

11. Existing SR 3.8.6.2 is deleted; its verifications are now contained in new SRs 3.8.6.2, 3.8.6.3, and 3.8.6.4.

12. New SR 3.8.6.2 verifies pilot cell voltage ≥2.07V every 31 days. This is the equivalent of the existing Category A limit of Table 3.8.6-1, which is currently surveilled every 7 days. This change in surveillance frequency is per the recommendations of IEEE 450-2002.

13. New SR 3.8.6.3 verifies each connected cell electrolyte level every 31 days. This is the equivalent of the current Category B limit of Table 3.8.6-1, which is surveilled every 92 days. This increase in surveillance frequency is per the recommendations of IEEE 450-2002.

14. Existing SR 3.8.6.3 is renumbered to SR 3.8.6.4. This SR replaces verification of average electrolyte temperature of representative cells >60°F with verification of each pilot cell temperature greater than or equal to minimum established design limits. The specified frequency for this new pilot cell surveillance is once per 31 days per TSTF 360, Rev. 1. These changes are made per the recommendations of IEEE 450-2002.

15. New SR 3.8.6.5 verifies each connected cell voltage every 92 days. This is the equivalent of the current Category C limit in Table 3.8.6-1, which is also surveilled every 92 days.

16. New SR 3.8.6.6 is the relocated existing SR 3.8.4.8. This surveillance is modified to allow a modified performance discharge test per TSTF 360, Rev. 1. This change is per the recommendations of IEEE 450-2002.

17. Table 3.8.6-1 is deleted in its entirety. As discussed previously, the limits are incorporated in the previous SRs.

LCO 3.8.7 The change to this LCO is regarded as acceptable since it consists of editorial improvements only.

1. For clarity, the LCO is restated from: "The required Train A, Train B, Train C, and Train D inverters shall be OPERABLE." to read: "The required Channel A, B, C, and D AC inverters shall be OPERABLE." This is an editorial change.

LCO 3.8.9 The change to this LCO is regarded as acceptable since it consists of editorial improvements only.

1. Similar to editorial changes clarifying the two electrical Trains configuration, the LCO is restated from:

"Train A and Train B AC;
Trains A, B, C, and D DC; and
Trains A, B, C, and D AC vital bus electrical power
distribution subsystems shall be OPERABLE."

to read:

"Train A and Train B AC,
subsystems A, B, C, and D DC and
Channels A, B, C, and D AC vital bus electrical power
distribution subsystems shall be OPERABLE."

This is an editorial change.

§ 5.5.2.16 The change to this LCO is regarded as acceptable since it consists of incorporation of the already-approved IEEE 450-2002.

1. A new Program is added: "Battery Monitoring and Maintenance Program" as new section 5.5.2.16 to the Procedures, Programs, and Manuals Section of the Technical Specifications. The Program description is verbatim per the recommendations of IEEE 450-2002, and provides the programmatic changes necessary to warrant the changes previously citing that IEEE standard.

REQUIRED DESIGN CHANGES

Design changes are required to facilitate manually cross-connecting DC subsystems during operating Modes 1-4 and meet General Design Criteria (GDC) 17, GDC 18, Regulatory Guide 1.6, and IEEE 308 requirements. The proposed design changes will add one new swing battery charger to be shared by subsystems A and C and another by subsystems B, D, or non-1E bus D5. The existing batteries for each train will be replaced with batteries with 1800 amp-hour ratings. (Refer to Sketches 1 and 2 of the post-modification system in Attachment J, Reviewer Aid) Currently, the subsystems A and B batteries are rated 1260 amp-hours nominal 8-hour, and the subsystems C and D batteries are rated 1500 amp-hours nominal 8-hour.

Each additional swing charger will be powered from the train aligned common Emergency Safety Feature (ESF) Motor Control Center that can be powered from either Unit 2 or Unit 3 ESF buses (refer to Sketches 1 and 2 of Train A and Train B systems). The output of one swing charger will have provisions, via separate output breakers, for alignment to either subsystems A or C. The output of the other swing battery charger could be aligned to the subsystem B, D, or non-1E bus D5 battery DC system via its output breakers. There will be mechanical interlocks to prevent closure of multiple output breakers to ensure that a swing charger will be connected to one DC bus at a time. This ensures that subsystems are not cross connected through a swing charger. During cross connected configuration battery chargers may be paralleled to share the load. Each charger has a current limit feature and consequently will not challenge interrupting duties of the protective devices during parallel operations.

Permanent cables will be upgraded between the molded case isolation switches used for the cross-connect configuration. Distribution system panels and breakers will be increased in size and capacity as necessary to handle the increased load requirements and short circuit current.

During Mode 1-4 cross-connect configurations, as needed by maintenance activities or for corrective activities, administrative controls will be in place to ensure that the required battery chargers are operable. The new swing charger will provide added flexibility to either supply a discharged battery or to supply the cross-connected distribution systems or to replace a normal battery charger should the normal battery charger become unavailable. The two batteries will not continuously operate in parallel supplying the cross-connected distribution system.

Each of the subsystems A, B, C, and D distribution buses are located in separate rooms to meet Appendix R and RG 1.75 requirements for system separation and redundancy. Each distribution room contains the associated distribution switchboard, associated battery charger, inverter, distribution panel, and molded case isolation switches and circuit breakers for the cross-connect configuration. The new swing charger for each safety group will be located in the subsystem A distribution room and subsystem B distribution room.

PRA ASSESSMENT

The SONGS 2/3 Living PRA was used to assess the risk impact of entering TS 3.8.4 for an extended period of 30 days for the configuration where two same train DC subsystems are cross-connected with one battery supporting both buses. The analysis was performed consistent with the guidelines of Regulatory Guide 1.174, "An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes To The Licensing Basis," and 1.177, "An Approach For Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications."

Methodology:

The SONGS 2/3 Living PRA Models and the Safety Monitor were used to assess the core damage and large early release frequencies (CDF and LERF) for two cases: 1) base case – nominal maintenance for all components, and 2) a battery removed from service with the associated bus cross-connected to another bus from the same train. The results from these calculations are combined with additional data to yield results that are measured against PRA acceptance guidelines from Regulatory Guide 1.174 and 1.177. A full PRA discussion is provided in Attachment I.

PRA Quality:

The SONGS PRA has been subjected to extensive peer and regulatory review. The PRA Model, assumptions, database changes, improvements, and computer code are controlled and documented by administrative procedure. The Model and database reflect the as-built design with enhancements that reflect design changes to the 1E DC system and the most recent historical data. Therefore, the SONGS 2/3 Living PRA is of a quality consistent with that required to perform accurate, thorough, and comprehensive evaluations for this application.

Conclusions:

The increases in core damage and large early release frequencies with two same train DC buses cross connected for 30 days are less than 1E-7/year and 1E-8/year, respectively. The changes in risk are small because a fully qualified alternate power source is aligned when a battery is removed for maintenance. The calculated incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP) are less than the acceptance guidelines from NRC Regulatory Guide 1.177 of 5E-7 and 5E-8, respectively.

The expected frequency of TS 3.8.4 usage and duration are combined with the core damage frequency while in the TS to assess the expected annual risk impact of the TS change. The expected annual risk impact is measured against NRC Regulatory Guide 1.174. The expected annual increase in risk is << 1E-7/year for CDF and <<1E-8/year for LERF, which are less than the RG 1.174 acceptance guidelines.

Therefore, the flexibility of the enhanced DC system to allow cross-connection to the other subsystem on the same train supports a TS 3.8.4 allowed outage time extension to 30 days as measured against the risk acceptance guidelines of References 7.8 and 7.9.

PRA Summary:

The PRA results compare favorably against Regulatory Guides 1.174 and 1.177 in large part because a qualified alternate source of power is aligned prior to removing a battery. When aligned to the alternate power source, each DC bus remains energized with a highly reliable source. If a battery is removed from service without the alternate power source aligned, the associated sub-channel reliability is reduced. This is outside the scope of the PRA for this PCN since shutdown is required if the alternate power source is not aligned in 2 hours. The action to initiate shutdown in 2 hours is the same as the current TS where the allowed outage time is 2 hours when a battery is removed from service.

5.0 REGULATORY SAFETY ANALYSIS

The proposed change to Technical Specification (TS) 3.8.4 would extend the Completion Time (CT) for an inoperable Direct Current (DC) subsystem, exclusive of the battery charger which has its own Limiting Condition for Operation (LCO), by adding required actions to allow manual cross-connect of distribution subsystems A and C or B and D for a period of 30 days during Modes 1-4. These changes will be allowed provided the following conditions are met:

1. The inoperable subsystem can be cross-connected within 2 hours.
2. Required battery chargers are operable.
3. Batteries are sized and tested to accommodate the combined connected loads.

The regulatory basis for TS 3.8.4 is to assure, as required by 10CFR50, Appendix A, General Design Criterion (GDC) 17, the DC electrical power system will provide sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. This ensures the DC system is capable of supporting systems critical to precluding or mitigating the release of fission product radioactivity.

The purpose of the LCO is to minimize the impact of loss of a DC safety train on the required Engineered Safety Feature (ESF) equipment needed to ensure that:

1. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of Anticipated Operational Occurrences (AOOs) or abnormal transients; and

2. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated Design Basis Accident (DBA).

Complying with the LCO assures that the assumptions reflected in the analysis for DBAs as documented in San Onofre Nuclear Generating Station (SONGS) 2 and 3 Updated Final Safety Analysis Report (UFSAR) Chapter 15, Accident Analysis are met.

The proposed change will extend the CT for inoperable DC subsystems to allow for effective assessment of corrective actions during Modes 1-4 by cross-connecting DC subsystems A and C or subsystems B and D. Use of the cross-connect option of the DC subsystems will be allowed provided all required battery chargers are operable and required batteries have met the service, performance, or modified performance test profiles.

The capability of the DC subsystems to be effectively cross-connected in a safe and timely manner is contingent upon the above proposed design changes being implemented. Effective switching with the appropriate administrative and mechanical restrictions/interlocks designed into the existing system configurations will assure system perturbations are held to a minimum.

The proposed changes to existing Surveillance Requirements (SRs) 3.8.4.7 and 3.8.4.8 are to eliminate the service profile test and performance tests in their entirety after the new batteries are installed. The modified performance discharge test would combine aspects of the service test and performance test into one test profile. The modified performance discharge test would assure the batteries would be capable of meeting the design bases duty cycles.

The revised calculations, Probabilistic Risk Assessment (PRA), proposed surveillance testing, and safety analysis indicate the basis for the Technical Specification requirements will be met during the extended period in which a DC subsystem is found inoperable and during the period DC distribution buses subsystems A and C or B and D are cross-connected.

EVALUATION

Battery and Charger Sizing

The results of the sizing calculation to support this amendment request indicate the proposed larger capacity battery will meet the design bases load requirements when supplying cross-connected DC subsystems.

The proposed new 400A swing chargers and existing chargers are adequate to support the design bases load requirements for various operating scenarios. In all cross-connect scenarios the required charger(s) can supply the buses' steady state loads and recharge the battery from a design minimum state within 24 hours.

Protection (Breakers, Fuses, Switches)

The results of circuit protection and coordination analysis to support this amendment request indicate that the larger capacity battery will require improvements/upgrades in the protective devices and distribution panels provided in the DC subsystems. Upgrades in breakers to accommodate increased short circuit currents and set-points changes for improved coordination are required and shall be implemented prior to installation of larger capacity batteries and prior to implementation of the DC distribution system cross-connect capability. With the required upgrade implemented, DC cables and distribution equipment will provide adequate protection to support the proposed changes.

During cross connecting of subsystem buses A and C or B and D, two batteries will be paralleled for a short duration. An electrical fault during that duration could exceed the interrupting duties of the protective devices. This is standard industry practice during transfer of power sources and is considered to be an acceptable minimal risk.

Separation requirements (Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems")

The proposed design complies with the separation requirements of IEEE 384 and RG 1.75 as follows:

1. The replacement batteries shall be installed at the same location as the existing batteries located in dedicated battery rooms, thus maintaining the original separation and isolation requirements.
2. Swing battery chargers shall be installed in separate distribution rooms. These battery chargers are furnished with dedicated output circuit breakers located in separate compartments. The circuit breakers are mechanically interlocked to restrict swing battery charger alignment to only one subsystem at a time. A redundant circuit breaker, external to the swing battery charger, is installed for isolation of each battery from the swing battery chargers.

5.1 No Significant Hazards Consideration

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10CFR50.92(c). A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) Involve a significant reduction in a margin of safety. A discussion of these standards as they relate to this amendment request follows:

i. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed changes to Technical Specifications (TS) 3.8.4 and 3.8.6 would allow extension of the Completion Time (CT) for inoperable Direct Current (DC) distribution subsystems to manually cross-connect DC distribution buses of the same safety train of the operating unit for a period of 30 days. Currently the CT only allows for 2 hours to ascertain the source of the problem before a controlled shutdown is initiated. Loss of a DC subsystem is not an initiator of an event. However, complete loss of a Train A (subsystems A and C) or Train B (subsystems B and D) DC system would initiate a plant transient/plant trip.

Operation of a DC Train in cross-connected configuration does not affect the quality of DC control and motive power to any system. Therefore, allowing the cross-connect of DC distribution systems does not significantly increase the probability of an accident previously evaluated in Chapter 15 of the Updated Final Safety Analysis Report (UFSAR).

The above conclusion is supported by Probabilistic Risk Analysis (PRA) evaluation which encompasses all accidents, including UFSAR Chapter 15.

Modification to the Frequency for Surveillance Requirement (SR) 3.8.6.1 is consistent with the recommendations of TSTF 360 Rev. 1 and IEEE 450-2002, and similarly does not impact safety considerations.

Further changes are made of an editorial nature or provide clarification only. For example, discussions regarding electrical 'Trains' and 'Subsystems' will be in more conventional terminology. Limiting Condition for Operations (LCO's) affected by editorial changes include 3.8.1, 3.8.4, 3.8.5, 3.8.6, 3.8.7, and 3.8.9.

Enhancements from TSTF-360, Rev. 1 and IEEE 450-2002 have been incorporated into LCO's 3.8.4 and 3.8.6. TSTF-360, Rev. 1 was previously approved by the NRC, and IEEE 450-2002 includes industry-generic recommendations.

The changes being proposed do not affect assumptions contained in other safety analyses or the physical design of the plant other than the upgrades of the electrical systems described in this change, nor do they affect other Technical Specifications that preserve safety analysis assumptions.

Therefore, operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously analyzed.

ii. Will operation of the facility in accordance with this proposed change create the possibility of new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change to Technical Specifications 3.8.4 will enable the cross-tie of subsystems. New equipment, swing battery chargers, distribution panels, and associated protective devices are added to increase overall DC system reliability. Both administrative and mechanical controls will be in place to ensure the design and operation of the DC distribution systems continue to perform to applicable design standards. During cross connecting of subsystem buses, two batteries would be paralleled for a short duration. An electrical fault during that duration could exceed the interrupting duties of the protective devices. This is standard industry practice during transfer of power sources and is considered to be an acceptable minimal risk. For example, the design of the 1E 4kV power system is based on this practice as well. Therefore, the addition of new equipment does not create the possibility of a new or different kind of accident from any previously evaluated.

Enhancements from TSTF-360, Rev. 1 and IEEE 450-2002 have been incorporated into LCO's 3.8.4 and 3.8.6. TSTF-360, Rev. 1 is previously approved and IEEE 450-2002 includes industry-generic recommendations. Enhancements, including surveillance intervals or required completion times, will not create the possibility of a new or different kind of accident from any previously evaluated.

LCO's 3.8.1, 3.8.4, 3.8.5, 3.8.6, 3.8.7, and 3.8.9 are revised to incorporate editorial changes. Since these changes do not affect plant design but enhance clarity, these modifications do not create the possibility of a new or different kind of accident from any previously evaluated.

Therefore, operation of the facility in accordance with this proposed change will not create the possibility of new or different kind of accident from any accident previously evaluated.

iii. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change does not alter the bases for assurance that safety-related activities are performed correctly or the basis for any Technical Specification that is related to the establishment of or maintenance of a safety margin. Specifically, battery sizing calculations continue to show that new upgraded capacity batteries will meet the most limiting load profile that includes margin for growth, with aging and temperature correction. Battery modified performance discharge testing will demonstrate on an on-going bases that battery capacity will be greater than or equal to 80% of original design requirements at all times during service life and that the service profiles will be met as is currently required by Surveillance Requirements 3.8.4.7 and 3.8.4.8. The addition of the DC cross-tie capability proposed for LCO 3.8.4 will ensure appropriate operations of the DC buses during maintenance activities such as battery testing or replacement.

Enhancements from TSTF-360, Rev. 1 and IEEE 450-2002 have been incorporated into LCO's 3.8.4 and 3.8.6. TSTF-360, Rev. 1 is previously approved and IEEE 450-2002 includes industry-generic recommendations. Enhancements including surveillance intervals or required completion times will not involve a significant reduction in a margin of safety.

Also, LCO's 3.8.1, 3.8.4, 3.8.5, 3.8.6, 3.8.7, and 3.8.9 are revised to incorporate editorial changes. Since these changes do not affect plant design or operations but should enhance clarity, these modifications would not involve a significant reduction in margin of safety.

Therefore, operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety.

Summary

Based on the above discussion, Southern California Edison (SCE) has concluded that: (1) that the proposed amendment request does not constitute a significant hazards consideration as defined by 10 CFR 50.92 and (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed change.

5.2 Applicable Regulatory Requirements/Criteria

NUREG-0800, "Standard Review Plan", Section 8.3.2, "DC Power Systems (Onsite) describes the acceptance criteria and determines if the DC onsite power system satisfies the requirements of General Design Criteria (GDC) 2, 4, 5, 17, 18, and 50 and will perform its intended functions during all plant operating, accident, and station blackout conditions. A discussion of continued compliance with the requirements is discussed in the following paragraphs.

U.S. NRC Regulatory Guide 1.75, "Physical Independence of Electric Systems," describes a method acceptable to the NRC staff of complying with IEEE Std 279-1971 and Criteria 3, 17, and 21 of Appendix A to 10 CFR 50, with respect to the physical independence of the circuits and electric equipment comprising or associated with the Class 1E power system, the protection system, systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system. The new system configurations and upgrades allowed by the proposed changes will continue to meet the physical independence requirements of the system.

U.S. NRC Regulatory Guide 1.93 "Availability of Electric Power Sources" describes operating procedures and restrictions acceptable to the Regulatory staff which should be implemented if the available electric power sources are less than the LCO. The new system configurations and upgrades allowed by the proposed changes will continue to meet the availability requirements of the system.

10 CFR 50, Appendix A, General Design Criteria:

Compliance with GDC 2 requires that nuclear power plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquake, tornado, hurricane, flood, tsunami, or seiche without loss of capability to perform their intended safety functions. Therefore, the DC power system and its components must normally be located in seismic Category I structures that provide protection from the effects of tornadoes, tornado missiles, and floods. The additional equipment being installed to support the proposed changes and the upgraded capacity batteries will be seismically designed, qualified, and installed to perform their functions in the event of an earthquake.

Compliance with GDC 4 requires that structures, systems, and components important to safety (a) be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operations, maintenance, testing, and postulated accidents and (b) be appropriately protected against dynamic effects that result from equipment failures, including missiles. The new system configurations and upgrades allowed by the proposed changes will continue to meet the requirements of GDC 4.

Compliance with GDC 5 requires that structures, systems, and components important to safety shall not be shared among nuclear power units, unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cool down of the remaining units. The additional equipment being upgraded and installed on the DC systems will not be shared between the units. However, the new swing chargers will have the capability of being powered from either of the two operating SONGS units through train separated motor control centers (MCCs) common to both units. These MCCs can receive power from the associated safety trains of both units. Use of the above options to power common MCCs will continue to adhere to existing procedures with appropriate updates to ensure reliability of the DC systems.

Compliance with GDC 17 requires that onsite and offsite electrical power be provided to facilitate the functioning of structures, systems, and components important to safety. Each electric power system, assuming the other system is not functioning, must provide sufficient capacity and capability to ensure that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and that the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. In addition, these onsite power supplies and onsite electrical distribution systems have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure. The proposed changes do not alter the basic alignment and operation of the existing Class 1E 4KV, 480V, and 120VAC systems nor the 125VDC systems.

Compliance with GDC 18 requires that electric power systems important to safety be designed to permit appropriate periodic inspection and testing of key areas and features to assess their continuity and the condition of their components. The proposed changes to the DC system continue to allow the flexibility and testability of the systems both during power and shutdown operations in order to meet the requirements of GDC 18.

Compliance with GDC 50 requires that the reactor containment structure, including access openings, penetrations, and containment heat removal systems, be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any Loss of Coolant Accident (LOCA). The proposed changes to the DC system continue to ensure systems and components required to support safety systems during a LOCA will be available.

Compliance with 10 CFR 50.63 requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout of specified duration. As required by 10 CFR 50.63, electrical systems must be of sufficient capacity and capability to ensure that the core is cooled and that appropriate containment integrity is maintained in the event of a station blackout. The capacity of the DC sources required for station blackout must therefore be verified to be adequate with respect to the worst-case station blackout load profile and specified duration. DC system and battery sizing analysis to support the proposed changes show new upgraded capacity batteries are designed and tested to meet station blackout load profile requirements under all postulated operating conditions.

EVALUATION CONCLUSIONS

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

Southern California Edison (SCE) has determined that the proposed amendment involves no changes in the amount or type of effluent that may be released offsite, and results in no increase in individual or cumulative occupational radiation exposure. As described above, the proposed TS amendment involves no significant hazards consideration and, as such, meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).

7.0 REFERENCES

7.1 SONGS 2 and 3, Updated Final Safety Analysis Report
7.2 SONGS 2 and 3, Technical Specifications
7.3 NUREG-0800, U.S. NRC Standard Review Plan Sections 8.3.2
7.4 Regulatory Guide 1.93, Availability of Electric Power Sources
7.5 IEEE 308, Standard Criteria for Class 1E Power Systems For Nuclear Power Generating Stations
7.6 IEEE 450-2002, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications
7.7 Standard Technical Specifications, Combustion Engineering Plants, Rev. 0 (NUREG 1432)
7.8 Regulatory Guide 1.174, An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis
7.9 Regulatory Guide 1.177, An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications
7.10 Pilot Application of ASME PRA Standard Peer Review Process for the San Onofre Nuclear Generating Station Units 2 and 3 PRA, WCAP-16165 Rev. 0, CEOG Task 1037, November 2003

Attachment A

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

Existing Technical Specification pages, Unit 2

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1	Be in MODE 3.	6 hours
	AND		
	F.2	Be in MODE 5.	36 hours
G. Three or more required AC sources inoperable.	G.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Buses 3A04 and 3D1 are required when unit crosstie breaker 3A0416 is used to provide a source of AC power. 2. Buses 3A06 and 3D2 are required when unit crosstie breaker 3A0603 is used to provide a source of AC power. ---	
	Verify correct breaker alignment and power availability for each required offsite circuit.	7 days

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources—Operating

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

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One battery or associated control equipment or cabling inoperable.	A.1	Restore DC electrical power subsystem to OPERABLE status.	2 hours
B. Required Action and Associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	B.2	Be in MODE 5.	36 hours
C. One required battery charger or associated control equipment or cabling inoperable.	C.1	Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	1 hour <u>AND</u> Once per 8 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ≥ 129 V on float charge.	7 days
SR 3.8.4.2	Verify no visible corrosion at terminals and connectors. <u>OR</u> Verify connection resistance is ≤ 150×10^{-6} ohm for inter-cell connections, ≤ 150×10^{-6} ohm for inter-rack connections, ≤ 150×10^{-6} ohm for inter-tier connections, and ≤ 150×10^{-6} ohm for terminal connections.	92 days
SR 3.8.4.3	Verify cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.4	Remove visible terminal corrosion, verify cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	24 months
SR 3.8.4.5	Verify connection resistance is $\leq 150 \times 10^{-6}$ ohm for inter-cell connections, $\leq 150 \times 10^{-6}$ ohm for inter-rack connections, $\leq 150 \times 10^{-6}$ ohm for inter-tier connections, and $\leq 150 \times 10^{-6}$ ohm for terminal connections.	24 months
SR 3.8.4.6	---NOTE--- Credit may be taken for unplanned events that satisfy this SR. ------ Verify each battery charger supplies $\geq$ 300 amps at $\geq$ 129 V for $\geq$ 12 hours.	24 months
SR 3.8.4.7	---NOTES--- 1. SR 3.8.4.8 may be performed in lieu of SR 3.8.4.7 once per 48 months. 2. This Surveillance shall not be performed in MODE 1,2,3, or 4. 3. Credit may be taken for unplanned events that satisfy this SR. ------ 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.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.8	------------------NOTES------------------ 1. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. 2. Credit may be taken for unplanned events that satisfy this SR. --- Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	60 months AND -----NOTE----- Only applicable when battery shows degradation or has reached 85% of the expected life -------------- 12 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources – Shutdown

LCO 3.8.5 DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems – Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One battery or associated control equipment or cabling 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 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	<u>AND</u>	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately
B. One required battery charger or associted control equipment or cabling inoperable.	B.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	1 hour AND Once per 8 hours thereafter
C. Required Action and associated Completion Time of Condition B not met.	C.1 Declare associated battery inoperable.	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, SR 3.8.4.7, 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 the Train A, Train B, Train C, and Train D batteries shall be within the Category A and B 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 more batteries with one or more battery cell parameters not within limits.	A.1	Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C values.	1 hour
	<u>AND</u>		
	A.2	Verify battery cell parameters meet Table 3.8.6-1 Category C values.	24 hours
	<u>AND</u>		
	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
B. Required Action and associated Completion Time of Condition A not met. OR One or more batteries with average electrolyte temperature of the representative cells < 60°F. OR One or more batteries with one or more battery cell parameters not within Category C values.	B.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
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 battery discharge < 110 V AND Once within 7 days after battery overcharge > 150 V
SR 3.8.6.3	Verify average electrolyte temperature of representative cells is > 60°F.	92 days

Table 3.8.6-1 (page 1 of 1)
Battery Surveillance Requirements

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE VALUE 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][c]	≥ 1.200	≥ 1.195 <u>AND</u> Average of all connected cells ≥ 1.205	Not more than 0.020 below the average of all connected cells <u>AND</u> Average of all connected cells ≥ 1.195

(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 is < 2 amps when on float charge.

(c) Specific gravity measurement may be substituted with the stabilized battery charging or float current for determining the state of charge of the designated pilot cell. This is acceptable only during a maximum of 7 days following a battery charge.

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters—Operating

LCO 3.8.7 The required Train A, Train B, Train C, and Train D inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer.	2 hours
	AND	
	A.2 Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC; Trains A, B, C, and D DC; and Trains A, B, C, and D AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1	Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1	Restore AC vital bus subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1	Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1	Be in MODE 3.	6 hours
	AND		
	D.2	Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

Attachment B

**Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3**

Existing Technical Specification pages, Unit 3

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. <u>AND</u> F.2 Be in MODE 5.	6 hours 36 hours
G. Three or more required AC sources inoperable.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Buses 2A04 and 2D1 are required when unit crosstie breaker 2A0417 is used to provide a source of AC power. 2. Buses 2A06 and 2D2 are required when unit crosstie breaker 2A0619 is used to provide a source of AC power. -- Verify correct breaker alignment and power availability for each required offsite circuit.	 7 days

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources—Operating

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

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One battery or associated control equipment or cabling inoperable.	A.1	Restore DC electrical power subsystem to OPERABLE status.	2 hours
B. Required Action and Associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 5.	36 hours
C. One required battery charger or associated control equipment or cabling inoperable.	C.1	Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	1 hour AND Once per 8 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ≥ 129 V on float charge.	7 days
SR 3.8.4.2	Verify no visible corrosion at terminals and connectors. <u>OR</u> Verify connection resistance is $\leq 150\text{x}10^{-6}$ ohm for inter-cell connections, $\leq 150\text{x}10^{-6}$ ohm for inter-rack connections, $\leq 150\text{x}10^{-6}$ ohm for inter-tier connections, and $\leq 150\text{x}10^{-6}$ ohm for terminal connections.	92 days
SR 3.8.4.3	Verify cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.4	Remove visible terminal corrosion, verify cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	24 months
SR 3.8.4.5	Verify connection resistance is $\leq 150 \times 10^{-6}$ ohm for inter-cell connections, $\leq 150 \times 10^{-6}$ ohm for inter-rack connections, $\leq 150 \times 10^{-6}$ ohm for inter-tier connections, and $\leq 150 \times 10^{-6}$ ohm for terminal connections.	24 months
SR 3.8.4.6	-------------------NOTE------------------ Credit may be taken for unplanned events that satisfy this SR. -- Verify each battery charger supplies $\geq$ 300 amps at $\geq$ 129 V for $\geq$ 12 hours.	24 months
SR 3.8.4.7	-------------------NOTES------------------ 1. SR 3.8.4.8 may be performed in lieu of SR 3.8.4.7 once per 48 months. 2. This Surveillance shall not be performed in MODE 1,2,3, or 4. 3. Credit may be taken for unplanned events that satisfy this SR. -- 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.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.8	------------------NOTES------------------ 1. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. 2. Credit may be taken for unplanned events that satisfy this SR. -- Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	60 months <u>AND</u> -----NOTE------ Only applicable when battery shows degradation or has reached 85% of the expected life -------------- 12 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources – Shutdown

LCO 3.8.5 DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems – Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One battery or associated control equipment or cabling inoperable.	A.1 Declare affected required feature(s) inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	A.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND	(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately
B. One required battery charger or associcted control equipment or cabling inoperable.	B.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	1 hour <u>AND</u> Once per 8 hours thereafter
C. Required Action and associated Completion Time of Condition B not met.	C.1 Declare associated battery inoperable.	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, SR 3.8.4.7, 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 the Train A, Train B, Train C, and Train D batteries shall be within the Category A and B 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 more batteries with one or more battery cell parameters not within limits.	A.1 Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C values.	1 hour
	<u>AND</u>	
	A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C values.	24 hours
	<u>AND</u>	
	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
B. Required Action and associated Completion Time of Condition A not met. OR One or more batteries with average electrolyte temperature of the representative cells < 60°F. OR One or more batteries with one or more battery cell parameters not within Category C values.	B.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
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 battery discharge < 110 V AND Once within 7 days after battery overcharge > 150 V
SR 3.8.6.3	Verify average electrolyte temperature of representative cells is > 60°F.	92 days

Table 3.8.6-1 (page 1 of 1)
Battery Surveillance Requirements

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE VALUE 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][c]	≥ 1.200	≥ 1.195 <u>AND</u> Average of all connected cells ≥ 1.205	Not more than 0.020 below the average of all connected cells <u>AND</u> Average of all connected cells ≥ 1.195

(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 is < 2 amps when on float charge.

(c) Specific gravity measurement may be substituted with the stabilized battery charging or float current for determining the state of charge of the designated pilot cell. This is acceptable only during a maximum of 7 days following a battery charge.

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters—Operating

LCO 3.8.7 The required Train A, Train B, Train C, and Train D inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer.	2 hours
	<u>AND</u>	
	A.2 Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC; Trains A, B, C, and D DC; and Trains A, B, C, and D AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1 Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1 Restore AC vital bus subsystem to OPERABLE status.	2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1 Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.9.1 Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

Attachment C

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

Proposed Technical Specification pages, Redline and Strikeout, Unit 2

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours
G. Three or more required AC sources inoperable.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Bus~~es~~ 3A04 ~~and 3D1~~ is ~~are~~ required when unit crosstie breaker 3A0416 is used to provide a source of AC power. 2. Bus~~es~~ 3A06 ~~and 3D2~~ is ~~are~~ required when unit crosstie breaker 3A0603 is used to provide a source of AC power. --- Verify correct breaker alignment and power availability for each required offsite circuit.	7 days

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources—Operating

LCO 3.8.4 The Train A and~~,~~ Train B~~, Train C, and Train D~~ DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	~~1~~2 hours
	AND	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per ~~8~~12 hours
	OR	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

SURVEILLANCE REQUIREMENTS
ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C~~A~~. One DC electrical power subsystem (exclusive of the battery charger) ~~battery or associated control equipment or cabling~~ inoperable for reasons other than Condition A.	C.1 Restore DC electrical power subsystem to OPERABLE status. OR C.2 Cross connect with same train DC subsystem.	2 hours 2 hours
**D. DC Subsystem Buses cross connected.	D.1 Restore DC Subsystem Buses to non-cross-connected configuration.	30 days
E~~B~~. Required Action and Associated Completion Time of Condition C or D not met.	E~~B~~.1 Be in MODE 3. AND E~~B~~.2 Be in MODE 5.	6 hours 36 hours
~~C. One required battery charger or associated control equipment or cabling inoperable.~~	~~C.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.~~	~~1 hour~~ ~~AND~~ ~~Once per 8 hours thereafter~~
~~D. Required Action and associated Completion Time of Condition C not met.~~	~~D.1 Declare associated battery inoperable.~~	~~Immediately~~

~~(continued)~~

** Note: Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-hours.

SURVEILLANCE REQUIREMENTS
SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage ~~≥ 129 V on float charge.~~	31 ~~7~~ days
~~SR 3.8.4.2~~	~~Verify no visible corrosion at terminals and connectors.~~ ~~OR~~ ~~Verify 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 cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.~~	~~24 months~~

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.4.4~~	~~Remove visible terminal corrosion, verify cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.~~	~~24 months~~
~~SR 3.8.4.5~~	~~Verify 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.~~	~~24 months~~
SR 3.8.4.2~~6~~	~~-------------------NOTE-------------------~~ ~~Credit may be taken for unplanned events that satisfy this SR.~~ -- Verify each battery charger supplies ≥ rated ~~300~~ amps at ≥ the minimum established float voltage ~~129 V~~ for ≥ 8 ~~12~~ hours.	24 months
SR 3.8.4.3~~7~~	-------------------NOTES------------------- 1. The modified performance discharge test in SR 3.8.~~4.8~~6.6 may be performed in lieu of SR 3.8.4.~~7~~3 ~~once per 48 months~~. 2. The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months. ~~2. This Surveillance shall not be performed in MODE 1,2,3, or 4.~~ ~~3. Credit may be taken for unplanned events that satisfy this SR.~~ -- 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.	30 ~~24~~ months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.4.8~~	~~-----NOTES-----~~ ~~1. This Surveillance shall not be performed in MODE 1, 2, 3, or 4.~~ ~~2. Credit may be taken for unplanned events that satisfy this SR.~~ ~~----------~~ ~~Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.~~	~~60 months~~ ~~AND~~ ~~-----NOTE-----~~ ~~Only applicable when battery shows degradation or has reached 85% of the expected life~~ ~~----------~~ ~~12 months~~

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources—Shutdown

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	OR	
	A.1.2 Cross connect with same train DC subsystem.	2 hours
	AND	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	OR	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A~~C. One or more required ~~battery or associated control equipment or cabling~~ DC electrical power subsystem inoperable for reasons other than Condition A.	~~A~~C.1 Declare affected required feature(s) inoperable.	Immediately
	OR	
	~~A~~C.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	~~A~~C.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	~~A~~C.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND	
	~~A~~C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

~~(continued)~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B. One required battery charger or associated control equipment or cabling inoperable.~~	~~B.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.~~	~~1 hour~~ ~~AND~~ ~~Once per 8 hours thereafter~~
~~C. Required Action and associated Completion Time of Condition B not met.~~	~~C.1 Declare associated battery inoperable.~~	~~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~~6,~~ and SR 3.8.4.3~~7,~~ ~~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 3.8.4.3~~7~~ ~~SR 3.8.4.2~~ ~~SR 3.8.4.5~~ ~~SR 3.8.4.8~~. ~~SR 3.8.4.3~~ SR 3.8.4.2~~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 the Train A and~~,~~ Train B~~, Train C, and Train D~~ batteries shall be within limits. ~~the Category A and B 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 more batteries with one or more battery cell parameters not within limits.~~	~~A.1 Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C values.~~	~~1 hour~~
	~~AND~~	
	~~A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C values.~~	~~24 hours~~
	~~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
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 voltage ≥ 2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps or specific gravity < 1.195.	B.1	Perform SR 3.8.4.1	2 hours
	AND		
	B.2.1	Verify or restore battery float current to ≤ 2 amps.	12 hours
		OR	
	B.2.2	Verify or restore average specific gravity of all connected cells to ≥ 1.195.	12 hours

(continued)

ACTIONS (Continued)

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

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F~~B~~. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two ~~more~~ batteries on one train with one or more battery cells float voltage < 2.07 V and float current > 2 amps. ~~with average electrolyte temperature of the representative cells < 60°F.~~ OR One or two ~~more~~ batteries on one train with one or more battery cells float voltage < 2.07 V and specific gravity <1.175. ~~parameters not within Category C values.~~	F~~B~~.1 Declare associated battery 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. -----------------------------------	(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
	Verify each battery float current is ≤ 2 amps or verify pilot cell specific gravity is ≥ 1.200. ~~parameters meet Table 3.8.6-1 Category A limits.~~	31 ~~7~~ days
~~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 battery discharge < 110 V~~ ~~AND~~ ~~Once within 7 days after battery overcharge > 150 V~~
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~~3~~	Verify each battery pilot cell ~~average electrolyte~~ temperature is greater than or equal to minimum established design limits. ~~of representative cells is > 60°F.~~	31 ~~92~~ 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	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 12 months when battery shows degradation or has reached 85% of the 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

~~Table 3.8.6-1 (page 1 of 1)~~
~~Battery Surveillance Requirements~~

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE VALUE FOR EACH CONNECTED CELL
Electrolyte Level	> Minimum level indication mark, and ≤ 3 inch above maximum level indication mark[a]	> Minimum level indication mark, and ≤ 3 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] [c]	≥ 1.200	≥ 1.195 **AND** Average of all connected cells ≥ 1.205	Not more than 0.020 below the average of all connected cells **AND** Average of all connected cells ≥ 1.195

(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 is < 2 amps when on float charge.

(c)Specific gravity measurement may be substituted with the stabilized battery charging or float current for determining the state of charge of the designated pilot cell. This is acceptable only during a maximum of 7 days following a battery charge.

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters—Operating

LCO 3.8.7 The required Channel A, B, C and D AC ~~Train A, Train B, Train C, and Train D~~ inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer. AND A.2 Restore inverter to OPERABLE status.	2 hours 24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC,~~;~~ subsystems A, B, C, and D DC and Channels A, B, C, and D AC vital bus ~~Trains A, B, C, and D DC, and Trains A, B, C, and D AC vital bus~~ electrical power distribution ~~sub~~systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1 Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1 Restore AC vital bus subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1 Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications," of 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.

Attachment D

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

Proposed Technical Specification pages, Redline and Strikeout, Unit 3

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours
G. Three or more required AC sources inoperable.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Bus~~es~~ 2A04 ~~and 2D1 are~~<u>is</u> required when unit crosstie breaker 2A0417 is used to provide a source of AC power. 2. Bus~~es~~ 2A06 ~~and 2D2 are~~<u>is</u> required when unit crosstie breaker 2A0619 is used to provide a source of AC power. --- Verify correct breaker alignment and power availability for each required offsite circuit.	7 days

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources—Operating

LCO 3.8.4 The Train A and, Train B, ~~Train C, and Train D~~ DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND A.2.1 Verify battery float current ≤ 2 amps. OR A.2.2 Verify pilot cell specific gravity ≥ 1.200.	~~1~~2 hours Once per ~~8~~12 hours Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
CA. One DC electrical power subsystem battery or associated control equipment or cabling inoperable for reasons other than Condition A.	C.1 Restore DC electrical power subsystem to OPERABLE status. OR C.2 Cross connect with same train DC subsystem.	2 hours 2 hours
**D. DC Subsystem Buses cross connected.	D.1 Restore DC Subsystem Buses to non-cross-connected configuration.	30 days
EB. Required Action and Associated Completion Time of Condition C or D not met.	EB.1 Be in MODE 3. AND EB.2 Be in MODE 5.	6 hours 36 hours
C. One required battery charger or associated control equipment or cabling inoperable.	C.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	1 hour AND Once per 8 hours thereafter
D. Required Action and associated Completion Time of Condition C not met.	D.1 Declare associated battery inoperable.	Immediately

** Note: Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-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 ~~≥ 129 V on float charge.~~	31 ~~7~~ days
~~SR 3.8.4.2~~	~~Verify no visible corrosion at terminals and connectors.~~ ~~OR~~ ~~Verify 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 cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.~~	~~24 months~~

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
~~SR 3.8.4.4~~ ~~Remove visible terminal corrosion, verify cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.~~	~~24 months~~
~~SR 3.8.4.5~~ ~~Verify connection resistance is $\leq 150x10^{-6}$ ohm for inter-cell connections, $\leq 150x10^{-6}$ ohm for inter-rack connections, $\leq 150x10^{-6}$ ohm for inter-tier connections, and $\leq 150x10^{-6}$ ohm for terminal connections.~~	~~24 months~~
SR 3.8.4.2~~6~~ ~~-------------------NOTE-------------------~~ ~~Credit may be taken for unplanned events that satisfy this SR.~~ -- Verify each battery charger supplies ≥ rated ~~300~~ amps at ≥ the minimum established float voltage ~~129 V~~ for ≥ 8 ~~12~~ hours.	24 months
SR 3.8.4.3~~7~~ -------------------NOTES------------------- 1. The modified performance discharge test in SR 3.8.~~4.8~~6.6 may be performed in lieu of SR 3.8.4.~~7~~3 ~~once per 48 months~~. 2. The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months. ~~2. This Surveillance shall not be performed in MODE 1, 2, 3, or 4.~~ ~~3. Credit may be taken for unplanned events that satisfy this SR.~~ -- 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.	30 ~~24~~ months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.4.8~~	~~-------------------NOTES-------------------~~ ~~1. This Surveillance shall not be performed in MODE 1, 2, 3, or 4.~~ ~~2. Credit may be taken for unplanned events that satisfy this SR.~~ ~~---~~ ~~Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.~~	~~60 months~~ ~~AND~~ ~~-----NOTE------~~ ~~Only applicable when battery shows degradation or has reached 85% of the expected life~~ ~~---------------~~ ~~12 months~~

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources—Shutdown

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	OR	
	A.1.2 Cross connect with same train DC subsystem.	2 hours
	AND	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	OR	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
~~A~~C. One or more required ~~battery or associated control equipment or cabling~~ DC electrical power subsystem (exclusive of the battery charger) inoperable for reasons other than Condition A.	~~A~~C.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	~~A~~C.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	~~A~~C.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	~~A~~C.2.3	Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND		
	~~A~~C.2.4	Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

~~(continued)~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B. One required battery charger or associted control equipment or cabling inoperable.~~	~~B.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.~~	~~1 hour~~ ~~AND~~ ~~Once per 8 hours thereafter~~
~~C. Required Action and associated Completion Time of Condition B not met.~~	~~C.1 Declare associated battery inoperable.~~	~~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~~6,~~ and SR 3.8.4.3~~7,~~ ~~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 3.8.4.3~~7~~ ~~SR 3.8.4.2~~ ~~SR 3.8.4.5~~ ~~SR 3.8.4.8.~~ ~~SR 3.8.4.3~~ SR 3.8.4.2~~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 the Train A and~~,~~ Train B~~, Train C, and Train D~~ batteries shall be within limits. ~~the Category A and B 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 more batteries with one or more battery cell parameters not within limits.~~	~~A.1 Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C values.~~	~~1 hour~~
	~~AND~~	
	~~A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C values.~~	~~24 hours~~
	~~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
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 voltage ≥2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps or specific gravity <1.195.	B.1 Perform SR 3.8.4.1	2 hours
	AND	
	B.2.1 Verify or restore battery float current to ≤ 2 amps.	12 hours
	OR	
	B.2.2 Verify or restore average specific gravity of all connected cells to ≥1.195.	12 hours

(continued)

ACTIONS (Continued)

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

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
FB. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two more batteries on one train with one or more battery cells float voltage <2.07 V and float current >2 amps. with average electrolyte temperature of the representative cells < 60°F. OR One or two more batteries on one train with one or more battery cells float voltage <2.07 V and specific gravity <1.175. parameters not within Category C values.	FB.1 Declare associated battery 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. ---	(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
	Verify each battery float current is ≤2 amps or verify pilot cell specific gravity is ≥1.200parameters meet Table 3.8.6-1 Category A limits.	7 31 days
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 battery discharge < 110 V AND Once within 7 days after battery overcharge > 150 V
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 3.8.6.34	Verify each battery pilot cellaverage electrolyte temperature is greater than or equal to minimum established design limits.of representative cells is > 60°F.	3192 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	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 12 months when battery shows degradation or has reached 85% of the 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.

~~Table 3.8.6-1 (page 1 of 1)~~
~~Battery Surveillance Requirements~~

~~PARAMETER~~	~~CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL~~	~~CATEGORY B: LIMITS FOR EACH CONNECTED CELL~~	~~CATEGORY C: ALLOWABLE VALUE FOR EACH CONNECTED CELL~~
~~Electrolyte Level~~	~~> Minimum level indication mark, and ≤ 1/4 inch above maximum level indication mark[(a)]~~	~~> Minimum level indication mark, and ≤ 1/4 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)(c)]~~	~~≥ 1.200~~	~~≥ 1.195~~ ~~AND~~ ~~Average of all connected cells ≥ 1.205~~	~~Not more than 0.020 below the average of all connected cells~~ ~~AND~~ ~~Average of all connected cells ≥ 1.195~~

~~(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 is < 2 amps when on float charge.~~

~~(c) Specific gravity measurement may be substituted with the stabilized battery charging or float current for determining the state of charge of the designated pilot cell. This is acceptable only during a maximum of 7 days following a battery charge.~~

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters—Operating

LCO 3.8.7 The required Channel A, B, C and D AC ~~Train A, Train B, Train C, and Train D~~ inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer.	2 hours
	AND	
	A.2 Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC,~~;~~ subsystems A, B, C, and D DC and Channels A, B, C, and D AC vital bus ~~Trains A, B, C, and D DC; and Trains A, B, C, and D AC vital bus~~ electrical power distribution ~~sub~~systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1 Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1 Restore AC vital bus subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1 Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications," of 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.

Attachment E

**Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3**

Proposed Technical Specification pages, Unit 2

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours
G. Three or more required AC sources inoperable.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Bus 3A04 is required when unit crosstie breaker 3A0416 is used to provide a source of AC power. 2. Bus 3A06 is required when unit crosstie breaker 3A0603 is used to provide a source of AC power. --- Verify correct breaker alignment and power availability for each required offsite circuit.	7 days

(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. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	OR	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One DC electrical power subsystem inoperable for reasons other than Condition A.	C.1 Restore DC electrical power subsystem to OPERABLE status. OR C.2 Cross connect with same train DC subsystem.	2 hours 2 hours
**D. DC Subsystem Buses cross connected.	D.1 Restore DC Subsystem Buses to non-cross-connected configuration.	30 days
E. Required Action and Associated Completion Time of Condition C or D not met.	E.1 Be in MODE 3. AND E.2 Be in MODE 5.	6 hours 36 hours

** Note: Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-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.	31 days
SR 3.8.4.2	Verify each battery charger supplies ≥ rated amps at ≥ the minimum established float voltage for ≥ 8 hours.	24 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. The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months. --- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	30 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources—Shutdown

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	<u>OR</u>	
	A.1.2 Cross connect with same train DC subsystem	2 hours
	<u>AND</u>	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	<u>OR</u>	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more required DC electrical power subsystem inoperable for reasons other than Condition A.	C.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	C.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	C.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	C.2.3	Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND		
	C.2.4	Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

ACTIONS (continued)

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 the 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 voltage ≥ 2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps or specific gravity < 1.195.	B.1 Perform SR 3.8.4.1	2 hours
	<u>AND</u>	
	B.2.1 Verify or restore battery float current to ≤ 2 amps.	12 hours
	<u>OR</u>	
	B.2.2 Verify or restore average specific gravity of all connected cells to ≥ 1.195.	12 hours

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or two batteries on one train with one or more cells electrolyte level less than minimum established design limits.	------------NOTES------------ 1. Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates 2. Required Action C.2 shall be completed if electrolyte level was below the top of plates. ----------------------------	
	C.1 Restore electrolyte level to above top of plates.	8 hours
	<u>AND</u>	
	C.2 Verify no evidence of leakage.	12 hours
	<u>AND</u>	
	C.3 Restore 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 temperature to greater than or equal to minimum established design limits.	12 hours
E. One or two 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

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
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. OR One or two batteries on one train with one or more battery cells float voltage < 2.07 V and specific gravity <1.175.	F.1 Declare associated battery 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 or verify pilot cell specific gravity is ≥ 1.200.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
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
SR 3.8.6.6	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 12 months when battery shows degradation or has reached 85% of the 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

3.8.7 Inverters—Operating

LCO 3.8.7 The required Channel A, B, C and D AC inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer.	2 hours
	<u>AND</u>	
	A.2 Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

This page intentionally deleted.

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC, subsystems A, B, C, and D DC and Channels A, B, C, and D AC vital bus electrical power distribution systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1 Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1 Restore AC vital bus subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1 Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications," of 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.

Attachment F

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

Proposed Technical Specification pages, Unit 3

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and Associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours
G. Three or more required AC sources inoperable.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	-------------------NOTES------------------- 1. Bus 2A04 is required when unit crosstie breaker 2A0417 is used to provide a source of AC power. 2. Bus 2A06 is required when unit crosstie breaker 2A0619 is used to provide a source of AC power. -- Verify correct breaker alignment and power availability for each required offsite circuit.	 7 days

(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. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	OR	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One DC electrical power subsystem inoperable for reasons other than Condition A.	C.1 Restore DC electrical power subsystem to OPERABLE status. OR C.2 Cross connect with same train DC subsystem.	2 hours 2 hours
**D. DC Subsystem Buses cross connected.	D.1 Restore DC Subsystem Buses to non-cross-connected configuration.	30 days
E. Required Action and Associated Completion Time of Condition C or D not met.	E.1 Be in MODE 3. AND E.2 Be in MODE 5.	6 hours 36 hours

** Note: Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-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.	31 days
SR 3.8.4.2	Verify each battery charger supplies ≥ rated amps at ≥ the minimum established float voltage for ≥ 8 hours.	24 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. The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months. -- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	30 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources—Shutdown

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable.	A.1.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	<u>OR</u>	
	A.1.2 Cross connect with same train DC subsystem.	2 hours
	<u>AND</u>	
	A.2.1 Verify battery float current ≤ 2 amps.	Once per 12 hours
	<u>OR</u>	
	A.2.2 Verify pilot cell specific gravity ≥ 1.200.	Once per 12 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Declare associated battery inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more required DC electrical power subsystem inoperable for reasons other than Condition A.	C.1 Declare affected required feature(s) inoperable.	Immediately
	<u>OR</u>	
	C.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	
	C.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	<u>AND</u>	
	C.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	<u>AND</u>	
	C.2.4 Initiate action to restore required DC electrical power subsystems 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 the 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 voltage ≥2.07 V.	24 hours
B. One or two batteries on one train with float current > 2 amps or specific gravity <1.195.	B.1 Perform SR 3.8.4.1	2 hours
	<u>AND</u>	
	B.2.1 Verify or restore battery float current to ≤ 2 amps.	12 hours
	<u>OR</u>	
	B.2.2 Verify or restore average specific gravity of all connected cells to ≥1.195.	12 hours

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or two batteries on one train with one or more cells electrolyte level less than minimum established design limits.	------------NOTES------------ 1. Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates 2. Required Action C.2 shall be completed if electrolyte level was below the top of plates. ----------------------------	
	C.1 Restore electrolyte level to above top of plates.	8 hours
	<u>AND</u>	
	C.2 Verify no evidence of leakage.	12 hours
	<u>AND</u>	
	C.3 Restore 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 temperature to greater than or equal to minimum established design limits.	12 hours
E. One or two 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

(continued)

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time of Condition A, B, 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. OR One or two batteries on one train with one or more battery cells float voltage <2.07 V and specific gravity <1.175.	F.1 Declare associated battery 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 or verify pilot cell specific gravity is ≥1.200.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
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
SR 3.8.6.6	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 12 months when battery shows degradation or has reached 85% of the 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

3.8.7 Inverters—Operating

LCO 3.8.7 The required Channel A, B, C and D AC inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.9 with one AC vital bus de-energized. ----------------------------	
A. One required inverter inoperable.	A.1 Power AC vital bus from its Class 1E constant voltage source transformer.	2 hours
	<u>AND</u>	
	A.2 Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

This page intentionally deleted.

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC, subsystems A, B, C, and D DC and Channels A, B, C, and D AC vital bus electrical power distribution systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AC electrical power distribution subsystem inoperable.	A.1 Restore AC electrical power distribution subsystem to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital bus inoperable.	B.1 Restore AC vital bus subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more DC electrical power distribution subsystem inoperable.	C.1 Restore DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

5.5 Procedures, Programs, and Manuals (continued)

5.5.2.15 Containment Leakage Rate Testing Program (Continued)

The provisions of Surveillance Requirement 3.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program. However, test frequencies specified in this Program may be extended consistent with the guidance provided in NEI 94-01, "Industry Guideline For Implementing Performance-Based Option Of 10CFR 50, Appendix J," as endorsed by Regulatory Guide 1.163. Specifically, NEI 94-01 has these provisions for test frequencies extension:

1. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for recommended Type A testing may be extended by up to 15 months. This option should be used only in cases where refueling schedules have been changed to accommodate other factors.

2. Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals for the recommended surveillance frequency for Type B and Type C testing may be extended by up to 25 percent of the test interval, not to exceed 15 months.

The provisions of Surveillance Requirement 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

5.5.2.16 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications," of 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.

Attachment G

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

Proposed Bases pages (for information only), Unit 2
(Unit 3 is similar)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources – Operating

BASES

BACKGROUND

The Class 1E Electrical Power Distribution System AC sources consist of the offsite power sources (normal preferred and alternate preferred power sources), and the standby (onsite) power sources (Train A and Train B Diesel Generators (DGs)). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The onsite Class 1E AC Distribution System is divided into redundant load groups (trains) so that the loss of any one group does not prevent the minimum safety functions from being performed. Each train has connections to two preferred (offsite) power sources and a single DG.

In Modes 1 through 4, the normal preferred power source (Offsite circuit #1) for each unit is Reserve Auxiliary Transformers XR1 and XR2 for the specific unit. XR1 feeds one 4.16 kV ESF bus (Train A) A04 and XR2 feeds the other 4.16 kV ESF bus (Train B) A06 of the onsite Class 1E AC distribution system for each unit. The alternate preferred power source (Offsite circuit #2) is the other unit's Reserve Auxiliary Transformers XR1 and XR2, or the other unit's Unit Auxiliary Transformer XU1 through the train oriented 4.16 kV ESF bus cross-ties between the two units. The 4.16 kV ESF bus alignment in the other unit determines which transformer(s) serves as the alternate preferred power source. If the 4.16 kV ESF bus in the other unit is aligned to the Reserve Auxiliary Transformer (XR1 or XR2), then that transformer is the required alternate preferred power source. If the 4.16 kV ESF bus in the other unit is aligned to the Unit Auxiliary Transformer (XU1), then that transformer is the required alternate preferred power source.

In Modes 5 and 6, when the main generator is not operating, each Class 1E Switchgear can be connected to a third preferred power source via the Unit Auxiliary Transformers by manually removing the links in the isolated phase bus between the Main Generator and the Main transformer of the non-operating (Modes 5 and 6) unit and closing the 4.16 kV circuit breaker to the Unit Auxiliary transformer of the same unit. In this alignment, the Unit Auxiliary Transformer (XU1) serves as the required normal preferred power source of the unit and the alternate preferred power source for the ESF bus(es) in the other unit.

(continued)

BASES (continued)

BACKGROUND (continued)

An offsite circuit includes all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus or buses.

During a Safety Injection Actuation Signal (SIAS), certain required ESF loads are connected to the ESF buses in a predetermined sequence. Within 77 seconds after the SIAS, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are placed in service.

The standby (onsite) power source for each 4.16 kV ESF bus is a dedicated DG. DGs G002 and G003 are dedicated to ESF buses A04 and A06, respectively. A DG starts automatically on a SIAS (i.e., low pressurizer pressure or high containment pressure signals) or on an ESF bus degraded voltage or undervoltage signal. After the DG has started, it will automatically connect to its respective bus after the offsite power supply breaker is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with a SIAS signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on a SIAS alone. Following the trip of offsite power, an undervoltage signal strips selected loads from the ESF bus. When the DG is tied to the ESF bus, the permanently connected loads are energized. If one or more ESF actuation signals are present, ESF loads are then sequentially connected to their respective ESF bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application.

In the event of a loss of preferred power in conjunction with one or more ESF actuation signals, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Ratings for Train A and Train B DGs satisfy the requirements of Regulatory Guide 1.9 (Ref. 3). The continuous service rating of each DG is 4700 kW with 10% overload permissible for up to 2 hours in any 24 hour period. However, for standby class of service like the San Onofre DGs the manufacturer allows specific overload values up to 116.1% of continuous duty rating based on the total hours the DG is operated per year. The ESF loads that are powered from the 4.16 kV ESF buses are listed in Reference 2.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the UFSAR, Chapter 6 (Ref. 4) and Chapter 15 (Ref. 5), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This results in maintaining at least one train of the onsite or offsite AC sources OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

The AC sources satisfy Criterion 3 of NRC Policy Statement.

LCO

Two qualified circuits between the offsite transmission network and the onsite Class 1E Electrical Power Distribution System and separate and independent DGs for each train ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an Anticipated Operational Occurrence (AOO) or a postulated DBA.

Qualified offsite circuits are those that are described in the UFSAR and are part of the licensing basis for the unit. Required offsite circuits are those circuits that are credited and required to be Operable per LCO 3.8.1.

Each required offsite circuit must be capable of maintaining frequency and voltage within specified limits, and accepting required loads during an accident, while connected to the ESF buses.

In Modes 1 through 4, the normal preferred power source (Offsite circuit #1) for each unit is Reserve Auxiliary Transformers XR1 and XR2 for the specific unit. XR1 feeds one 4.16 kV ESF bus (Train A) A04 and XR2 feeds the other 4.16 kV ESF bus (Train B) A06 of the onsite Class 1E AC distribution system for each unit.

(continued)

BASES (continued)

LCO (continued)

The alternate preferred power source (Offsite circuit #2) is the other unit's Reserve Auxiliary Transformers XR1 and XR2, or the other unit's Unit Auxiliary Transformer XU1 through the train oriented 4.16 kV ESF bus cross-ties between the two units. The 4.16 kV ESF bus alignment in the other unit determines which transformer(s) serves as the alternate preferred power source. If the 4.16 kV ESF bus in the other unit is aligned to the Reserve Auxiliary Transformer (XR1 or XR2), then that transformer is the required alternate preferred power source. If the 4.16 kV ESF bus in the other unit is aligned to the Unit Auxiliary Transformer (XU1), then that transformer is the required alternate preferred power source.

In Modes 5 and 6, when the main generator is not operating, each Class 1E Switchgear can be connected to a third preferred power source via the Unit Auxiliary Transformers by manually removing the links in the isolated phase bus between the Main Generator and the Main transformer of the non-operating (Modes 5 and 6) unit and closing the 4.16 kV circuit breaker to the Unit Auxiliary transformer of the same unit. In this alignment, the Unit Auxiliary Transformer (XU1) serves as the required normal preferred power source of the unit and the alternate preferred power source for the ESF bus(es) in the other unit.

Each DG must be capable of starting, accelerating to within specified frequency and voltage limits, connecting to its respective ESF bus on detection of bus undervoltage, and resetting the 4.16 kV bus undervoltage relay logic, in less than or equal to 10 seconds. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the ESF buses.

These capabilities are required to be met from a variety of initial conditions such as: DG in standby with the engine hot, DG in standby with the engine at ambient conditions, and DG operating in a parallel test mode. A DG is considered already operating if the DG voltage is $\geq$ 4297 and $\leq$ 4576 volts and the frequency is $\geq$ 59.7 and $\leq$ 61.2 Hz.

Proper sequencing of loads, including tripping of nonessential loads on a SIAS, is a required function for DG OPERABILITY.

The ACs in one train must be separate and independent (to the extent possible) of the AC sources in the other train. For the DGs, separation and independence are complete.

For the offsite AC sources, separation and independence are to the extent practical. A circuit may be connected to more than one ESF bus, with transfer capability to the other circuit, and not violate separation criteria.

(continued)

BASES (continued)

APPLICABILITY

The AC sources and associated automatic load sequence timers are required to be OPERABLE in MODES 1, 2, 3, and 4 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 OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

The AC power requirements for MODES 5 and 6 are covered in LCO 3.8.2, "AC Sources – Shutdown."

ACTIONS

A.1

To ensure a highly reliable power source remains with the one offsite circuit inoperable, it is necessary to verify the OPERABILITY of the remaining required offsite circuit on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action not met. However, if a second required circuit fails SR 3.8.1.1, the second offsite circuit is inoperable, and Condition C, for two offsite circuits inoperable, is entered.

A.2

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition A for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System.

The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES (continued)

ACTIONS

A.2 (continued)

The second Completion Time for Required Action A.2 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DG is inoperable, and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 14 days. This could lead to a total of 17 days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable, the circuit restored OPERABLE, and an additional 14 days (for a total of 31 days) allowed prior to complete restoration of the LCO. The 17 day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The "AND" connector between the 72 hour and 17 day Completion Time means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action A.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition A was entered.

As required by Section 5.5.2.14, a Configuration Risk Management Program is implemented in the event of Condition A.

B.1

To ensure a highly reliable power source remains when one of the required DGs is inoperable, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions and Required Actions must then be entered.

(continued)

BASES (continued)

ACTION

B.2 (continued)

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. This includes motor driven auxiliary feedwater pumps. Single train systems, such as turbine driven auxiliary feedwater pumps, are not included. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable DG.

Reference 18 contains information implying that for a component or system to be considered a "required feature," it must meet ALL the following criteria:

- perform a safety function;
- require electrical power from a class 1E power source to perform its safety function (see Note 1);
- be credited to perform the safety function in loss of offsite power events;
- be redundant to a system or component in the opposite train that performs the same safety function;
- fail in a position on loss of electrical power that does not fulfill the safety function.

Note 1: Systems or components that are powered from a Class 1E battery or inverter are "required features" ONLY if credited to perform their safety function at a time in the event that is longer than the UFSAR assumed life of the associated class 1E battery, AND all other above criteria are met (for example, redundant post accident monitoring instrumentation and atmospheric dump valves).

The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A required feature on the other train is inoperable.

(continued)

BASES (continued)

ACTIONS

B.2 (continued)

If at any time during the existence of this Condition (one DG inoperable) a required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering one required DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DG, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently, is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

In this Condition, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DG, the other DG would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists and Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG, performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that DG.

According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable to confirm that the OPERABLE DG is not affected by the same problem as the inoperable DG.

(continued)

BASES (continued)

ACTION (continued)

B.4

An augmented analysis using the methodology set forth in Reference 16 provides a series of deterministic and probabilistic justifications and supports continued operations in Condition B for a period that should not exceed 14 days.

In Condition B, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 14 day Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.4 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently returned OPERABLE, the LCO may already have been not met for up to 72 hours. This could lead to a total of 17 days, since initial failure to meet the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 72 hours (for a total of 20 days) allowed prior to complete restoration of the LCO. The 17 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The "AND" connector between the 14 day and 17 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action B.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition B was entered.

As required by Section 5.5.2.14, a Configuration Risk Management Program is implemented in the event of Condition B.

(continued)

BASES (continued)

ACTION (continued)

C.1 and C.2

Required Action C.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions. The Completion Time for this failure of redundant required features is reduced to 12 hours from the 24 hours allowed by Regulatory Guide 1.93 (Ref. 6) for two inoperable required offsite circuits. The 24 hour allowance is based upon the assumption that two complete safety trains are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case and a shorter Completion Time of 12 hours is appropriate. These features are powered from redundant AC safety trains. This includes motor driven auxiliary feedwater pumps. Single train turbine driven auxiliary pumps, are not included in the list.

The Completion Time for Required Action C.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable; and

b. A required feature is inoperable.

If at any time during the existence of Condition C (two offsite circuits inoperable) and a required feature becomes inoperable, this Completion Time begins to be tracked.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition C for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

Because of the normally high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two AC sources inoperable that involve one or more DGs inoperable. However, two factors tend to decrease the severity of this level of degradation:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

(continued)

BASES (continued)

ACTION

C.1 and C.2 (continued)

With both of the required offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

According to Reference 6, with the available offsite AC sources two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A.

D.1 and D.2

Pursuant to LCO 3.0.6, the Distribution System (LCO 3.8.9) ACTIONS would not be entered even if all AC sources to it were inoperable resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems – Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of one offsite circuit and one DG without regard to whether a train is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized train.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition D for a period that should not exceed 12 hours.

In Condition D, individual redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES (continued)

ACTIONS (continued)

E.1

With Train A and Train B DGs inoperable, there are no remaining standby AC sources. Thus, with an assumed loss of offsite electrical power, insufficient standby AC sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of AC power for this level of degradation, the risk associated with continued operation for a short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of AC power). Since any inadvertent generator trip could also result in a total loss of offsite AC power, however, the time allowed for continued operation is severely restricted. The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

According to Reference 6, with both DGs inoperable, operation may continue for a period that should not exceed 2 hours.

F.1 and F.2

If the inoperable AC electrical power sources 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 unit systems.

G.1

Condition G corresponds to a level of degradation in which all redundancy in the AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system will cause a loss of function. Therefore, no additional time is justified for continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 8). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the DGs are in accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3), Regulatory Guide 1.108 (Ref. 9), and Regulatory Guide 1.137 (Ref. 10).

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 4297 V is above the maximum reset voltage of the 4.16 kV bus undervoltage relays (Ref. SR 3.3.7). Achieving a voltage at or above 4297 V ensures that the LOVS/SDVS/DGVSS relay logic will reset allowing sequencing of the ESF loads on to the ESF bus if one or more ESF actuation signals is present. This minimum voltage limit, which is consistent with ANSI C84.1-1982 (Ref. 11), is above the allowed voltage drop to the terminals of 4160 V motors whose minimum steady state operating voltage is 3744 V (90% of 4160 V). This minimum voltage requirement also ensures that adequate voltage is provided to motors and other equipment down through the 120 V level. The specified maximum steady state output voltage of 4576 V ensures that, for a lightly loaded distribution system, the voltage at the terminals of 4160 V motors is no more than the maximum allowable steady state operating voltage (110% of 4160V). The specified minimum and maximum frequencies of the DG are 59.7 Hz and 61.2 Hz, respectively. The upper frequency limit is equal to + 2% of the 60 Hz nominal frequency and is derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3). The lower frequency limit is equal to - 0.5% of the 60 Hz nominal frequency and is based on maintaining acceptable high pressure safety injection system performance as assumed in the accident analyses.

During a DG surveillance test, steady state DG voltage of 4297 to 4576 volts and steady state frequency of 59.7 to 61.2 Hz shall be verified. For the lower voltage and frequency limits, the Total Loop Uncertainty (TLU) of the measurement device (Reference Calculation E4C-098) shall be considered.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.1

This SR assures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their preferred power source, and that availability of independent offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room. This SR is modified by two notes. Note 1 states: "Bus 3A04 is required when unit crosstie breaker 3A0416 is used to provide a source of AC power." Note 2 states: "Bus 3A06 is required when unit crosstie breaker 3A0603 is used to provide a source of AC power." These notes are provided for clarification.

SR 3.8.1.2 and SR 3.8.1.7

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the unit in a safe shutdown condition.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, DG starts may be preceded by an engine prelube period. SR 3.8.1.2 is modified by Notes 2 and 3 to indicate that all DG starts for SR 3.8.1.2 may be preceded by an engine prelube period and followed by a warmup period prior to loading. The DG manufacturer recommends a modified (slow) start (when possible) in which the starting speed of the DG is limited, warmup is limited to this lower speed, and the DG is gradually accelerated to rated speed prior to loading. SR 3.8.1.7 is modified by Note 1 to indicate that all DG starts for SR 3.8.1.7 may be preceded by an engine prelube period.

For the purposes of SR 3.8.1.2 and SR 3.8.1.7 testing, the DGs are started from standby conditions. Standby conditions for a DG mean the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with manufacturer recommendations.

SR 3.8.1.7 requires that the DG starts from standby conditions and achieves required voltage and frequency within 9.4 seconds without DG breaker closure. The 9.4 second start requirement ensures that the DG meets the design basis LOCA analysis assumptions (Ref. 5), that the DG starts, accelerates to within the specified frequency and voltage limits, connects to the 4.16kV ESF bus, and resets the ESF bus undervoltage relay logic within 10 seconds of a SIAS.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.2 and SR 3.8.1.7 (continued)

The 9.4 second start requirement is not applicable to SR 3.8.1.2 when a modified (slow) start procedure described above is used. Since SR 3.8.1.7 requires a 9.4 second start, it is more restrictive than SR 3.8.1.2 and it may be performed in lieu of SR 3.8.1.2. This is the intent of Note 1 of SR 3.8.1.2.

In addition to the SR requirements, the time for the DG to reach steady state operation, unless the modified DG start method is employed, is periodically monitored and is evaluated to identify degradation of governor and voltage regulator performance.

SR 3.8.1.7 is modified by Note 2 which acknowledges that credit may be taken for unplanned events that satisfy this SR.

The normal 31 day Frequency for SR 3.8.1.2 (see Table 3.8.1-1, "Diesel Generator Test Schedule," in the accompanying LCO) and the 184 day Frequency for SR 3.8.1.7 are consistent with Regulatory Guide 1.9 (Ref. 3). These frequencies provide adequate assurance of DG OPERABILITY, while minimizing degradation resulting from testing. Note 4 - This note discusses operability of the diesel generator subcomponent Automatic Voltage Regulator (AVR). The AVR is an integral part of the DG, however, each DG has 2 AVRS that are 100% redundant to each other. Only one AVR may be inservice at any one time. To ensure operability of each AVR, the AVRs must have been in service during the performance of SR 3.8.1.2 and SR 3.8.1.3 within the last 60 days plus any allowance per SR 3.0.2. SR 3.8.1.2 is modified by NOTE 1 to indicate that SR 3.8.1.7 satisfies all of the requirements of SR 3.8.1.2. This note is applicable for AVR operability. Also, each AVR must have been in service for either SR 3.8.1.9, SR 3.8.1.10, or SR 3.8.1.19 within the last 24 months plus any allowance per SR 3.0.2. During the 24 month test dynamic performance of the AVR is measured to confirm it is acceptable for all required AVR transients. Based on the design of the AVR, its intended function and the maintenance history, the above specified surveillance schedule will assure the AVRs are capable of performing their intended function.

SR 3.8.1.3

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to the equivalent of the maximum expected accident loads listed in Reference 2. This capability is verified by performing a load test between 90 to 100% of rated load, for an interval of not less than 60 minutes, consistent with the requirements of Regulatory Guide 1.9 (Ref. 3). The lower load limit of 4450 kW is 94.7% of the DG continuous rating (4700 kW). The 94.7% limit is based on design basis loading and includes instrument uncertainty plus margin.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.3 (continued)

Instrument uncertainty is not applied to the upper load limit. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the DG is connected to the offsite source.

Although no power factor requirements are established by this SR, the surveillance is performed with DG kVAR output that offsite power system conditions permit during testing without exceeding equipment ratings (i.e., without creating an overvoltage condition on the ESF buses, over excitation condition on the ESF buses, over excitation condition in the generator, or overloading the DG main feeder). The kVAR loading requirement during this test is met, and the equipment ratings are not exceeded, when the DG kVAR output is increased such that:

a. kVAR is ≥ 3000 and ≤ 3200 or
b. the excitation current is ≥ 3.8 A and ≤ 4.0 A or
c. the ESF bus voltage is ≥ 4530 V and ≤ 4550 V or
d. DG feeder current is ≥ 730 A and ≤ 750 A

This method of establishing kVAR loading ensures that, in addition to verifying the load carrying capability (kW) of the diesel engine, the reactive power (kVAR) and voltage regulation capability of the generator is verified to the extent practicable, consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Information Notice 91-13 (Ref. 16).

The normal 31 day Frequency for this Surveillance (Table 3.8.1-1) is consistent with Regulatory Guide 1.9 (Ref. 3).

This SR is modified by five Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary DG load transients do not invalidate this test. Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Note 4 stipulates that a successful DG start must precede this test to credit satisfactory performance. Note 5 - This note discusses operability of the diesel generator subcomponent Automatic Voltage Regulator (AVR). The AVR is an integral part of the DG, however, each DG has 2 AVRS that are 100% redundant to each other. Only one AVR may be inservice at any one time. To ensure operability of each AVR, the AVRs must have been in service during the performance of SR 3.8.1.2 and SR 3.8.1.3 within the last 60 days plus any allowance per SR 3.0.2. SR 3.8.1.2 is modified by NOTE 1 to indicate that SR 3.8.1.7 satisfies all of the requirements of SR 3.8.1.2.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.3 (continued)

This note is applicable for AVR operability. Also, each AVR must have been in service for either SR 3.8.1.9, SR 3.8.1.10, or SR 3.8.1.19 within the last 24 months plus any allowance per SR 3.0.2. During the 24 month test dynamic performance of the AVR is measured to confirm it is acceptable for all required AVR transients. Based on the design of the AVR, its intended function and the maintenance history, the above specified surveillance schedule will assure the AVRs are capable of performing their intended function.

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above the level selected to ensure adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%. The level is expressed as an equivalent volume in inches. The 30 inch level includes instrument uncertainties and corresponds to the minimum requirement of 355.1 gallons of fuel oil.

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and unit operators would be aware of any large uses of fuel oil during this period.

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous microorganisms that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day tanks once every 31 days eliminates the necessary environment for microbial survival in the day tanks. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and from breakdown of the fuel oil by microorganisms. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 10). This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR provided the accumulated water is removed during the performance of this Surveillance.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.6

This Surveillance demonstrates that for each OPERABLE DG at least one fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of the standby power source. This Surveillance provides assurance that at least one fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for the fuel transfer system are OPERABLE.

The design of the fuel transfer system is such that one pump will operate automatically, while the other pump can be started manually. Either pump will maintain an adequate volume of fuel oil in the day tank. In such a case, a 31 day Frequency is appropriate.

SR 3.8.1.7

See SR 3.8.1.2.

SR 3.8.1.8

Verification of the capability to transfer each 4.16 kV ESF bus power supply from the normal preferred power source (offsite circuit) to each required alternate preferred power source (offsite circuit), via the train-aligned 4.16 kV crosstie between Unit 2 and Unit 3, demonstrates the OPERABILITY of the alternate preferred power distribution network to power the post-accident and shutdown loads. For 2A04 the normal offsite power source is 2XR1, and the alternate offsite power source is 3XR1 or 3XU1. For 2A06 the normal offsite power source is 2XR2, and the alternate offsite power source is 3XR2 or 3XU1. A required alternate offsite power source is the source that is credited as the alternate source of offsite power in LCO 3.8.1. Therefore, the alignment of the ESF buses in Unit 3 determines which alternate offsite circuit is the required circuit at any point in time.

For each 4.16 kV ESF bus (2A04 or 2A06) this surveillance requirement may be satisfied by performing both a manual transfer and an auto-transfer from the normal offsite power source to at least one of the alternate offsite power sources. The tested source may then be credited as the required alternate offsite power source per LCO 3.8.1. This surveillance may be satisfied for the remaining power source by performing a circuit functional test in addition to the transfer test above. This functional test shall be performed such that all components that are required to function for a successful manual or auto-transfer that were not included in the transfer tests above, are tested. This testing may include any series of sequential, overlapping, or total steps so that the entire manual and auto-transfer capability of the source is verified. This is explained in a note to this SR.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.8 (continued)

The 24 month Frequency of the Surveillance is based on engineering judgment, taking into consideration the unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single post-accident load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. For this unit, the largest single post-accident load for each DG is the Auxiliary Feedwater pump which has a nameplate rating of 800 HP. As required by IEEE-308 (Ref. 13), the load rejection test is acceptable if the DG frequency does not exceed 66.75 Hz, which is 75% of the difference between synchronous speed (60 Hz) and the overspeed trip setpoint (69 Hz).

The time, voltage, and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequencing and load rejection. The 4 seconds specified is equal to 80% of the 5 second load sequence interval associated with sequencing of the largest load. Since SONGS specific analyses demonstrate the acceptability of overlapping load groups (i.e., adjacent load groups that start at the same time due to load sequence timer tolerance), the use of 80% of load sequence interval for voltage recovery is consistent with the requirements of Regulatory Guide 1.9 (Ref. 3). The voltage and frequency specified are consistent with the design range of the equipment powered by the DG. SR 3.8.1.9.a corresponds to the maximum frequency excursion, the recommendation of Regulatory Guide 1.9 (Ref. 3). while SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover following load rejection. The 24 month Frequency is consistent with the recommendation of Regulatory Guide 1.9 (Ref. 3).

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.9 (continued)

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing is performed by rejecting an inductive load with kW and kVAR greater than or equal to the single largest post-accident load (683 kW, 369 kVAR). These test conditions are consistent with the power factor requirements of Regulatory Guide 1.9 (Ref. 3) and the recommendations of Information Notice 91-13 (Ref. 16).

This SR is modified by two Notes. Note 1 acknowledges that credit may be taken for unplanned events that satisfy this SR. Note 2 - This note discusses operability of the diesel generator subcomponent Automatic Voltage Regulator (AVR). The AVR is an integral part of the DG, however, each DG has 2 AVRS that are 100% redundant to each other. Only one AVR may be inservice at any one time. To ensure operability of each AVR, the AVRs must have been in service during the performance of SR 3.8.1.2 and SR 3.8.1.3 within the last 60 days plus any allowance per SR 3.0.2. SR 3.8.1.2 is modified by NOTE 1 to indicate that SR 3.8.1.7 satisfies all of the requirements of SR 3.8.1.2. This note is applicable for AVR operability. Also, each AVR must have been in service for either SR 3.8.1.9, SR 3.8.1.10, or SR 3.8.1.19 within the last 24 months plus any allowance per SR 3.0.2. During the 24 month test dynamic performance of the AVR is measured to confirm it is acceptable for all required AVR transients. Based on the design of the AVR, its intended function and the maintenance history, the above specified surveillance schedule will assure the AVRs are capable of performing their intended function.

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a load equal to 90% to 100% of its continuous rating without overspeed tripping or exceeding the predetermined voltage limits. The lower load limit of 4450 kW is 94.7% of the DG continuous rating (4700 kW). The 94.7% limit is based on design basis loading and includes instrument uncertainty plus margin. Instrument uncertainty is not applied to the upper load limit.

The DG full load rejection may occur because of a system fault, inadvertent breaker tripping or a SIAS received during surveillance testing. This Surveillance ensures proper engine and generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the DG experiences following a full load rejection and verifies that the DG will not trip upon loss of the load. The voltage transient limit of 5450 V is 125% of rated voltage (4360 V). These acceptance criteria provide DG damage protection.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.10 (continued)

While the DG is not expected to experience this transient during an event and continues to be available, this response ensures that the DG is not degraded for future application (e.g., reconnection to the bus if the trip initiator can be corrected or isolated). These loads and limits are consistent with Regulatory Guide 1.9 (Ref. 3).

The DG is tested under inductive load conditions that are as close to design basis conditions as possible. Testing is performed with DG kVAR output that offsite power system conditions permit during testing without exceeding equipment ratings (i.e., without creating an overvoltage condition on the ESF buses, over excitation condition in the generator, or overloading the DG main feeder). The kVAR loading requirement during this test is met, and the equipment ratings are not exceeded, when the DG kVAR output is increased such that:

a. kVAR is ≥ 3000 and ≤ 3200 or
b. the excitation current is ≥ 3.8 A and ≤ 4.0 A or
c. the ESF bus voltage is ≥ 4530 V and ≤ 4550 V or
d. DG feeder current is ≥ 730 A and ≤ 750 A

This method of establishing kVAR loading ensures that, in addition to verifying the full load rejection capability (kW) of the diesel engine, the reactive power rejection capability (kVAR) of the generator is verified to the extent practicable, consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Information Notice 91-13 (Ref. 16).

The 24 month Frequency is consistent with the recommendation of Regulatory Guide 1.9 (Ref. 3) and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. Note 1 acknowledges that credit may be taken for unplanned events that satisfy this SR. Note 2 - This note discusses operability of the diesel generator subcomponent Automatic Voltage Regulator (AVR). The AVR is an integral part of the DG, however, each DG has 2 AVRS that are 100% redundant to each other. Only one AVR may be inservice at any one time. To ensure operability of each AVR, the AVRs must have been in service during the performance of SR 3.8.1.2 and SR 3.8.1.3 within the last 60 days plus any allowance per SR 3.0.2. SR 3.8.1.2 is modified by NOTE 1 to indicate that SR 3.8.1.7 satisfies all of the requirements of SR 3.8.1.2. This note is applicable for AVR operability. Also, each AVR must have been in service for either SR 3.8.1.9, SR 3.8.1.10, or SR 3.8.1.19 within the last 24 months plus any allowance per SR 3.0.2. During the 24 month test dynamic performance of the AVR is measured to confirm it is acceptable for all required AVR transients. Based on the design of the AVR, its intended function and the maintenance history, the above specified surveillance schedule will assure the AVRs are capable of performing their intended function.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.11

As required by Regulatory Guide 1.9 (Ref. 3), this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including shedding of selected loads and energization of the permanently connected loads from the DG. The permanently connected loads are the Class 1E 480 V Loadcenters and MCCs. It is recognized that certain consequential loads may also start following a loss of offsite power and therefore it is important to demonstrate that the DG operates properly with these loads. The consequential loads are sequenced on the DG following a LOVS with the same time delays as for a LOVS with a SIAS. Therefore, the ability of the DG to operate with the consequential loads is appropriately demonstrated by the existing Surveillance Requirement simulating a loss of offsite power in combination with a SIAS (Surveillance Requirement 3.8.1.19). Since there are no auto-connected shutdown loads, the Regulatory Guide 1.9 (Ref. 3) requirements for sequencing of auto-connected shutdown loads do not apply (Ref. 17). This surveillance further demonstrates the capability of the DG to automatically achieve the required voltage and frequency, to close the DG output breaker and connect to the ESF bus, and to reset the 4.16 kV bus undervoltage relay logic within the specified time.

The DG auto-start and undervoltage relay logic reset time of 10 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The frequency should be restored to within the specified range following energization of the permanently connected loads. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability has been achieved.

The requirement to verify the connection and power supply of permanent loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, Emergency Core Cooling Systems (ECCS) injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or shutdown cooling (SDC) systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of shedding, connection, and loading of loads, overlap testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire sequence of load shedding and reenergization of permanently connected loads is verified.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.11 (continued)

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.12

This Surveillance demonstrates that after a SIAS, the DG automatically starts and achieves the required voltage and frequency within the specified time and operates for ≥ 5 minutes. The 9.4 second start requirement ensures that the DG meets the design basis LOCA analysis assumption, that the DG starts, accelerates to within the specified frequency and voltage limits, connects to the 4.16 kV ESF bus, and resets the ESF bus undervoltage relay logic within 10 seconds of a SIAS. The 5 minute period provides sufficient time to demonstrate stability.

In addition to the SR requirements, the time for the DG to reach steady state operation, unless the modified DG start method is employed, is periodically monitored and is evaluated to identify degradation of governor and voltage regulator performance.

The Frequency of 24 months is consistent with Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with the expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.13

This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on a SIAS in accordance with Regulatory Guide 1.9 (Ref. 3). The critical protective functions (engine overspeed, generator differential current, and low-low lube oil pressure), which trip the DG to avert substantial damage to the DG unit, are not bypassed. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately to prevent damage to the DG. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

Testing to satisfy this surveillance requirement may include any series of sequential, overlapping, or total steps so that the entire noncritical trip bypass function is verified.

The 24 month Frequency is based on engineering judgment, taking into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. The SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.14

Regulatory Guide 1.9 (Ref. 3), requires demonstration once per refueling outage that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at load equivalent to 105% to 110% of the continuous duty rating and the remainder of the time at a load equivalent to 90% to 100% of the continuous duty rating of the DG. For the 22 hour duration, the lower load limit of 4450 kW is 94.7% of the DG continuous rating (4700 kW). The 94.7% limit is based on design basis loading and includes instrument uncertainty plus margin. Instrument uncertainty is not applied to the 100%, 105% or 110% load limits.

This test is performed with the DG connected to the offsite power supply. In this alignment DG frequency is controlled by the offsite power supply, and the operator has minimal control over DG output voltage. Therefore, specific DG voltage and frequency requirements as recommended by Regulatory Guide 1.9 (Ref. 3) do not apply.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.14 (continued)

The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

The DG is tested under inductive load conditions that are as close to design conditions as possible. Testing is performed with DG kVAR output that offsite power system conditions permit during testing without exceeding equipment ratings (i.e., without creating an overvoltage condition on the ESF buses, over excitation condition in the generator, or overloading the DG main feeder). The kVAR loading requirement during this test is met, and the equipment ratings are not exceeded, when the DG kVAR output is increased such that:

a. kVAR is ≥ 3000 and ≤ 3200 or
b. the excitation current is ≥ 3.8 A and ≤ 4.0 A or
c. the ESF bus voltage is ≥ 4530 V and ≤ 4550 V or
d. DG feeder current is ≥ 730 A and ≤ 750 A

This method of establishing kVAR loading ensures that, in addition to verifying the load carrying capability (kW) of the diesel engine, the reactive power (kVAR) and voltage regulation capability of the generator is verified to the extent practicable, consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Information Notice 91-13 (Ref. 16).

The kW load band in the SR is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9, (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by two Notes. Note 1 states that momentary DG load transients do not invalidate this test. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 9.4 seconds. The 9.4 second time is

derived from the requirements of the accident analysis to respond to a design basis large break LOCA. The LOCA analysis assumes that the DG starts, accelerates to within the specified frequency and voltage limits, connects to the 4.16 kV ESF bus, and resets the ESF bus undervoltage relay logic within 10 seconds of a SIAS.

In addition to the SR requirements, the time for the DG to reach steady state operation, unless the modified DG start method is employed, is periodically monitored and is evaluated to identify degradation of governor and voltage regulator performance.

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3) and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Momentary DG load transients do not invalidate this test. Note 2 allows all DG starts to be preceded by an engine prelube period to minimize wear and tear on the diesel during testing.

SR 3.8.1.16

As required by Regulatory Guide 1.9 (Ref. 3), this Surveillance ensures manual synchronization and load transfer from the DG to the offsite source can be made and that the DG can be returned to ready to load operation when offsite power is restored. Ready to load operation is defined as the DG running within the specified frequency and voltage limits, with the DG output breaker open. If this test is performed with a SIAS present, the load transfer occurs when the offsite power breaker is manually closed, and the SIAS causes the DG output breaker to open. If this test is performed without a SIAS present, the load transfer occurs when the offsite power breaker is manually closed, and the DG output breaker is manually opened. By design, the LOVS/SDVS/DGVSS logic will have been

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.16 (continued)

previously reset thus allowing the DG to reload if a subsequent loss of offsite power or degraded voltage condition occurs. The LOVS/SDVS/DGVSS signal will strip the bus, reset the load sequence timers, close the DG output breaker, and permit resequencing of the ESF loads if an ESF actuation signal is present.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.17

For this Surveillance, the DG is in test mode when it is running, connected to its bus, and in parallel with offsite power. Demonstration of the test mode override ensures that:

1) the DG availability under accident conditions will not be compromised as the result of testing with the DG connected to its bus in parallel with offsite power, and

2) the DG will automatically return to ready to load operation,

if a SIAS is received during operation in the test mode. Ready to load operation is defined as the DG running within the specified frequency and voltage limits, with the DG output breaker open. These provisions are required by IEEE-308 (Ref. 13), paragraph 6.2.6(2) and Regulatory Guide 1.9 (Ref. 3).

The intent in the requirement to automatically energize the emergency loads with offsite power associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by DG operation in the test mode in parallel with offsite power. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable. This testing may include any series of sequential overlapping, or total steps so that the entire connection and loading sequence is verified.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

Under accident conditions, electrical loads are sequentially connected to a DG bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DG due to high motor starting currents. The load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses. Table B 3.8.1-1 provides a matrix of loads sequenced by the ESF timing logic. The timer as-left setting requirement and the as-found acceptance criteria are provided in Table B 3.8.1-1.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 + 2.5/ -0.5 seconds. The tolerance is based on a design interval of 5 seconds.

This testing may include any series of sequential, overlapping, or total steps so that all load sequence timers are verified.

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. This surveillance is performed in SR 3.8.1.19. The sequence relays tested under SR 3.8.1.18 are required to support proper DG loading sequence.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note, which acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES (continued)

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA

		Start Time (Sec)	Nominal Setting (As Left) Tolerance (Sec)	As-Found Tolerance (Sec)
1.	LPSI Pumps P015, P016	5.00	"0.5	-0.5 +2.5
2.	Dome Air Circulating Fans A071, A072, A073, A074	5.00	"0.5	-0.5 +2.5
3.	Control Room AC Units E418, E419	5.00	"0.5	-0.5 +2.5
4.	Containment Spray Pumps P012, P013	10.00	"0.5	"2.5
5.	Diesel Generator Radiator Fans E546, E547, E549, E550	10.00	"0.5	"2.5
6.	Component Cooling Water Pumps P024, P025, P026	15.00	"0.5	"2.5
6A.	Containment Emergency Cooling Units E399, E400, E401, E402	CCW Pump Breaker Closure +5 secs	"0.5*	-0.5* +2.5*
7.	Diesel Generator Building Emergency Fans A274, A275, A276, A277	15.00	"0.5	"2.5
8.	Salt Water Cooling Pumps P112, P307, P113, P114	20.00	"0.5	"2.5
9.	Auxiliary Feed Water Pumps P141, P504	30.00	"0.5	"3.0
10.	Emergency Chillers E335, E336	35.00	"0.5	"3.5

*Emergency Cooling Unit time delay as measured from closure of the CCW pump breaker position switch 152-1.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during an actual or simulated loss of offsite power signal (LOVS/DGVSS/SDVS) in conjunction with actual or simulated ESF actuation signals (SIAS, CCAS, CSAS, EFAS-1, and EFAS-2). Multiple ESF actuation signals are initiated to simulate worst case DG load sequencing conditions.

In lieu of actual demonstration of shedding, connection, and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire load shedding, connection, and loading sequence is verified.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by three Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

Note 3 - This note discusses operability of the diesel generator subcomponent Automatic Voltage Regulator (AVR). The AVR is an integral part of the DG, however, each DG has 2 AVRS that are 100% redundant to each other. Only one AVR may be inservice at any one time. To ensure operability of each AVR, the AVRs must have been in service during the performance of SR 3.8.1.2 and SR 3.8.1.3 within the last 60 days plus any allowance per SR 3.0.2. SR 3.8.1.2 is modified by NOTE 1 to indicate that SR 3.8.1.7 satisfies all of the requirements of SR 3.8.1.2. This note is applicable for AVR operability. Also, each AVR must have been in service for either SR 3.8.1.9, SR 3.8.1.10, or SR 3.8.1.19 within the last 24 months plus any allowance per SR 3.0.2. During the 24 month test dynamic performance of the AVR is measured to confirm it is acceptable for all required AVR transients. Based on the design of the AVR, its intended function and the maintenance history, the above specified surveillance schedule will assure the AVRs are capable of performing their intended function.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.20

This Surveillance demonstrates that the DG starting independence has not been compromised. This Surveillance demonstrates that each engine can achieve proper speed within the specified time when the DGs are started simultaneously.

The 10 year Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.b, Regulatory Guide 1.137 (Ref. 10), paragraph C.2.f, and Regulatory Guide 1.9 (Ref. 3).

This SR is modified by a Note. The reason for the Note is to minimize wear on the DG during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated, and temperature maintained consistent with manufacturer recommendations.

Diesel Generator Test Schedule

The DG test schedule (Table 3.8.1-1) implements the recommendations of Revision 3 to Regulatory Guide 1.9 (Ref. 3). The purpose of this test schedule is to provide timely test data to establish a confidence level associated with the goal to maintain DG reliability above 0.95 per demand.

According to Regulatory Guide 1.9, Revision 3 (Ref. 3), each DG unit should be tested at least once every 31 days. According to Draft Regulatory Guide DG-1021 (Ref. 14) and 10 CFR 50.63(a)(3)(ii) (Ref. 15), whenever a DG has experienced 4 or more valid failures in the last 25 valid tests, the maximum time between tests is reduced to 7 days. Four failures in 25 valid tests is a failure rate of 0.16, or the threshold of acceptable DG performance, and hence may be an early indication of the degradation of DG reliability.

When considered in the light of a long history of tests, 4 failures in the last 25 valid tests may only be a statistically probable distribution of random events. Increasing the test Frequency will allow for a more timely accumulation of additional test data upon which to base judgment of the reliability of the DG. The increased test Frequency must be maintained until seven consecutive, failure free tests have been performed.

The Frequency for accelerated testing is 7 days, but no less than 24 hours. Therefore, the interval between tests should be no less than 24 hours, and no more than 7 days. A successful test at an interval of less than 24 hours should be considered an invalid test and not count towards the seven consecutive failure free starts. A test interval in excess of 7 days constitutes a failure to meet the SRs.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. UFSAR, Chapter 8.
3. Regulatory Guide 1.9, Rev. 3.
4. UFSAR, Chapter 6.
5. UFSAR, Chapter 15.
6. Regulatory Guide 1.93, Rev. 0.
7. Generic Letter 84-15.
8. 10 CFR 50, Appendix A, GDC 18.
9. Regulatory Guide 1.108, Rev. 1.
10. Regulatory Guide 1.137, Rev. 1.
11. ANSI C84.1-1982.
12. ASME, Boiler and Pressure Vessel Code, Section XI.
13. IEEE Standard 308-1978.
14. Draft Regulatory Guide DG-1021, April 1992.
15. 10 CFR 50.63(a)(3)(ii) as published in Federal Register Vol. 57, No. 77 page 14517, April 21, 1992.
16. Information Notice 91-13, "INADEQUATE TESTING OF EMERGENCY DIESEL GENERATORS (EGDs)," 09/16/91.
17. Letter from SCE to the NRC dated May 5, 1995, subject Docket Nos. 50-361 and 50-362, Diesel Generator Loading San Onofre Nuclear Generating Station Units 2 and 3.
18. Letter from the NRC to SCE dated May 12, 1999, subject Technical Specification Interpretation (TAC Nos. MA0232 and MA0233).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources — Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital 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 systems (Train A and Train B). Each train consists of two subsystems, with each subsystem containing one 125 VDC battery (each battery with 100% capacity), the associated battery charger for each battery, and all the associated control equipment and interconnecting cabling. Additionally, there is one swing battery charger per train, which provides backup service in the event that the preferred battery charger is out of service. If the swing battery charger is substituted for one of the preferred battery chargers, then the requirements of independence and redundancy between subsystems are maintained.

Each Train has a swing battery charger that meets all the performance requirements of the dedicated charger and can be manually aligned to either subsystem. Key interlocks limit swing charger alignment to one subsystem at a time. The breakers and interconnecting cables provide the capability to crosstie subsystems within a train. The Train B swing charger can also be aligned to non-1E 125 VDC Battery Bus D5. The key interlocks and the isolation capability of the charger itself allow R.G. 1.75 Train separation requirements to be maintained in this alignment.

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.

(continued)

BASES (continued)

BACKGROUND (continued)

The Train A and Train B DC electrical power subsystems provide control power for its associated Class 1E AC power load group, 4.16 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 Train A DC system (subsystems A and C) provides power to the Channel A and C inverters feeding the 120 VAC vital bus 1 and 3 electrical power distribution subsystems (Channel A and C). The Train B DC system (subsystems B and D) provides power to the Channel B and D inverters feeding the 120 VAC vital bus 2 and 4 electrical power distribution subsystems (Channel B and D). DC subsystem C also provides DC power to the Auxiliary Feedwater Pump steam inlet valve HV-4716 and the AFWP electric governor.

Train A DC systems are capable of providing DC power to both Channel A and Channel C loads when DC subsystems A and C are manually cross-connected. This allows both DC buses to remain operable during battery replacement, testing, or maintenance of any one DC battery or battery charger. With two DC subsystems cross-connected, the combined system shall have at least one OPERABLE 1800 AH rated battery and one OPERABLE battery charger.

Train B DC systems are capable of providing DC power to both Channel B and Channel D loads when DC subsystems B and D are manually cross-connected. This allows both DC buses to remain operable during battery replacement, testing, or maintenance of any one DC battery or battery charger. With two DC buses cross-connected, the combined system shall have at least one OPERABLE 1800 AH rated battery and one OPERABLE battery charger.

During cross connecting of subsystem buses A and C or B and D, two batteries will be paralleled for a short duration. An electrical fault during that duration could exceed the interrupting duties of the protective devices. This is standard industry practice during transfer of power sources and is considered to be an acceptable minimal risk.

(continued)

BASES (continued)

BACKGROUND (continued)

Train	Subsystem	DC Bus	Vital Bus	Battery	Charger	Swing charger
A	A	D1	1	B007	B001	B021
	C	D3	3	B009	B003	
B	B	D2	2	B008	B002	B022
	D	D4	4	B010	B004	

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

Each 125 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing of equipment between redundant Class 1E Trains. Subsystems A and C or subsystems B and D share a battery and battery charger(s) when cross-tied.

Each battery has adequate storage capacity to meet the duty cycle(s) discussed in the UFSAR, Chapter 8 (Ref. 6). 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 systems are sized to produce the required capacity at 80% of nameplate rating, corresponding to the warranted capacity at the end of life cycles and the 100% design demand. The minimum design voltage limit at the supplied loads 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 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 of a fully charged cell when there is no charging or discharging. All cells begin to self-discharge when left on open circuit, but cells can be left on open circuit for some period of time (>30 days, refer to the manufacturer's instruction for the maximum storage periods) without any long term performance degradation.

(continued)

BASES (continued)

BACKGROUND (continued)

Optimal long term performance, however, is obtained by maintaining a float voltage from 2.20 to 2.28 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge.

Each Train A and Train B DC electrical power system 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 UFSAR, Chapter 8 (Ref. 6).

With same-train DC buses cross-connected, an OPERABLE charger or chargers with a combined rated capacity greater than or equal to 400 Amps is required.

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.

For upper DC Voltage limits, refer to the Licensee Controlled Specifications (LCS).

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 7) and Chapter 15 (Ref. 8), 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 the NRC Policy Statement.

LCO

The DC electrical power trains, each train consisting of two batteries, 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 train DC electrical power subsystem does not prevent the minimum safety function from being performed consistent with UFSAR Chapter 8 (Ref. 6).

An OPERABLE DC electrical power train requires two batteries and respective chargers to be operating and connected to the associated DC buses. With the same train buses cross-connected, the combined system shall have at least one OPERABLE battery and associated OPERABLE battery charger(s).

(continued)

BASES (continued)

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.2.1 and A.2.3

Condition A represents one train with one battery charger inoperable (e.g., the battery voltage limit of SR 3.8.4.1 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action A.2.1 or A.2.2) from any discharge that might have occurred due to the charger inoperability. A discharged battery having a 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 (continued)

ACTIONS A.1, A.2.1 and A.2.3 (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.

The charger operating in the current limit mode after 2 hours 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.2.1 or A.2.2).

Required Action A.2.1 requires that the 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 there may be additional battery problems and the battery must be declared inoperable.

Required Action A.2.2 requires that the battery pilot cell specific gravity be verified as greater than or equal to 1.200. This is an alternative indication 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 specific gravity is not greater than or equal to 1.200, then there may be additional battery problems and the battery must be declared inoperable.

Either of Required Actions A.2.1 or A.2.2 will demonstrate satisfactory recovery of the battery.

B.1

If the inoperable DC electrical power subsystem battery charger cannot be restored to OPERABLE status and the battery float voltage and current is not restored within the required Completion Time, the associated battery must be declared inoperable immediately.

(continued)

BASES (continued)

C.1 and C.2

Condition C represents one train with one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery charger. Any event that results in a loss of the AC bus supporting the battery charger will also result in loss of 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.) rely upon the operability of the battery(ies). In addition, the energization transients of any DC loads that are beyond the capability of the battery charger and normally require the assistance of the battery 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 conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

Condition C also represents one train with a loss of ability to completely respond to an event, and a potential 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 for reasons other than Condition A or C (e.g., inoperable battery charger and associated inoperable battery), the remaining 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 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. 9) and reflects a reasonable time to cross connect with the same train DC subsystem or 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. Either of Required Actions C1 or C.2 will demonstrate satisfactory recovery of a DC subsystem train.

(continued)

BASES (continued)

ACTIONS C.1 and C.2 (continued)

Required Action C.1 requires that each of the two subsystem batteries of the same train is restored to OPERABLE status in 2 hours.

Required Action C.2 requires that the two subsystem DC buses are cross connected and fed from one subsystem battery within 2 hours.

D.1

Condition D represents one train with one subsystem battery out of service and two subsystems of the same train cross-connected with one battery in service. This alignment will allow both subsystems to remain OPERABLE for 30 days. The 30-day duration is adequate for replacement of a battery bank and performance of battery testing online.

The SONGS 2/3 Living PRA was used to assess the risk impact of entering T.S. 3.8.4 for a period of 30 days while two same train DC subsystems are cross-connected with one battery supporting both buses.

The analysis was performed consistent with the guidelines of R.G. 1.74 and R.G 1.177. The PRA results show that the cross-tie alignment and the swing battery charger alignment yield essentially no change in risk, which is primarily due to the availability and high reliability of an aligned alternate source of 1E power.

Condition D includes a Note "Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 amp-hours." This ensures the battery aligned to the cross-tied system has adequate capacity.

ACTIONS E.1 and E.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 unit systems. The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 9).

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage is greater than or equal to the minimum established float voltage for the batteries helps to ensure the effectiveness of the battery charges, which support the ability of the batteries to perform their intended function. 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 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 (2.20 Vpc). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 31 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 4).

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32, 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 ensure that these requirements can be satisfied. This SR requires that each battery charger be capable of supplying equal to or greater than rated amps at equal to or greater than the minimum established float voltage for equal to or greater than 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 battery is recharged when the measured charging current is ≤2 amps on float charge. 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 24 month intervals.

(continued)

BASES (continued)

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 Reference 4.

The Surveillance Frequency of 30 months is consistent with the recommendations of Regulatory Guide 1.32 and Regulatory Guide 1.129, which state that the battery service test should be performed during refueling operations, or at some other intervals between battery performance tests.

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 continues to allow the once per 48 month performance of the battery performance discharge test in SR 3.8.6.6 in lieu of SR 3.8.4.3. This substitution is acceptable because SR 3.8.6.6 represents a more severe test of battery capacity than does 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 (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

The modified performance discharge test may consist of just two rates, for instance the one minute rate 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 one minute discharge represent 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 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 (continued)

REFERENCES

1. 10CFR.50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-1978.
4. IEEE-450-2002.
5. IEEE-485-1997.
6. UFSAR, Chapter 8.
7. UFSAR, Chapter 6.
8. UFSAR, Chapter 15.
9. Regulatory Guide 1.93, December 1974.
10. Regulatory Guide 1.32, February 1977.
11. Regulatory Guide 1.129, April 1977.

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 (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), 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 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 and during movement of irradiated fuel assemblies 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.

The DC sources satisfy Criterion 3 of the NRC Policy Statement.

(continued)

LCO

The DC electrical power subsystems, each subsystem consisting of two batteries, one battery charger per battery, and the corresponding control equipment and interconnecting cabling within the train, are required to be OPERABLE to support required trains of 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).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies provide assurance that:

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

b. 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.1.1, A.1.2, A.2.1, and A.2.2

Condition A represents one train with 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 focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period.

Required Action A.1.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. Required Action A.1.2 requires as an alternative that the two subsystem DC buses are cross connected and fed from one subsystem battery within 2 hours. When Required Action A.1.2 is completed, the LCO is met and subsequent Required Action A.2 is not

(continued)

ACTIONS

A.1.1, A.1.2, A.2.1 and A.2.2 (continued)

required. In MODES 5 and 6 there is no time limit for restoration of DC Subsystem Buses to a non-cross-connected configuration. The two hour completion time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action A.2.1) 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.

The charger is operating in the current limit mode after 2 hours 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. If the charge time is extensive, there is not adequate assurance that the battery can be recharged within 12 hours (Required Action A.2.1).

(continued)

ACTIONS A.1.1, A.1.2, A.2.1 and A.2.2 (continued)

Required Action A.2.1 requires that the 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 there may be additional battery problems and the battery must be declared inoperable.

Required Action A.2.2 requires as an alternative that the battery pilot cell specific gravity be verified as greater than or equal to 1.200. This alternative 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 specific gravity is not greater than or equal to 1.200, there may be additional battery problems and the battery must be declared inoperable.

Either of Required Actions A.2.1 or A.2.2 will demonstrate satisfactory recovery of the battery and/or operability of one DC electrical power subsystem.

ACTION B.1

With the required DC electrical power subsystem battery charger or associated control equipment or cabling outside the allowances of the Required Actions for Condition A, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding DC battery must be declared inoperable immediately.

ACTIONS: C1, C2.1, C2.2, C.2.3, and C.2.4

Condition C represents one train with the required DC electrical power subsystem (exclusive of the battery charger) inoperable for reasons other than Condition A. The ACTIONS provide a tiered response allowing the option to declare required features inoperable immediately with the associated DC power source(s) inoperable.

If two trains are required per LCO 3.8.10, the remaining train with DC power available may be capable of supporting sufficient systems to allow continuation of CORE ALTERATIONS and fuel movement. By allowing the option to declare required features inoperable with the

(continued)

ACTIONS:

C1, C2.1, C2.2, C.2.3, and C.2.4 (continued)

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.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the 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 states that Surveillances required by SR 3.8.4.1 through SR 3.8.4.3 are applicable in these MODES. 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 SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

(continued)

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15

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, float voltage, and specific gravity 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 licensee controlled program also implements a program specified in Administrative Controls Specification 5.5.2.16 for monitoring various battery parameters that is based on recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications" (Ref. 3).

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, 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 of 2.20 to 2.28 Vpc. This provides adequate over-potential which limits the formation of lead sulfate and self discharge.

(continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature 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 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 Criterion 3 of the NRC Policy Statement.

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 preventive maintenance, testing, and monitoring performed in accordance with the Licensee Controlled Specifications 3.8.104 and 3.8.106 is conducted as specified in Administrative Controls Specification 5.5.2.16.

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 the Bases for LCO 3.8.4 and LCO 3.8.5.

(continued)

ACTIONS

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

A battery cell is degraded when the cell float voltage is <2.07 V. A battery bank may not be degraded with one or more degraded battery cells in one or more battery banks in one train (one train consists of two subsystem battery banks).

Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (perform SR 3.8.4.1 per Required Action A.1) and of the overall battery state of charge by monitoring the battery float charge current or pilot cell specific gravity (perform SR 3.8.6.1 per Required Action A.2). 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 (per Required Action A.3).

Since the Required Actions of A.1 and A.2 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 Condition(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed then there is no assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

ACTIONS

B.1, B.2.1 and B.2.2

One or two batteries in one train at float current of >2 amps or average specific gravity of all connected cells of <1.195 is an indication 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. Verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage within 2 hours (perform SR 3.8.4.1 per Required Action B.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. Condition A above addressed charger inoperability. Operating the charger in the current limit mode longer than 2 hours 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

(continued)

ACTIONS B.1, B.2.1 and B.2.2 (continued)

loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. If the charge time is extensive, and the battery can not be recharged within 12 hours (per 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, 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 a good assurance that, within 12 hours, the battery will be restored to its fully charged condition (per 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.

One or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, 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.

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

With one or two batteries in one train with one or more cells with 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. Electrolyte level limits are visually indicated on each cell via minimum and maximum electrolyte level lines.

(continued)

ACTIONS

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

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 5.5.16, 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. The Required Action C.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.16.b item to initiate action to equalize and test in accordance with manufacturer's recommendations are taken from Appendix D of IEEE Standard 450 (Ref. 3). These actions 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 cell(s) replaced.

ACTION

D.1

With one or two batteries on one train with the pilot cell electrolyte temperature less than the minimum established design limit, 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.

ACTION

E.1

With one or two batteries in redundant trains with battery parameters not within limits there is not sufficient assurance 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.

(continued)

ACTION

F.1

With one or two 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 immediately. Additionally, discovering one or two batteries in one train with one or more battery cell float voltage less than 2.07 V and either float current greater than 2 amps or specific gravity <1.175 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 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. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 3). The 31 day Frequency is consistent with IEEE-450 (Ref. 3).

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 must be taken to provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of ≤2 amps or pilot cell specific gravity ≥1.200 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

SR 3.8.6.2 requires verification that the pilot or connected cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limit provided by the battery manufacturer, which is 2.28 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.6.2 (continued)

render the battery inoperable. Float voltages <2.13Vpc, but greater than 2.07Vpc, are addressed in Administrative Control Specification 5.5.2.16. The Frequency for pilot cell voltage verification every 31 days is consistent with IEEE-450 (Ref. 3).

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The 31 day Frequency is consistent with IEEE-450 (Ref. 3).

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit. 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 31 day Frequency is consistent with IEEE-450 (Ref. 3).

SR 3.8.6.5

SR 3.8.6.5 requires verification that the connected cell float voltages are equal to or greater than the short-term absolute minimum voltage of 2.07 V. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limit provided by the battery manufacturer, which is 2.28 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self-discharge, which could eventually render the battery inoperable. Float voltages <2.13Vpc, but greater than 2.07Vpc, are addressed in Administrative Control Specification 5.5.2.16. The Frequency for connected cell voltage verification every 92 days is consistent with IEEE-450 (Ref.3).

(continued)

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.

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

The modified performance discharge test may consist of just two rates: for instance, the one minute rate 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 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 time equal to that of the service test.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 3) and IEEE-485 (Ref. 4). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer 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 a capacity is <100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the

(continued)

SR 3.8.6.6 (continued)

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 a capacity of ≥100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 3), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is 10% below the manufacturer's rating. These frequencies are consistent with the recommendations in IEEE-450 (Ref. 3).

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.
3. IEEE-450-2002.
4. IEEE-485-1997.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters - Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the AC vital buses because of the stability and reliability the inverters achieve in being powered from the 125 VDC battery source. The function of the inverter is to convert DC electrical power to AC electrical power, thus providing an uninterruptible power source for the instrumentation and controls for the Reactor Protective System (RPS) and the Engineered Safety Feature Actuation System (ESFAS). Specific details on inverters and their operating characteristics are found in the UFSAR, Chapter 8 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 2) and Chapter 15 (Ref. 3) assume Engineered Safety Feature systems are OPERABLE. The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the RPS and ESFAS instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining required AC vital buses OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

Inverters are a part of the distribution system and, as such, satisfy Criterion 3 of the NRC Policy Statement.

(continued)

BASES (continued)

LCO

The inverters ensure the availability of AC electrical power for the systems instrumentation required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the RPS and ESFAS instrumentation and controls is maintained. The four battery powered inverters (one per channel) are required to be OPERABLE to ensure an uninterruptible supply of AC electrical power to the AC vital buses even if the 4.16 kV safety buses are de-energized.

OPERABLE inverters require the associated AC vital bus to be powered by the inverter, which has the correct DC voltage (105-140 V) applied from a battery to the inverter input, and inverter output AC voltage to be within tolerances.

APPLICABILITY

The inverters are required to be OPERABLE in MODES 1, 2, 3, and 4 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 OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Inverter requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.8, "Inverters—Shutdown."

ACTIONS

A.1 and A.2

Required Action A.1 is modified by a Note, which states to enter the applicable conditions and Required Actions of LCO 3.8.9, "Distribution Systems–Operating," when Condition A is entered with one AC vital bus de-energized. This ensures the vital bus is returned to OPERABLE status within 2 hours.

Required Action A.2 allows 24 hours to fix the inoperable inverter and return it to service. The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is

(continued)

BASES (continued)

ACTIONS (continued)

A.1 and A.2

exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the AC vital bus is powered from its constant voltage source, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible, battery backed inverter source to the AC vital buses is the preferred source for powering instrumentation trip setpoint devices.

B.1 and B.2

If the inoperable devices or components 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 unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and AC vital buses energized from the inverter. The verification of proper voltage output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the AC vital buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions.

REFERENCES

1. UFSAR, Chapter 8.
2. UFSAR, Chapter 6.
3. UFSAR, Chapter 15.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems – Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided by train into redundant and independent AC, DC, and AC vital bus electrical power distribution subsystems.

The AC primary electrical power distribution system consists of two 4.16 kV Engineered Safety Feature (ESF) buses, each having at least one separate and independent offsite source of power as well as a dedicated onsite diesel generator (DG) source. Each 4.16 kV ESF bus is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV ESF bus, a transfer to the alternate offsite source is accomplished by utilizing a time delayed bus undervoltage relay. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources – Operating," and the Bases for LCO 3.8.4, "DC Sources–Operating."

The Class 1E AC electrical power distribution system for each train is shown in Table B 3.8.9-1.

The 120 VAC vital buses are arranged into four channels and each channel is normally powered from its own channel inverter. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from one of the trains in the same load group (one transformer per load group), and its use is governed by LCO 3.8.7, "Inverters – Operating." Each constant voltage source transformer is powered from a Class 1E AC bus.

There are four independent 125 VDC electrical power distribution subsystems (two for each Train A and B).

The list of all required distribution buses is presented in Table B 3.8.9-1.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume ESF systems are OPERABLE. The AC, DC, and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

The distribution systems satisfy Criterion 3 of the NRC Policy Statement.

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital bus electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The AC, DC, and AC vital bus electrical power distribution subsystems are required to be OPERABLE.

Maintaining the Train A and Train B AC, Trains A, B, C, and D DC, and Channels A, B, C, and D AC vital bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution systems will not prevent safe shutdown of the reactor.

OPERABLE AC, DC, and AC vital bus electrical power distribution systems require the associated buses and load centers to be energized to their proper voltages.

(continued)

BASES (continued)

APPLICABILITY

The electrical power distribution systems are required to be OPERABLE in MODES 1, 2, 3, and 4 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 OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution system requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems – Shutdown."

ACTIONS

A.1

With one or more required AC buses or the required load center, except AC vital buses, in one train inoperable, the remaining AC electrical power distribution subsystem in the other train is capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses and load center must be restored to OPERABLE status within 8 hours.

The Condition A worst scenario is one train without AC power (i.e., no offsite power to the train and the associated DG inoperable). In this condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to

(continued)

BASES (continued)

ACTIONS

A.1 (continued)

the affected train. The 8 hour time limit before requiring a unit shutdown in this condition is acceptable because of:

a. The potential for decreased safety if the unit operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train, to the actions associated with taking the unit to shutdown within this time limit; and

b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time, a DC circuit could again become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

B.1

With one or more AC vital bus inoperable, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 2 hours.

(continued)

BASES (continued)

ACTIONS

B.1 (continued)

Condition B represents one or more AC vital bus without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining vital buses, and restoring power to the affected vital bus.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate vital AC power.

The 2 hour Completion Time takes into account the importance to safety of restoring the AC vital bus to OPERABLE status, the redundant capability afforded by the other OPERABLE vital buses, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the vital bus distribution system. At this time, an AC train could again become inoperable, and vital bus distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition B was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

BASES (continued)

ACTIONS (continued)

C.1

With one or more DC bus inoperable, the remaining DC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the required DC bus must be restored to OPERABLE status within 2 hours.

Condition C represents one or more subsystems without adequate DC power; potentially both with the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining trains, and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components which would be without power.

The 2 hour Completion Time for DC buses is consistent with Regulatory Guide 1.93 (Ref. 3).

The second Completion Time for Required Action C.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable, and DC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

(continued)

BASES (continued)

ACTIONS (continued)

D.1 and D.2

If the inoperable distribution 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 unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the AC, DC, and AC vital bus electrical power distribution systems are functioning properly, with all the required circuit breakers closed and the buses energized from normal power. The verification of proper voltage availability on the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. The 7 day Frequency takes into account the redundant capability of the AC, DC, and AC vital bus electrical power distribution systems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.
3. Regulatory Guide 1.93, December 1974.

BASES (continued)

Table B 3.8.9-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	TRAIN A		TRAIN B	
AC safety buses	4160 V	ESF Bus A04		ESF Bus A06	
	480 V	Load Center B04		Load Center B06	
DC buses	125 V	SUBSYSTEM A	SUBSYSTEM C	SUBSYSTEM B	SUBSYSTEM D
		Bus D1 from required battery(3) and charger	Bus D3 from required battery(3) and charger	Bus D2 from required battery(3) and charger	Bus D4 from required battery(3) and charger
AC vital buses	120 V	CHANNEL A	CHANNEL C	CHANNEL B	CHANNEL D
		Bus Y01 from inverter Y001	Bus Y03 from inverter Y003	Bus Y02 from inverter Y002	Bus Y04 from inverter Y004

NOTES: (1) Each train of the electrical power distribution consists of one AC bus, two DC subsystems, and two AC vital power channels.

(2) If a support system (e.g., charger or inverter) is declared inoperable and it has its own LCO, entry into LCO 3.8.9 is not required. Only entry into its LCO is required.

(3) An OPERABLE Class 1E battery bank B00X may replace any battery to allow battery maintenance (including replacement) activities.

Attachment H

Proposed Change Number (PCN) 548,
Batteries Upgrade & DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

List of Regulatory Commitments

List of Regulatory Commitments

1. Relocate existing Surveillance Requirements (SRs) 3.8.4.3, 3.8.4.4, and 3.8.4.5 from the Technical Specifications to the Licensee Controlled Specifications.

Attachment I

Proposed Change Number (PCN) 548,
Batteries Upgrade and DC Cross-tie Capability
San Onofre Nuclear Generating Station, Units 2 and 3

PRA Evaluation

OBJECTIVE

The objective of this risk-informed analysis is to support an extension of the Completion Time (CT) of Technical Specification (TS) 3.8.4 for San Onofre Nuclear Generating Station (SONGS) 2/3 1E DC Power System.

BACKGROUND

The SONGS 125V DC Class 1E batteries have a design life of 20 years. IEEE Code and NRC regulations require batteries to be tested annually when a battery reaches 85% of service life or falls below 90% of its rated capacity. These batteries will approach their 85% service life within the next two fuel cycles and some batteries are approaching their 90% capacity. In order to avoid the need for annual tests that cannot be completed online within the current CT, SONGS is replacing these batteries.

In addition to replacing 1E DC batteries, the 1E DC power system is to be upgraded to include the capability to 1) cross-tie subsystems A and C (as well as sub-systems B and D) when a battery is removed from service, and 2) align a permanently installed swing charger (one for each train) to either of two DC buses on a single train. The first added feature permits an operator to align two DC buses from the same train together and remove a battery from service for testing or maintenance. This configuration would allow all four DC buses to remain energized with sufficient battery support. The second added feature permits online battery charger testing or maintenance by first aligning the swing battery charger to the supported bus.

The proposed technical specification change would permit a battery to be removed for up to 30 days provided that the supported DC bus is realigned within 2 hours via the new cross-tie capability to its companion same train bus that is supported by a battery. For example, prior to removing battery B007 from bus D1, D1 is to be cross-tied to bus D3 that is supported by battery B009.

This analysis evaluates the increase in risk between the normal alignment and the maintenance alignment with a battery removed from service and the upgraded realignments implemented.

This allowed outage time extension request is unique because the out-of-service component is to be replaced by a designed and installed 'compensatory' measure. The compensatory measure is an alternate power source that can meet the functional requirements of the unavailable component. Without the alternate power source, the TS extension is not allowed and the TS reverts to a format that is effectively the same as the current allowed outage time of 2 hours.

METHODOLOGY

This analysis is performed consistent with the requirements of Regulatory Guides (RG) 1.174 and 1.177 [1,2]. The SONGS 2/3 Living Probabilistic Risk Assessment (PRA) is modified to reflect the proposed design change to the 1E DC system. The modified model is used for all calculations.

Regulatory Guide 1.177:

Regulatory Guide 1.177 requires the licensee to demonstrate that the proposed TS CT change has only a small quantitative impact on plant risk. An incremental conditional core damage probability (ICCDP) of less than 5.0E-7 is considered small for a single TS CT change. An incremental conditional large early release probability (ICLERP) of less than 5.0E-8 is also considered small. As defined in RG 1.177,

ICCDP* = [(conditional CDF[1] with the subject equipment out of service) – (baseline CDF with subject equipment in service)] X (duration of the single CT under consideration)

ICLERP* = [(conditional LERF[2] with the subject equipment out of service) – (baseline LERF with subject equipment in service)] X (duration of the single CT under consideration)

*nominal maintenance unavailabilities are assumed for all other equipment

To demonstrate that the change in risk is small for TS 3.8.4, ICCDP and ICLERP are calculated for a battery out-of-service as follows:

$ICCDP_{battery}$ = [(conditional CDF with a battery out of service) – (baseline CDF with battery available)] X (30 days) [1]

$ICLERP_{battery}$ = [(conditional LERF with a battery out of service) – (baseline LERF with battery available)] X (30 days) [2]

These calculations are performed for preventive and corrective maintenance and compared to the RG 1.177 guidelines. Since the allowed outage time extensions are to be applicable to all four electrical sub-systems, calculations should be performed for all four sub-systems. However, to simplify the analysis, the most bounding sub-system is determined and all subsequent calculations are based on the bounding case.

Regulatory Guide 1.174:

The anticipated changes in overall annual core damage frequency (CDF) and large early release frequency (LERF) are calculated and compared to the risk acceptance guidelines in Figures 3 and 4 of RG 1.174. This is calculated using an expected annual frequency and duration of corrective and preventive maintenance multiplied by the CDF/LERF with the subject component out-of-service.

PRA Model:

The SONGS 2/3 Living PRA (as of November 3, 2003) is modified to reflect the proposed design change to the 1E DC system. All calculations are performed with this modified model.

---

[1] Core Damage Frequency (CDF)
[2] Large Early Release Frequency (LERF)

ANALYSIS

The proposed design change only impacts the electrical power system fault tree of the SONGS 2/3 Living PRA. The expected usage of the extended allowed outage time is provided by the electrical engineering group within the SONGS Maintenance Engineering Division and listed in Table 1.

The relevant calculations are performed with the following notes and assumptions.

Notes and Assumptions:

1. As part of the proposed design change, each battery is to be replaced with one of a larger capacity. By design, each new 1800 amp-hour (AH) rated 1E DC battery, while cross-connected, will supply sufficient power to support two 1E DC buses. For example, when bus D1 is cross-connected to D3 with Battery B007 removed from service, Battery B009 can meet the concurrent design load requirements for both DC buses D1 and D3.

2. When performing preventive maintenance of a battery, the cross-connect between buses is completed prior to removing the battery from service (i.e., 'make before break'). The probability of operator failure to properly align the cross-tie is zero. If the action is unsuccessful, the TS action to align the cross-tie within two hours will not have been met and therefore the extension to 30 days is not permitted. The order of restoration of the battery to the bus is done in reverse (i.e., the battery breaker is closed to the bus prior to opening the cross-tie breakers).

3. Emergent unavailability (i.e., corrective maintenance) of a battery requires operators to perform local actions to close breakers to cross-connect buses. If the alignment is not performed within 2 hours or performed incorrectly, then the TS action to align has not been met and the extension to 30 days is not permitted. Only when the alignment is properly performed is the extension to 30 days granted. Once aligned, the 1E DC system is identical to the preventive maintenance alignment. Therefore, except for common-cause failure probability considerations, the corrective maintenance calculation is similar to the preventive maintenance calculation.

4. The PRA model reflects the proposed design as described in Document 90090, "Scope: Replacement of Class 1E Batteries And Associated Equipment," SONGS Design Engineering, June 2003.

5. Test and preventive maintenance activities on a battery are assumed not to increase the likelihood of any additional events.

6. All common-cause failures (CCF) of 1E 125VDC batteries have been modeled along with CCF of all battery chargers (including dedicated and swing chargers).

7. Credit for cross connecting DC buses is limited to maintenance activities. Without post-initiator specific procedures, credit for successful post-initiator alignment of the DC bus cross-tie is difficult to assess. Although such credit would improve the baseline risk (i.e., reduce risk), this improvement is minimal since the likelihood of post-initiator failure of a battery is extremely small.

8. Components other than the affected battery are set to their nominal maintenance unavailabilities.

Data Analysis:

Modifications to the model include the addition of 125V circuit breakers, swing battery chargers and upgraded batteries. Since these added components are generically similar to components already existing in the model, it is reasonable to use the same failure data of similar components already in the Living PRA. Therefore, generic data found in the Living PRA for failures of circuit breakers, battery chargers, and batteries are applicable to the new breakers, batteries, and battery chargers. Probabilities for common-cause failures are adjusted to account for the added components.

The initiating event frequencies for fire are increased for rooms containing DC bus D1 and D2 to account for the addition of the swing battery chargers B021 and B022, respectively, which provide an additional fire source in those rooms. Therefore, the fire frequencies in these rooms increase from 2.1E-5/yr to 4.2E-5/yr.

<u>Maintenance Data</u>:

Table 1 shows the expected maintenance activities for batteries. The activities are shown with the expected frequency and duration. The shaded activities are those activities that require the cross-tie and therefore require entry into TS 3.8.4 action statement. This data is used to assess the expected annual risk impact for comparison to risk acceptance guidelines in RG 1.174.

Table 1
List of Battery Maintenance Activities

Batteries – Preventive Maintenance	Requires Cross-tie? (yes/no)	Frequency	Duration
Pilot cell re-designation	No	Annual	1 hr/battery
Spare cell inspections	No	0.5/year	2 hrs/battery
Monthly battery inspection	No	Monthly	1 hr/battery
Quarterly battery inspection	No	Quarterly	8 hr/battery
Physical inspection of battery	No	Annual	8 hrs (or 1 shift)/battery
Equalize charge	No	Annual	7 days/battery
Single cell equalize charge	No	4-8 years	7 days/battery
Acid adjustment on low specific gravity cells	No	4-8 years	1 day/battery
Performance or Modified Performance Test	Yes	5 years	7 days/battery
Service Test	Yes	2 years	7 days/battery
Proactive replacement of battery and battery rack	Yes	15-20 years	30 days/battery
Proactive replacement of multiple jars	Yes	10 years	21 days/ battery

Human Reliability Analysis (HRA):

The additional operator actions required for this design change are:

Basic Event	Operator Action Description
U-HCD1TOD3-V	Operator Fails To Cross-tie Bus D1 and D3 (Train A)
U-HCD2TOD4-V	Operator Fails To Cross-tie Bus D2 and D4 (Train B)

This design change also required the addition of operator actions to align the swing battery charger. The likelihood of operator failure to align the swing battery charger in the base and maintenance cases was set to 1.0 (i.e., no credit for swing battery chargers).

When performing preventive maintenance on a battery, operators will align the crosstie to the other bus prior to removing the battery to be serviced (also known as "make before break"). It is expected that the pre-alignment is proceduralized and successfully implemented prior to removing equipment from service and entering the TS 3.8.4 action statement. Since a revised TS 3.8.4 would allow an CT extension to 30 days only if the bus cross-tie is closed within 2 hours, alignment failure precludes an CT extension. That is, the extension to operate in the cross-tied alignment for 30 days is permitted only upon successful alignment of the alternate power source. Therefore, during preventive maintenance, the probability of failure for operator actions to align the alternate power source is set to zero.

Common-Cause Failure (CCF) Analysis:

Common-cause failures of swing and dedicated battery chargers are directly modeled in the electrical power system fault tree and quantified using the alpha factor method [5]. Common-cause failure of cross-tie and swing battery charger breakers is not required since the breakers are operated in series where a single breaker failure is sufficient to fail power from the alternate source. Common-cause failure modeling for batteries is included in the base model. The CCF probabilities for batteries are not modified for the preventive maintenance case. CCF probabilities for batteries are modified upward, however, for corrective maintenance of a battery. Modifications are necessary since an emergent battery failure may impact other batteries due to common failure mechanisms. CCF probabilities are summarized in Tables C-1 and C-2.

Uncertainty Analysis:

Parameter uncertainty calculations were not performed since the base case CDF and LERF are essentially the same as those calculated when either two buses are cross-tied. This expectation is similarly stated in Section 2.3.5 of Regulatory Guide 1.177. Modeling uncertainties were assessed via sensitivity analysis of key assumptions. This is described in more detail in the following sensitivity analysis section.

Sensitivity Analysis:

Sensitivity analysis was addressed in several areas: cull level, operator action, bounding sub-system and operation in Modes 2 - 4. These areas are discussed specifically below.

<u>Cull Level</u>: Analyses to assess sensitivity to cull level for both CDF and LERF were performed. The base analysis was performed at a cull level of 5E-10/yr and 5E-11/yr for CDF and LERF, respectively. Sensitivity runs for CDF with cull levels of 1E-10/yr and 1E-11/yr were performed. Similar runs for LERF were performed at 1E-11/yr and 1E-12/yr. The calculated CDF/LERF and increase in baseline CDF/LERF are very small and less than 1E-7/yr and 1E-8/yr, respectively. Reducing the cull levels did not change the single AOT risk from that calculated using a cull level of 5E-10/yr (CDF) and 5E-11/yr (LERF).

<u>Operator Action</u>: Sensitivity analysis on operator action values was not performed for alignments. Operator actions to align the cross-tie to another DC bus to perform preventive maintenance were assumed to be successful since alignment must be successful prior to removing equipment for preventive maintenance (i.e., also known as "make before break"). This is assumed since direct feedback is provided by bus voltage current readings in the control room. Also, the completion time extension to 30 days is dependent on successful alignment to the other bus within 2 hours. If successful alignment is not or cannot be performed in 2 hours, then the extension is not permitted and the allowed outage time remains at 2 hours (as it is in the current TS). Therefore, since operator success is a condition of the extension, no sensitivity analysis is required.

Bounding Sub-system: To determine the most limiting of the four sub-systems to be assessed for this application, sensitivity calculations were performed to assess which sub-system, when aligned to its alternate power source, would result in the highest risk increase. The differences in the core damage and large early release frequencies between each of the sub-systems were calculated to be very small and insignificant. Therefore, sub-system A was arbitrarily chosen for all calculations.

Impact of Peer Review Comments: Sensitivity calculations were performed in response to several facts and observations (F & O's) from the pilot peer review of the SONGS 2/3 Living PRA against the ASME PRA Standard [4]. These sensitivity analyses are discussed in the PRA Quality Section.

Operations in Modes 2 – 4: The requested TS is applicable in Modes 1 – 4. Although it is unlikely that SONGS would operate in Mode 2 – 4 for 30 days, sensitivity calculations were also performed for Modes 2 – 4. The results are provided in the following Table:

		CDF base	CDF maint	delta CDF	ICCDP	LERF base	LERF maint	delta LERF	ICLERP
Mode 2	startup	3.457E-05	3.458E-05	1E-8	8E-10	1.226E-06	1.226E-06	<1E-9	<1E-10
Mode 3	Hot Standby	2.786E-05	2.786E-05	<1E-9	<1E-10	7.702E-07	7.702E-7	<1E-10	<1E-11
Mode 4	AFW cooling (no TDAFWP)	5.014E-05	5.030E-05	1.6E-7	1E-08	3.037E-06	3.037E-06	<1E-9	<1E-10

In Modes 2 – 4, the ICCDP and ICLERP are consistent with RG 1.177 risk acceptance guidelines of 5E-7 and 5E-8 for ICCDP and ICLERP, respectively. Calculation of impact on an annual frequency (for comparison with RG 1.174 acceptance guidelines), based on intended annual usage, was not performed since the AOT extension is not expected to be used in Modes 2 - 4.

PRA QUALITY:

PRA Adequacy Determination Process:

PRA adequacy refers to 1) baseline PRA model quality and 2) adequacy of the PRA calculation for the application.

Determination of baseline PRA technical quality/adequacy is based on assessing the current quality status of the SONGS 2/3 PRA as reviewed in a number of cumulative quality PRA reviews over recent years. Most recently, the SONGS 2/3 PRA was reviewed against the ASME PRA standard [3]. This review identified a number of ASME PRA Standard supporting requirements that are less than capability category II. This peer review provides insight into the current quality status of the SONGS 2/3 PRA.

The technical adequacy of the PRA for the application is based on an assumption that a capability category II for all supporting requirements is inherently sufficient to meet adequacy requirements for risk-informed applications, including risk-informed CT applications. In cases where a peer review has identified supporting requirements as less than capability category II, then technical adequacy for the application is deemed sufficient when the peer review 'facts & observations,' that are the basis of the reduced capability category determination, can be shown to have little or no impact on the calculated results and no impact on the decisions and conclusions of the application. The assessment of impact is addressed by either 1) sensitivity calculations or 2) bounding risk-informed arguments.

Baseline PRA Adequacy:

Several measures have been implemented in the development of the SONGS 2 and 3 Living PRA to ensure quality. Changes in the model that impact assumptions, success criteria, basic event probabilities, and system and plant models formally undergo several levels of review, and depending on the complexity of the change, may also include peer and/or technical expert panel review.

A comprehensive independent peer review of the SONGS 2 and 3 Level 1 and Level 2 internal events living PRA for full power and shutdown operations was conducted between August 1996 and April 1997 by an outside consultant (Scientech, Inc.). During this review, documents, procedures, and supporting calculations and analyses were examined. The review was based primarily on the guidance provided in the PRA procedure guides such as NUREG/CR-2300, "PRA Procedures Guide: A Guide to the Performance of PRAs for Nuclear Power Plants," and NUREG/CR-4550, Revision 1, "Analysis of Core Damage Frequency," as well as PRA applications documents such as EPRI TR-105396, "PSA Applications Guide," and NUREG-1489, "Review of NRC Staff Uses of PRA." The results of all independent review activities performed by internal and external reviewers were documented in the SCE PRA Change Package process and tracked in the PRA Punch List Database. In June 2003, a pilot application of the ASME PRA Standard peer review process for the SONGS 2/3 Living PRA was performed [4]. The results of this pilot application are documented in WCAP-16165 Rev. 0 [3].

Adequacy Of The PRA Calculation For The Application:

The ASME peer review team provided a list of comments (known as 'facts and observations' or F & O's). These F & O's were identified based on a review of the SONGS 2/3 Living PRA versus the high level and supporting requirements of the ASME PRA Standard. Each F & O was graded based on the type of finding (i.e., technical adequacy or correctness, editorial, suggestion, or complementary). Seventy-five (75) comments are of type A/B. By definition, A/B F & O's are:

"Important and necessary to address to assure the technical adequacy of the PRA, the capability of the PRA or the robustness of the PRA update process."

All type A/B F & O's (75) were reviewed for possible impact on the results and conclusions of this report. These F & O's cover supporting requirements with all capability categories. Almost all SRs with capability category of less than II have an associated F & O. Ten F & O's were determined to potentially have an impact on the results and are included at the end of this attachment. Sensitivity calculations were performed on each of these ten F & O's. The results of these calculations show that none of the F & O's impact the results or conclusions.

There are three (3) supporting requirements with capability category I that did not have an associated F & O from the peer review. These three supporting requirements were assessed to determine the impact, if any, on the application.

Supporting Requirement AS-A9:

Capability Category I	Capability Category II
USE generic thermal hydraulic analyses (e.g., as performed by a plant vendor for a class of similar plants) to determine the accident progression parameters (e.g., timing, temperature, pressure, steam) that could potentially affect the operability of the mitigating systems.	**USE realistic, applicable (i.e., from similar plants) thermal hydraulic analyses** to determine the accident progression parameters (e.g., timing, temperature, pressure, steam) that could potentially affect the operability of the mitigating systems.

SONGS uses plant-specific thermal/hydraulic (T/H) analyses (MAAP and RETRAN) in lieu of generic design basis T/H analyses when such analyses is deemed overly conservative. SCE believes that the SONGS living PRA meets capability category II for the supporting requirements. Additionally, more extensive use of realistic, applicable T/H analyses would equally impact the base and maintenance (cross-tied) calculations for the application. Therefore, capability category I for this supporting requirement is considered sufficient for this application.

Supporting Requirement DA-C10:

Capability Category I	Capability Categories II & III
When using surveillance test data, REVIEW the test procedure to determine whether a test should be credited for each possible failure mode. COUNT only completed tests or unplanned operational demands as success for component operation.	When using surveillance test data, REVIEW the test procedure to determine whether a test should be credited for each possible failure mode. COUNT only completed tests or unplanned operational demands as success for component operation. **If the component failure mode is decomposed into sub-elements (or causes) that are fully tested, then USE tests that exercise specific sub-elements in their evaluation. Thus, one sub-element sometimes has many more successes than another**

The requirements for capability category II, as written, state that if the component failure mode is decomposed, then the PRA should include those tests that exercise the specific elements. Since decomposing failure modes into sub-elements is not required, it could be argued that SONGS does in fact meet capability category II. Interpretation notwithstanding, rigorous decomposition of failure modes would be applicable to both the base and maintenance cases and therefore are equally affected by it. Consequently, capability category I for this supporting requirement is considered acceptable for this application.

Supporting Requirement QU-D3:

Capability Category I	Capability Categories II & III
No requirement to compare results to those from similar plants	COMPARE results to those from similar plants and IDENTIFY causes for differences in significant contributors.

SCE believes that the SONGS 2/3 Living PRA meets capability category II/III. A comparison of PRA cutsets and dominant contributors for all Combustion Engineering (CE) pressurized water reactors (PWRs) was performed and documented in CE NPSD-1029, Supplement 1, "Summary Report for Comparison of PSA Cutsets for Dominant Contributors for CE PWRs, Phase 5, CEOG Task 1046." San Onofre's results compare favorably with similar CE plants.

RESULTS:

Table 2 provides results for removing a 1E DC battery for preventive maintenance. Lines 4 and 5 show CDF/LERF results when a battery is out of service (OOS) and in-service, respectively. The results show that the cross-tie alignment yields minimal change in risk. This result is expected because of the availability and high reliability of an alternate aligned qualified source of power.

TABLE 2

SONGS Conditional CDF & LERF Contributions for Preventive Maintenance (PM)

		TS 3.8.4	
		CDF[d]	LERF[d]
1	Present Allowed Outage Time (AOT)	2 hours	
2	Proposed AOT - aligned to alternate power source	30 days	
3	Baseline (CDF/LERF) - nominal maintenance	*3.235E-5/yr*	*1.425E-6/yr*
4	Conditional CDF/LERF for PM (Component UNAVAILABLE, others nominal maintenance)	*3.237E-5/yr*	*1.425E-6/yr*
5	Conditional CDF/LERF for PM (Component AVAILABLE, others nominal maintenance)	*3.235E-5/yr*	*1.425E-6/yr*
6	Increase in CDF/LERF for PM *(Line 4 – Line 5)*	2E-8/yr	<1E-9/yr
7	**Single AOT Risk (ICCDP/ICLERP) for PM - proposed AOT (RG 1.177): 30 days** *(Line 6)*30/365*	**2E-9**	**<9E-11**
8	Downtime Frequency for PM[a] *(from Table 1)*	3.07 /year[b]	
9	Mean Duration of PM	8.99 days[c]	
10	Single AOT Risk for PM - based on mean duration *(Line 6) * (line 9)/365*	4E-10	<1E-10
11	**Yearly AOT Risk for PM - based on mean duration (RG 1.174)** *(Line 10) * (Line 8)*	**1E-9/yr**	**<1E-10/yr**

a Frequency represents the combined downtime frequency of all four sub-systems.

b Preventive maintenance consists of tests and proactive battery replacements: 2 performance tests in 10 years and 5 service tests in 10 years. This is a total of 7 tests in 10 years times 4 batteries. 7 tests * 4 batteries/10 years = 2.8 tests/year; 4 battery replacements every 15 years or 0.267/year; total downtime frequency = 2.8 + 0.267 = 3.07

c Mean duration = [2.8 (7 days) + 0.267 (30 days)]/3.07 = 8.99 days

d Cull level = 5E-10/yr CDF, 5E-11/yr LERF

Bolded values are measured against RG 1.174/1.177 acceptance guidelines

The change in LERF (line 6) is smaller than the last significant digit in the calculation (1E-9/yr). To test whether the calculation is performed correctly and the model changes completed accurately, the cross-tie breakers were set to 0.1 failure probability instead of 0.0. In this test case, valid cutsets with an increase in CDF/LERF were expected and observed. This confirms that the same identical case was not performed for base and maintenance cases. However, since the change in LERF is less than the last significant digit of the Safety Monitor output (1E-9), calculations for lines 7, 10, and 11 are based on ΔLERF < 1E-9/yr.

Regulatory Guide 1.177:

From line 7, the single CT risk for the removal of a battery is much less than the RG 1.177 guideline of 5E-7 for ICCDP and 5E-8 for ICLERP. Line 7 is calculated by taking the increase in risk in line 6 and integrating over the proposed AOT duration of 30 days.

Regulatory Guide 1.174:

From Line 11, the annual increase in risk takes into account the expected frequency and duration of outages of the batteries. This value is less than the RG 1.174 guideline of 1E-6/yr for CDF and 1E-7/yr for LERF.

Corrective Maintenance:

All battery maintenance since initial commercial operation has been predominantly preventive maintenance. Except in one case, corrective battery maintenance has been limited to activities that did not require entry into a TS action statement and/or did not involve a battery that would be unable to perform its design functions. One case involving a single cell's voltage below TS limits was corrected within the current TS CT of 2 hours. The corrective action was to jumper in an available spare cell. Battery maintenance activities are otherwise proactive in anticipation of degrading cell capacity or to correct potential personal safety concerns. In all instances of past battery or jar replacement, the batteries would have been able to meet their design requirement at the time of replacement. Batteries, by their nature, do not exhibit rapid, immediate failure but rather degrade over time. With the SONGS trending and surveillance program, degradation to the degree in which a battery is unable to perform (i.e., fail) is predictable and can be maintained through proactive replacement. Although immediate failure requiring corrective maintenance is unlikely, such a calculation with conservative assumptions for frequency and duration are included in this analysis.

For the purposes of assessing corrective maintenance risk, a bounding standby failure frequency of a battery must be developed. It's conservatively assumed that one battery failure has occurred since commercial operation of Units 2 and 3 (approximately 42 years of operation). The results of this sensitivity evaluation are included in Table 3.

TABLE 3

SONGS Conditional CDF & LERF Contributions for Corrective Maintenance (CM)

		TS 3.8.4	
		CDF[d]	LERF[d]
1	Present Completion Time (CT)	2 hours	
2	Proposed CT - aligned to alternate power source	30 days	
3	Baseline (CDF/LERF) - nominal maintenance	*3.235E-5/yr*	*1.425-06*
4	Conditional CDF/LERF for CM (Component UNAVAILABLE, others nominal maintenance)	*7.811E-5/yr*	*6.345E-6/yr*
5	Conditional CDF/LERF for CM (Component AVAILABLE, others nominal maintenance)	*3.235E-5/yr*	*1.425E-6/yr*
6	Increase in CDF/LERF for CM *(Line 4 – line 5)*	4.576E-5/yr	4.920E-6/yr
7	Single AOT Risk (ICCDP/ICLERP) for CM *(Line 6)*30/365*	1.87E-06	4.04E-7
8	Downtime Frequency for CM[a] *(From Table 1)*	0.024/yr[b]	
9	Mean Duration of CM	30 days[c]	
10	Single AOT Risk for CM - based on mean duration *(Line 6) * (line 9)/365*	3.76E-06	4.04E-7
11	Yearly AOT Risk for CM - based on mean duration *(Line 10) * (Line 8)*	9.03E-8/yr	9.71E-9/yr

[a] Frequency represents the combined downtime frequency of all four sub-systems.
[b] Downtime frequency: In one instance, corrective maintenance was required to jumper in a spare cell to replace a cell that fell below the TS required minimum voltage. The action to jumper a cell was completed within the current 2 hour TS CT. Since no other battery failures have occurred at SONGS Units 2 and 3, for purposes of determining downtime frequency, one battery failure requiring full battery replacement is assumed to have occurred since initial power operation. That is, one failure in 42 years or 0.024/year.
[c] Mean duration: Battery replacement and testing requires 30 days
[d] Cull level = 5E-10/yr CDF, 5E-11/yr LERF

Corrective maintenance requiring 30 days to complete represents replacement of a failed battery. Although the ICCDP/ICLERP (line 7) are greater than the RG 1.177 guidelines, the conservative assumption on frequency of usage/duration provides results that are consistent with the RG 1.174 guidelines.

CONCLUSIONS:

The objective of this risk-informed analysis is to support an extension of the completion time (CT) of Technical Specification 3.8.4 for SONGS 2/3 1E DC Power System (battery). Calculations were performed to assess the incremental core damage and large early release probabilities and the expected annual CDF and LERF for the proposed TS change. The results are compared against NRC RG 1.174 and RG 1.177 acceptance guidelines.

Regulatory Guide 1.177:

As shown in line 6 of Table 2, the increases in core damage and large early release frequencies with two same train DC buses cross-connected are less than 1E-7/year and 1E-8/yr, respectively. The changes in risk are small because a fully qualified alternate power source is aligned when a battery is removed for maintenance. The calculated incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP) (line 7 of Table 2) are less than the acceptance guidelines from NRC Regulatory Guide 1.177 of 5E-7 and 5E-8, respectively.

Regulatory Guide 1.174:

In line 11 of Table 2, the expected frequency of TS 3.8.4 usage and duration are combined with the core damage frequency while in the TS to assess the expected annual risk impact of the TS change. The expected annual risk impact is measured against NRC Regulatory Guide 1.174. The expected annual increase in risk is < 1E-7/year for CDF and <1E-8/year for LERF, which are less than the RG 1.174 acceptance guidelines.

Therefore, the flexibility of the enhanced DC system to allow cross-connection to the other sub-system on the same train supports a Technical Specification 3.8.4 allowed outage time extension to 30 days as measured against the risk acceptance guidelines of RG 1.174 [1] and RG 1.177 [2].

SUMMARY:

The PRA results compare favorably against Regulatory Guides 1.174 and 1.177 in large part because a qualified alternate source of power is aligned prior to removing a battery. When aligned to the alternate power source, each DC bus remains energized with a highly reliable source.

REFERENCES:

[1] U.S. NRC Regulatory Guide 1.174, "An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes To The Licensing Basis," July 1998.

[2] U.S. NRC Regulatory Guide 1.177, "An Approach For Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998.

[3] "Pilot Application of ASME PRA Standard Peer Review Process For the San Onofre Nuclear Generating Station Units 2 and 3 PRA," WCAP-16165, CEOG Task 1037, November 2003.

[4] "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME RA-S-2002, ASME, April 2002.

[5] "Common-Cause Failure Parameter Estimations," NUREG/CR-5497, October 1998.

FACTS & OBSERVATIONS (F & O's) FROM THE PILOT APPLICATION OF THE ASME PRA STANDARD PEER REVIEW PROCESS

When assessing the impact of a Fact & Observation, the impact on the delta or difference in the non-aligned case versus the aligned case was assessed. With the 1E Direct Current (DC) sub-system crosstie, there is one battery supporting two buses. With respect to each bus, the bus is still supported by one battery. The failure rate of each sub-system remains the same. However, the failure probability of two sub-systems simultaneously increases because of the common battery. A failure of one of the cross-tied buses or its power source may also fail both sub-systems simultaneously. Peer review comments have an impact on results if the comment results in an increase in risk for the cross-connected (one battery/two bus cross-tied) case without a commensurate increase in risk for the base ('two battery/two bus) case. The following 10 F & O's were determined to potentially have an impact on the results.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
DA-C3-02	NM	Some significant components (e.g., Low Pressure Safety Injection (LPSI) pumps, Auxiliary Feedwater (AFW) pumps, and Service Water pumps) were assumed the same demand rate as 12 years ago and adopted the demand data collected from 1985 to 1991 as current demand data. Especially, the demand data of Tank 121 was adopted from the P140 demand data from control room log from 1997 to 2001, but, P140 did not apply its own data, instead of, P140 applied the demand data from 1985 to 1991. Furthermore, most of the components applied a time period 54 months, but P140 applied 10 months only without appropriate documentation of the reason..	None provided	Turbine driven AFW pump P140 sensitivity was tested by doubling the failure to start probability and testing with Sub-system A battery B007 in-service and out-of-service. The calculation shows a delta risk with the doubled failure rate of P140 to be 1E-7/year CDF. A very minimal increase that does not impact the conclusions or the request for a TS 3.8.4 CT extension. Pumps from other systems are expected to have an even smaller impact on a delta risk calculation.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
DA-C3-03	NM	SCE assumed that 70% turbine-driven (T/D) AFW pump failed to run is due to overspeed and it is recoverable. No bases can be found to support this assumption. Plant data showed 0 failure to run in 295 hours and 0 failure to start on 38 demands. Furthermore, there is no justification to apply this recoverable credit to failure to start but not the failure to run. (Note that Failure to start has a higher failure rate than failure to run.)	None provided	The non-recovery probability for P140 (L-TP140NR--S) was doubled. The calculation shows a delta risk of less than 1E-7/year CDF. Therefore, this F&O has no impact on the conclusions.
DA-C14-01	NM	Recovery of common cause failure of AFW and Emergency Diesel Generators (EDGs) does not use plant-specific data and the applicable Common Cause has not been reviewed. Common cause failure to run events for the EDGs and AFW pumps are recovered using data from an EPRI report. It is not clear that the data from that reference report (NSAC-161) applies to common cause failure events.	Review plant specific data to identify actual or potential common cause failure of the AFW and diesel generators and document that these failures can be recovered. Update recovery rates and common cause failure factors using plant-specific data.	Sensitivity calculations were performed by adjusting the recovery of CCF of AFW pumps and EDGs. When setting these recoveries to 1.0 together, the base case CDF (LERF) increased from 3.24E-5/yr (1.12E-6/yr) to 3.25E-6 (1.13E-6/yr). The cross-tied case went from 3.24E-5/yr(1.12E-6/yr) to 3.26E-5 (1.13E-6/yr). The ICCDP and ICLERP for 30 days are 8E-9 and 8E-10, respectively.
DA-D3-01	III	Consider modifying the SONGS 2/3 Generic Data for turbine pump (TP) and battery chargers (BC). A mean of 3.0E-2 for turbine driven pump failure to start on demand appears to be significantly conservative before factoring the SONGS failure experience with condensate trips. PLG-500 has a value of 1.3E-7 EF 4. The SONGS experience that is included in the generic data should be removed for determining the generic component, as long as it is included in the Bayesian update. A mean of 6.0E-7 for battery charger failure to operate appears to be non-conservative since a value of 1E-5 EF 5 is available from EGGSSRE-8875.	Review current PRA data studies and update generic data for these components.	BC: Code for the failure rate of the battery chargers were increased by a factor of 16.7 to 1E-5/hr with a 24 hour failure probability = 2.4E-4. The CCF values of battery chargers were also increased by a factor of 16.7. X-tied CDF= 3.227E-5/y Base CDF = 3.226E-5/y ΔCDF = 1E-8/y ICCDP = 8E-10 X-tied LERF= 1.125E-6/y Base LERF= 1.125E-6/y ΔLERF < 1E-9/y ICLERP < 1E-10 Note: cull level for CDF and LERF set to 5E-10.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
				TP: Reducing the failure rate of the turbine driven pump by several orders of magnitude as suggested by the F & O would reduce the frequencies of all cutsets involving the pump and DC power. This essentially eliminates any contribution of the TD AFW pump to this application. Therefore, this F&O has no impact on the conclusions.
HR-G4-05	II	*Human action should only be used as interviewed.* This means that for scenarios where indication is lost (e.g., Loss of 125 VDC pre-trip and post trip) that the human actions that credited this indication should not be used.	Use human actions as interviewed	All initiating events (IE's) except for Loss of DC (LDC1 & LDC2) were set to 0.0. The initiating frequency for LDC1 & LDC2 were set to 1.0. All resulting cutsets were reviewed for any operator actions (HC events, that is: post-initiator operator actions). The only operator actions that are relevant are operator manually closing breakers for AFW pumps P141 and P504. The probability of these actions is 0.1, but they are multiplied by 10 to account for loss of indication (from loss of DC). Therefore, the loss of indication was already accounted for in the calculation for the main report. Also, with the above settings, the following results were calculated: X-tied CDF= 1.79E-5/y Base CDF = 1.79E-5/y ΔCDF < 1E-7/y ICCDP < 8E-9 X-tied LERF= 9.61E-6/y Base LERF= 9.61E-6/y ΔLERF < 1E-8/y ICLERP < 8E-10 Note: cull level for CDF and LERF set to 5E-

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
				10. *No impact from this F&O.*
QU-A2-01	II	The uncertainty analysis attempting to address the correlation of parameter inputs does appear to yield results that would be expected. The results of the case accounting for the impact of parameter correlation yielded a reduction in the mean CDF as compared to the uncorrelated results. This should not be the case. It appears that either the inputs are incorrect (for example, the translation from the histogram to code inputs) or there is a computational problem.	Make sure that inputs for both cases are appropriate and/or benchmark code to assure appropriate treatment to resolve problem.	No impact. Resolution of this F & O will equally affect the base and maintenance case. Therefore, a delta risk calculation is unaffected by this F&O.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
QU-A4-01	I/II/III	Recoveries - Post Processing (Appendix A-7 Post Processing Explanation Report) - a number of post processing actions (9 of 23) increase the basic event probability in the minimum cutset, some by significant factors (i.e., multiplication factors of 34.2 and 90.9). Applying increasing factors after solution will allow cutsets which should have been above the truncation limit and part of the solution to be missing from the final analysis, since they were dropped by the truncation and were not present to have the multiplier applied. This also impacts the importance of components for applications such as the Maintenance Rule.	Incorporate these corrections into the fault trees. Missing cutsets will impact both the overall solution of CDF/LERF as well as individual importances.	No impact. Truncation limit dropped to 1E-12 for CDF and LERF. X-tied CDF= 3.753E-5/y Base CDF = 3.746E-5/y ΔCDF = 7E-8/y ICCDP = 6E-9 X-tied LERF= 1.723E-6/y Base LERF= 1.719E-6/y ΔLERF = 4E-9/y ICLERP = 3E-10
QU-B3-01	NM	The truncation limits selected for CDF and LERF were not selected sufficiently low enough to capture an adequate number of cutsets, especially for applications involving component importance such as the Maintenance Rule. One industry rule of thumb is to use a truncation that captures 90% of the CDF obtained when a 1% change in CDF occurs when dropping the truncation one decade. From the figures provided in IPE-MR-000, there was a 4.2% drop at 5E-12 truncation for CDF and a 9.0% drop at 1E-12 truncation for LERF for the lowest solved analyses. Therefore, the value assumed to be "close" to the final value was not valid. Even though the selected truncation captures 94% of the lowest analyzed value for CDF and 92% for LERF, it is capturing a much lower ratio of the actual CDF and LERF. The statement in the reports that 95% of the CDF is being captured is not accurate. This is also why the number of minimum cutsets is less than usually observed at other utilities. From experience, the truncation would be expected to be about a decade lower for CDF and between 1-2 decades for LERF. (Note: SR QU-B3 requires that truncation be such that no significant accident sequences are inadvertently eliminated. The NRC quantitative interpretation of significance is that you need to have enough cutsets such have 95% of final CDF/LERF for solution with convergence sufficient to demonstrate the 95% of CDF/LERF.)	My experience is that truncation usually falls between 5 to 6 decades below the CDF or LERF value. The industry thumb-rule can be used. Since a fast analysis engine is being used the time needed for the solutions should not be excessive. Enough calculations need to be performed that it is clear that the "curve" has truly flattened and the selected value adequately captures CDF and LERF.	Sensitivity analysis was performed to assess the impact of lower truncation levels (1E-11, 1E-12). Lower truncation levels did not impact the results and conclusions. Therefore, this F & O will equally affect the base and maintenance case. Therefore, a delta risk calculation is unaffected by this F&O.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
QU-F3-01	NM	There was some discussion in Section 12.5 of the Main Report of the assessment of impact of assumptions that could impact PRA results. This focused on results of a series of sensitivity cases that were run. Within this set of cases, the impacts of selected modeling assumptions were quantified and evaluated individually. However, SR QU-F3 (and also SR QU-E2 and QU-E4) of the ASME Standard should be interpreted as requiring a more structured approach to: (a) identifying what the key assumptions and key sources of uncertainty are, and (b) for evaluating and documenting both individual and, to the extent practical, cumulative or overlapping impacts. Some items of particular interest would be assumptions that may introduce a significantly conservative bias into the results (e.g., the simplifying assumptions made for loss of control room HVAC), and assumptions that result in the screening of potential contributors from the model (e.g., the process used in the internal flooding analysis), or assumptions and uncertainties associated with success criteria. Some additional guidance is provided in the SRs noted above.	The presence of impacts of such assumptions and sources of uncertainties can affect risk-informed decisions made using the PRA. Consider developing a process for identifying key assumptions and key sources of uncertainty in the PRA, and developing meaningful sets of sensitivity cases to identify their impacts.	Sensitivity analyses were performed on specific assumptions that may affect the base case differently than the maintenance case. These are discussed in the sensitivity analysis section of this report.
QU-F6-01	NM	The main report describes the overall results and provides some sensitivity analyses. No description of the limitations of the PRA model was identified. In the self-assessment, the focus of SCE's response was on limitations in scope (i.e., shutdown, Level 3, etc.). However, the internal events CDF/LERF model has limitations in and of itself.	Add a section to the main report that discusses limitations of the PRA model.	Sensitivity analyses were performed on specific assumptions that may affect the base case differently than the maintenance case. These are discussed in the sensitivity analysis section of this report.

F&O	Capability Category of SR	Observation	Proposed Resolution from Peer Review Team	DC CT Extension Impact
SY-A11-01	I/II/III	The EDG mission time is limited to 8 hours. This is based on the data that no Loss of Offsite Power (LOOP) in excess of 8 hours has occurred in this region. There is some likelihood that a LOOP in excess of 8 hours. Assigning a zero likelihood to this possibility seems overly optimistic. In Recoveries, Post Processing Basis Code #1 changes the Mission Time of the Diesel Generators from 24 hours to 8 hours for internal initiators. The basis for this change is recovery of offsite power having a high probability of recovery within 8 hours. However, recovery of offsite power requires manual operator action and such action is not being added to the recovered cutset to account for failure to restore power.	Model the full spectrum of possible LOOP durations up to 24 hrs. If the 8 hour mission time is retained, add an operator action with this recovery to account for restoration of offsite power.	No impact. The run times were extended to 24 hrs with the following results: X-tied CDF= 3.221E-5/y Base CDF = 3.220E-5/y ΔCDF = 1E-8/y ICCDP = 8E-10 X-tied LERF= 1.121E-6/y Base LERF= 1.121E-6/y ΔLERF < 1E-9/y ICLERP < 1E-10 Note: cull level for CDF and LERF set to 5E-10.

Attachment J

Proposed Change Number (PCN) 548,
Reviewers' Aid: Markup of Common
Technical Specifications Pages
San Onofre Nuclear Generating Station, Units 2 and 3

MARKUP OF COMMON TECHNICAL SPECIFICATION PAGES

PCN 548 Review Aid

LEGEND:

Color coded wording indicates the following:

GREEN
Wording in TSTF-360, R1.
Wording not applicable to SONGS because of specific reasons identified.

BLUE
Proposed SONGS Tech Spec wording same as TSTF-360, R1.

RED

Wording not in TSTF-360, R1.

Modified wording for clarification purposes and/or added wording to describe alternate methods used on SONGS.

LCO 3.8.4 The Train A and Train B DC electrical power subsystems shall be OPERABLE. ~~(Same as TSTF-360, R1)~~

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable. ~~(Same objective, however wording different from TSTF-360, R1)~~	A.1 Restore battery terminal voltage is greater than or equal to the minimum established float voltage. ~~(Same as TSTF-360, R1)~~ AND A.2.1 Verify battery float current ≤ 2 amps. ~~(Same as TSTF-360, R1)~~ OR A.2.2 Verify pilot cell specific gravity ≥ 1.200. ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~ ~~AND~~ ~~A.3 Restore battery charger to OPERABLE status.~~ ~~(In TSTF-360, R1. Not in SONGS LCO because not part of current licensing basis)~~.	2 hours ~~(Same as TSTF-360, R1)~~ Once per 12 hours ~~(Same as TSTF-360, R1)~~ Once per 12 hours ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~ ~~7 days~~ ~~(In TSTF-360, R1. Not in SONGS LCO)~~
B. Required Action and associated Completion Time of Condition A not met. ~~(Added, not in TSTF-360, R1)~~	B.1 Declare associated battery inoperable. ~~(Added, not described in TSTF-360, R1)~~	Immediately ~~(Added, not in TSTF-360, R1)~~
C. One DC electrical power subsystem inoperable for reasons other than Condition A. ~~(Same as TSTF-360, R1)~~	C.1 Restore DC electrical power subsystem to OPERABLE status ~~(Same as TSTF-360, R1)~~ OR C.2 Cross connect with same train DC subsystem. ~~(Added to allow alternate configuration, not described in TSTF-360, R1)~~	2 hours ~~(Same as TSTF-360, R1)~~ 2 hours ~~(Added, not in TSTF-360, R1)~~
**D. DC Subsystem Buses cross connected. ~~(Added to allow alternate configuration, not described in TSTF-360, R1)~~	D.1 Restore DC Subsystem Buses to non-cross-connected configuration. ~~(Added to allow alternate configuration, not described in TSTF-360, R1)~~	30 days ~~(Added to allow alternate configuration, not described in TSTF-360, R1)~~

E. Required Action and Associated Completion Time of Condition C or D not met. ~~(Same as TSTF-360, R1, added Condition D applicability)~~	E.1 Be in MODE 3. ~~(Same as TSTF-360, R1)~~ <u>AND</u> E.2 Be in MODE 5. ~~(Same as TSTF-360, R1)~~	6 hours ~~(Same as TSTF-360, R1)~~ 36 hours ~~(Same as TSTF-360, R1)~~

**Note: Requires an OPERABLE battery with a rated capacity of greater than or equal to 1800 Amp-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. ~~(Same as TSTF-360, R1)~~	31 days ~~(7 days per TSTF-360, R1. 31 days per IEEE 450-2002)~~
SR 3.8.4.2	Verify each battery charger supplies ≥ rated amps at ≥ the minimum established float voltage for ≥ 8 hours. ~~(Essentially same as TSTF-360, R1, rated amps will be specified in the LCS)~~ ~~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.~~ ~~(In TSTF-360, R1. Not necessary for SONGS LCO)~~	24 months ~~(18 months per TSTF-360, R1. 24 months per IEEE 450-2002)~~
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. ~~(Same as TSTF-360, R1)~~ ~~2. This Surveillance shall not be performed in MODE 1, 2, 3 or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~(In TSTF-360, R1. Not necessary for SONGS)~~ 2. The battery performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 once per 48 months. ~~(Added to continue to allow alternate method for existing batteries)~~ --- 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. ~~(Same as TSTF-360, R1)~~	30 months ~~(18 months per TSTF-360, R1. 30 months per IEEE 450-2002)~~

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems-Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
Required DC electrical power subsystem battery charger or associated control equipment or cabling inoperable. ~~(Same objective, however wording different from TSTF-360, R1)~~ ~~AND~~ ~~The redundant Train battery and charger OPERABLE.~~ ~~(In TSTF-360, R1. Not in SONGS LCO because not part of current licensing basis)~~.	A.1.1 Restore battery terminal voltage is greater than or equal to the minimum established float voltage. ~~(Same as TSTF-360, R1)~~ OR A.1.2 Cross-connect with same train DC subsystem. ~~(Added to allow alternate configuration, not described in TSTF-360, R1)~~ AND A.2.1 Verify battery float current ≤ 2 amps. ~~(Same as TSTF-360, R1)~~ OR A.2.2 Verify pilot cell specific gravity ≥ 1.200. ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~ ~~AND~~ ~~A.3 Restore battery charger to OPERABLE status.~~ ~~(In TSTF-360, R1. Not in SONGS LCO because not part of current licensing basis)~~.	2 hours ~~(Same as TSTF-360, R1)~~ 2 hours ~~(Not in TSTF-360, R1)~~ Once per 12 hours ~~(Same as TSTF-360, R1)~~ Once per 12 hours ~~(Not in TSTF-360, R1)~~ ~~7 days~~ ~~(In TSTF-360, R1. Not in current SONGS LCO)~~
B. Required Action and associated Completion Time of Condition A not met. ~~(Added, Condition B & C combined in TSTF-360, R1)~~	B.1 Declare associated battery inoperable. ~~(Added, Condition B & C combined in TSTF-360, R1)~~	Immediately ~~(Added, Condition B & C combined in TSTF-360, R1)~~

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more required DC electrical power subsystem inoperable for reasons other than Condition A. ~~(Same objective asTSTF-360, R1)~~ ~~OR~~ ~~Required Action and associated Completion Time of Condition A not met.~~ ~~(In TSTF-360, R1. See Condition B in SONGS LCO)~~	C.1 Declare affected required feature(s) inoperable. ~~(Same as TSTF-360, R1)~~	Immediately ~~(Same as TSTF-360, R1)~~
	OR	
	C.2.1 Suspend CORE ALTERATIONS. ~~(Same as TSTF-360, R1)~~	Immediately ~~(Same as TSTF-360, R1)~~
	AND	
	C.2.2 Suspend movement of irradiated fuel assemblies. ~~(Same as TSTF-360, R1)~~	Immediately ~~(Same as TSTF-360, R1)~~
	AND	
	C.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. ~~(Same objective as TSTF-360, R1, wording from current SONGS LCO used)~~	Immediately ~~(Same as TSTF-360, R1)~~
	AND	
	C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status. ~~(Same as TSTF-360, R1)~~	Immediately ~~(Same as TSTF-360, R1)~~

SURVEILLANCE REQUIREMENTS LCO

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. ~~(Same as TSTF-360, R1)~~	In accordance with applicable SRs ~~(Same as TSTF-360, R1)~~

LCO 3.8.6 Battery parameters for the 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. ~~(Same as TSTF-360, R1)~~	A.1 Perform SR 3.8.4.1. ~~(Same as TSTF-360, R1)~~	2 hours ~~(Same as TSTF-360, R1)~~
	<u>AND</u>	
	A.2 Perform SR 3.8.6.1. ~~(Same as TSTF-360, R1)~~	2 hours ~~(Same as TSTF-360, R1)~~
	<u>AND</u>	
	A.3 Restore affected cell voltage ≥ 2.07 V. ~~(Same as TSTF-360, R1)~~	24 hours ~~(Same as TSTF-360, R1)~~
B. One or two batteries on one train with float current > 2 amps ~~(Same as TSTF-360, R1)~~ or specific gravity < 1.195. ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~	B.1 Perform SR 3.8.4.1 ~~(Same as TSTF-360, R1)~~	2 hours ~~(Same as TSTF-360, R1)~~
	<u>AND</u>	
	B.2.1 Verify or restore battery float current to ≤ 2 amps. ~~(Same as TSTF-360, R1)~~	12 hours ~~(Same as TSTF-360, R1)~~
	<u>OR</u>	
	B.2.2 Verify or restore average specific gravity of all connected cells to ≥ 1.195. ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~	12 hours ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~
C. One or two batteries on one train with one or more cells electrolyte level less than minimum established design limits. ~~(Same as TSTF-360, R1)~~ ~~-----NOTE-----~~ ~~Required Action C.2 shall be completed if electrolyte was below the top of plates.~~ ~~(Moved text to Required Action Note 2)~~	------------------NOTES------------------ 1. Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates. ~~(Same as TSTF-360, R1)~~ 2. Required Action C.2 shall be completed if electrolyte level was below the top of plates. ~~(Same as TSTF-360, R1 Condition Note)~~ --	
	C.1 Restore electrolyte level to above top of plates. ~~(Same as TSTF-360, R1)~~	8 hours ~~(Same as TSTF-360, R1)~~
	<u>AND</u>	
	C.2 Verify no evidence of leakage. ~~(Same as TSTF-360, R1)~~	12 hours ~~(Same as TSTF-360, R1)~~
	<u>AND</u>	
	C.3 Restore electrolyte level to greater than or	31 days

CONDITION	REQUIRED ACTION	COMPLETION TIME
	equal to minimum established design limits. ~~(Same as TSTF-360, R1)~~	~~(Same as TSTF-360, R1)~~
D. One or two batteries on one train with pilot cell electrolyte temperature less than minimum established design limits. ~~(Same as TSTF-360, R1)~~	D.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits. ~~(Same as TSTF-360, R1)~~	12 hours ~~(Same as TSTF-360, R1)~~
E. One or two batteries in redundant trains with battery parameters not within limits. ~~(Same as TSTF-360, R1)~~	E.1 Restore battery parameters for batteries in one train to within limits. ~~(Same as TSTF-360, R1)~~	2 hours ~~(Same as TSTF-360, R1)~~
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. ~~(Same as TSTF-360, R1)~~ <u>OR</u> One or two batteries on one train with one or more battery cells float voltage < 2.07 V and float current > 2 amps. ~~(Same as TSTF-360, R1)~~ <u>OR</u> One or two batteries on one train with one or more battery cells float voltage < 2.07 V and specific gravity <1.175. ~~(Added to allow alternate verification, not described in TSTF-360, R1)~~	F.1 Declare associated battery inoperable. ~~(Same as TSTF-360, R1)~~	Immediately ~~(Same as TSTF-360, R1)~~

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 ~~(Same as TSTF-360, R1)~~ or verify pilot cell specific gravity is ≥ 1.200. ~~(Added to continue to allow alternate verification)~~	31 days ~~(7 days per TSTF-360, R1. 31 days per IEEE 450-2002)~~
SR 3.8.6.2 Verify each battery pilot cell voltage is ≥ 2.07 V. ~~(Same as TSTF-360, R1)~~	31 days ~~(Same as TSTF-360, R1)~~
SR 3.8.6.3 Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits. ~~(Same as TSTF-360, R1)~~	31 days ~~(Same as TSTF-360, R1)~~
SR 3.8.6.4 Verify each battery pilot cell temperature is greater than or equal to minimum established design limits. ~~(Same as TSTF-360, R1)~~	31 days ~~(Same as TSTF-360, R1)~~
SR 3.8.6.5 Verify each battery connected cell voltage is ≥ 2.07 V. ~~(Same as TSTF-360, R1)~~	92 days ~~(Same as TSTF-360, R1)~~
SR 3.8.6.6 Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test. ~~(Same as TSTF-360, R1)~~ ~~Note:~~ ~~This Surveillance shall not be performed in Mode 1, 2, 3, or 4. However credit may be taken for unplanned events that satisfy this SR. (Not possible at SONGS)~~	60 months ~~(Same as TSTF-360, R1)~~ AND 12 months when battery shows degradation or has reached 85% of the expected life with capacity < 100% of manufacturer's rating. ~~(Same as TSTF-360, R1)~~ AND 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating. ~~(Same as TSTF-360, R1)~~

5.5 Procedures, Programs, and Manuals

5.5.2.16 Battery Monitoring and Maintenance Program

This Program provides for restoration and maintenance, based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications," of the following:

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

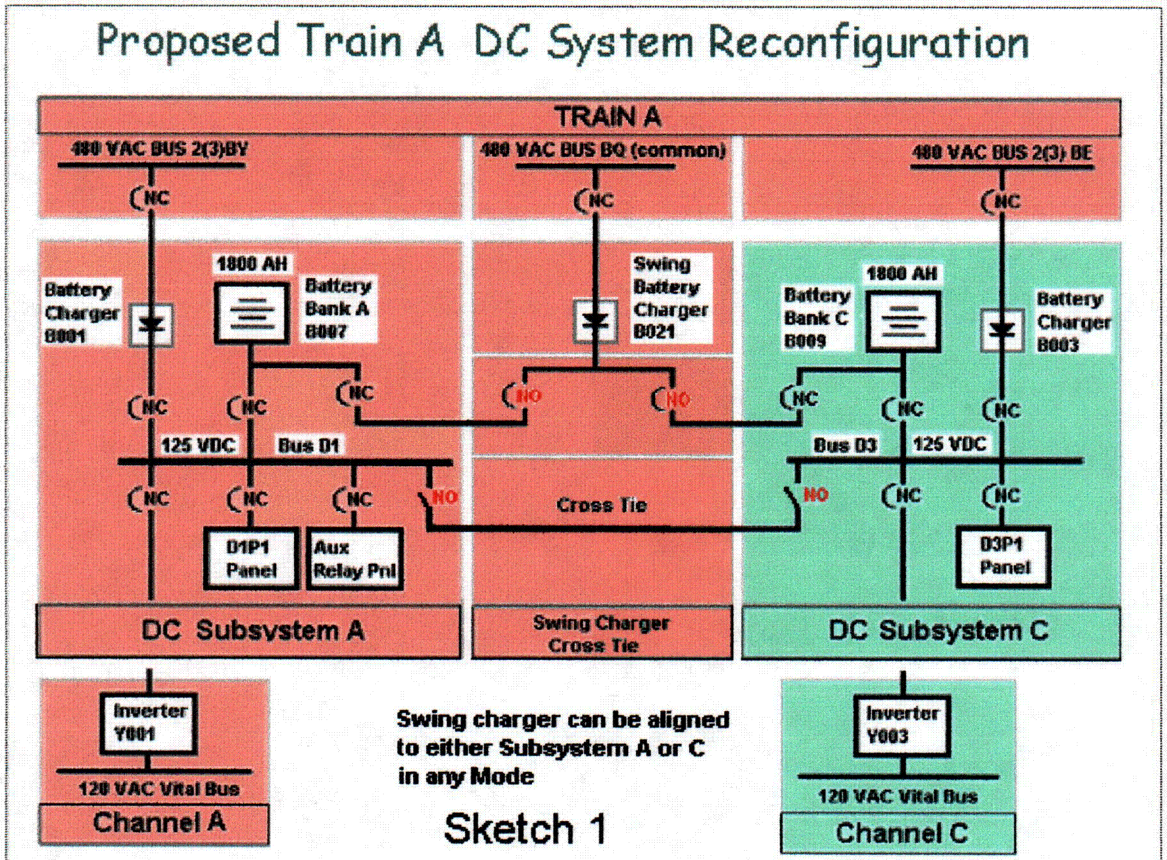
b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

TABLE 1 "IEEE 450-2002 Requirements - Proposed TS/LCS References"

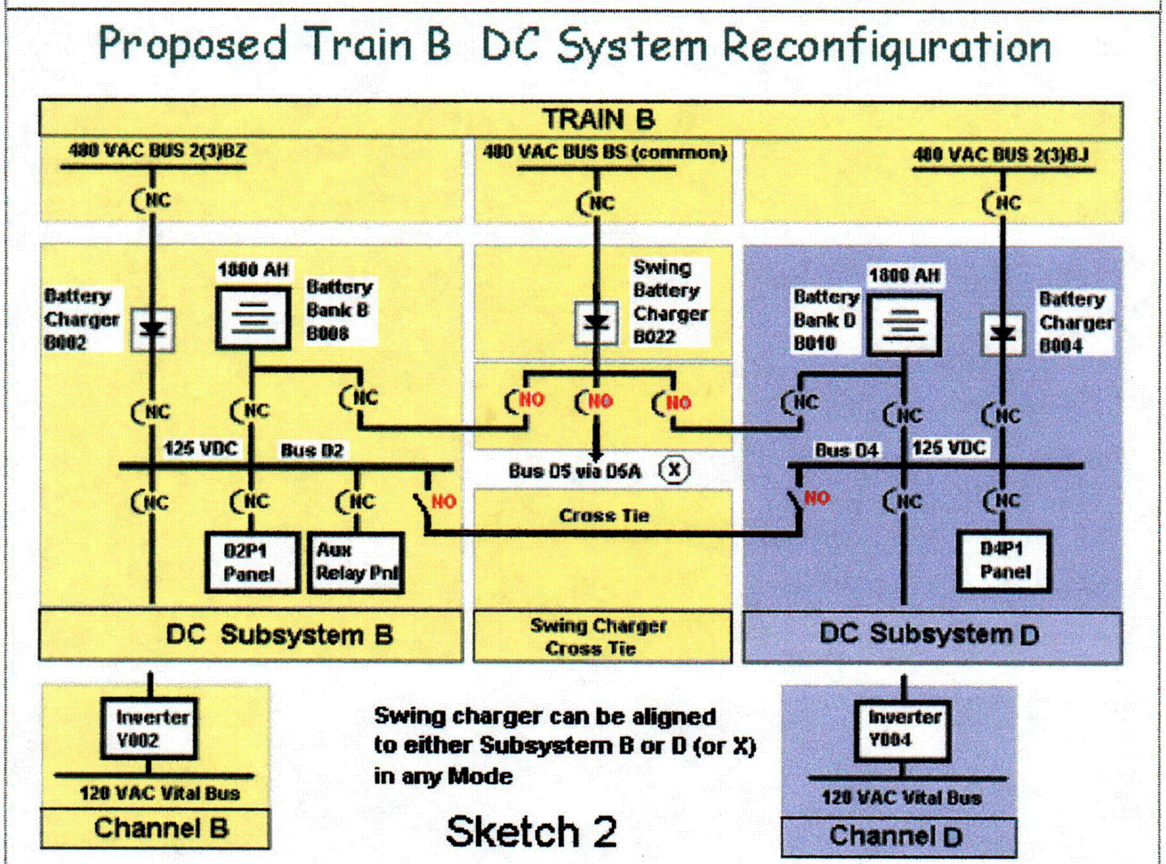
IEEE 450-2002 Requirements (Recommended Practice for Battery Maintenance, Testing & Replacement) *Description of Parameter*	***Proposed Tech Spec*** *Surveillances*	***450-2002 Sec 5.2.1 Paragraph*** *Monthly (31 days)*	***450-2002 Sec 5.2.2 Paragraph*** *Quarterly (92 days)*	***450-2002 Sec 5.2.3 Paragraph*** *Yearly (12 months)*	***450-2002 Sec 6.1, 6.2, 6.3, 6.4*** *1 to 5 Yrs (12 to 60 months)*
Float voltage measured at battery terminals	*3.8.4.1 LCS 3.8.104.1*	***a)***			
General appearance and cleanliness of the battery, the battery rack and/or battery cabinet, and the battery area	*LCS 3.8.106.1*	***b)***			
Charger output current and voltage	*LCS 3.8.104.2*	***c)***			
Electrolyte level of all cells	*3.8.6.3*	***d)***			
Cracks in cells or evidence of electrolyte leakage	*LCS 3.8.106.1*	***e)***			
Any evidence of corrosion at terminals, connectors, racks, or cabinets	*LCS 3.8.106.2*	***f)***			
Ambient temperature and ventilation	*None**	***g)***			
Pilot cell voltage and electrolyte temperature	*3.8.6.2 & 3.8.6.4 LCS 3.8.106.4*	***h)***			
Battery float charging current or pilot cell specific gravity	*3.8.6.1*	***i)***			
Unintentional battery grounds	*None**	***j)***			
All battery monitoring systems are operational, if installed	*NA*	***k)***			
Voltage of each cell	*3.8.6.5*		***a)***		
Specific gravity of 10% of the cells of the battery if battery float charging current is not used to monitor state of charge	*LCS 3.8.106.3*		***b)***		
Electrolyte temperature of 10% or more of the battery cells	*LCS 3.8.106.4*		***c)***		
Specific gravity and temperature of each cell.	*LCS 3.8.106.3 LCS 3.8.106.4*			***a)***	
Cell condition. (See Annex E) This involves a detailed visual inspection of each cell in contrast to the monthly inspection in 5.2.1.	*LCS 3.8.106.5*			***b)***	
Cell to cell and terminal connection resistance. (See Annex F)	*LCS 3.8.106.6*			***c)***	
Structural integrity of the battery rack and/or cabinet.	*LCS 3.8.106.5*			***d)***	
Battery Charger & Battery Service Test (User discretion - IEEE Sec 6.3)	*3.8.4.2 3.8.4.3*				***24 mos 30 mos***
*Battery Performance Test **(See Notes below)*	*3.8.6.6*				***60 mos, 24 mos or 12 mos***
Modified Performance Test (Can be used at any time in lieu of service and/or performance test - IEEE Sec 6.4)	*3.8.6.6*				***Per service or performance test frequency***

Notes:

- ** Asterisk indicates that no Surveillances were specified in TSTF-360 R1. Parameters are alarmed in the SONGS Control Room.*
- *** Frequency not greater than 25% of Expected Service Life (25% of 20 = 5 yrs or 60 mos) or within 24 mos after initially in-service, or annually if battery is degraded or has reached 85% of life expectancy (IEEE Sec 6.2).*



Sketch 1



Sketch 2

C01