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A. Edward Scherer
Manager of
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August 10, 2007

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

Subject: **Docket Nos. 50-361 and 50-362**
Response to Request for Additional Information on the Proposed Amendment Regarding Revision to DC Sources - TSTF-360
San Onofre Nuclear Generating Station, Units 2 and 3

References:
1. July 18, 2007, letter from N. Kalyanam (NRC) to Southern California Edison (SCE), Subject: Meeting with Representatives of SCE for SONGS 2 and 3
2. May 3, 2007 letter from N. Kalyanam (NRC) to R. M Rosenblum (SCE), Subject: San Onofre Nuclear Generating Station, Units 2 and 3 Request for Additional Information on the Proposed Amendment Regarding Revision to DC Sources - TSTF-360 (TAC NOS. MD5140 and MD5141)
3. March 30, 2007 letter from B. Katz (SCE) to Document Control Desk (NRC), Subject: Docket Nos. 50-361 and 50-362, Proposed Change Number (PCN) 548, Revision 2, Battery and DC Sources Upgrades and Cross-Tie, San Onofre Nuclear Generating Station, Units 2 and 3

Dear Sir or Madam:

By letter dated May 3, 2007, the Nuclear Regulatory Commission issued a request for additional information (Reference 2) regarding Proposed Change Number (PCN) 548, Revision 2, Battery and DC Sources Upgrades and Cross-Tie (Reference 3). The enclosure provides Southern California Edison's (SCE's) response. SCE's response reflects discussions between SCE and the NRC by phone and at NRC headquarters (Reference 1).

SCE plans to submit a new revision to PCN-548 in September 2007 which incorporates the enclosed responses and identifies all of the regulatory commitments. New regulatory commitments are made in the responses to NRC Questions 2 and 8.

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A001
NRR

If you have any questions or require additional information, please contact Ms. Linda T. Conklin at (949) 368-9443.

Sincerely,

C E Williams for

Enclosure

cc: B. S. Mallett, Regional Administrator, NRC Region IV
N. Kalyanam, NRC Project Manager, San Onofre Units 2 and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 and 3

ENCLOSURE

Response to Request for Additional Information (RAI)
on the Proposed Amendment Regarding Revision to DC Sources

NRC Question 1:

Provide an endorsement letter from your Battery Manufacturer(s) to show that float current monitoring can be used to identify a battery's state-of-charge and that the proposed float current value will remain adequate throughout the expected service life of the battery. This is consistent with the industry resolution that was reached following the July 12, 2006, Technical Specifications Task Force (TSTF)-360 public meeting.

SCE Response:

A letter from the battery manufacturer, EnerSys, is provided as Attachment 1 to this Enclosure.

NRC Question 2:

Does the proposed 2 ampere float current limit indicate a fully charged battery? If not, provide a regulatory commitment to maintain a design margin to ensure that 2 amperes is indicative of a fully charged battery. This is consistent with the industry resolution that was reached following the July 12, 2006, TSTF-360 public meeting.

SCE Response:

A 2 ampere float current limit does not indicate a fully charged battery. Southern California Edison (SCE) is revising the float current limit to 1.5 amperes which indicates the battery is greater than 98 percent charged based on the manufacturer's letter provided in Attachment 1. SCE is making a regulatory commitment to maintain a capacity margin (presently 2%) to account for the uncertainty in the battery capacity assigned by the manufacturer associated with the allowed float current limit (presently 1.5 amps) for 1800 amp-hour (AH) batteries. This new commitment will be added to the list of regulatory commitments in the revised submittal. The Licensee Controlled Specification (LCS) will require 0.75 amps or less charging current for the 1260 AH batteries until they are upgraded to 1800 AH batteries.

NRC Question 3:

Identify the values for the minimum established design limits for float voltage and temperature in the Technical Specification (TS) Bases. This is consistent with the industry resolution that was reached following the July 12, 2006, TSTF-360 public meeting.

SCE Response:

The values for the minimum established design limits for float voltage and temperature will be added to the proposed TS Bases in the revised submittal.

NRC Question 4:

Provide the basis for the proposed 7-day battery charger Completion Time. Consistent with the industry resolution that was reached following the July 12, 2006, TSTF-360 public meeting, the staff requires that a risk-informed evaluation be performed in accordance with Regulatory Guides (RGs) 1.174 and 1.177 to support extending the battery charger Completion Time beyond 72 hours when using a non-1E battery charger that is not capable of being supplied power from a source independent of the offsite power system (e.g., diesel generator). Furthermore, describe the 'alternate means' that is being credited for the proposed extended Completion Time.

SCE Response:

SCE is proposing to add TS 3.8.4 Required Action A.3, "Restore required battery charger(s) to OPERABLE status" to establish a finite time limit of 72 hours or 7 days for the battery charger Completion Time (CT) depending on the 480 VAC power source that is powering the spare battery charger. The basis for the proposed CTs is provided below.

The battery discharge is terminated when the charger is operating with an output voltage greater than what it would be if the battery were supplying the load. With charger output voltage greater than battery voltage, the charger will supply all of the load current as well as supply current back into the battery which, given sufficient time, will restore the battery to a fully charged state.

The "required" battery charger(s) (i.e., the existing dedicated battery chargers and the new swing battery chargers associated with the Train A and B 125 VDC system) are fully qualified chargers that are powered from a diesel-backed Class 1E distribution system and are fully capable of supporting system design requirements. These 100 percent capacity battery chargers are the preferred means for supporting the Train A and B 125 VDC subsystems.

If the "required" battery charger is inoperable, a spare battery charger will be used to restore the associated 125 VDC battery terminal voltage within 2 hours. The 100 percent capacity spare battery charger, which is identical to the dedicated Class 1E charger, is normally powered from a non-1E source and requires a 72-hour CT for restoration of the "required" battery charger.

The alternate means, consisting of when the spare battery charger can be powered from a Class 1E diesel-backed source within 4 hours, allows the 72-hour CT to be extended to 7 days.

The proposed TS adds a restriction to the CT. There is currently no TS restriction on how long a spare non-1E-powered battery charger can support a Class 1E 125 VDC bus at the San Onofre Nuclear Generating Station (SONGS). The current TS 3.8.4, DC Sources - Operating, Condition C, states "One required battery charger or associated control equipment or cabling inoperable." The corresponding Required Action C.1 states "Verify battery cell parameters meet Table 3.8.6-1 Category A limits" with a Completion Time of 1 hour AND Once per 8 hours thereafter."

Adding a proposed completion time for an aligned spare battery charger that requires plant shutdown where one does not currently exist is a positive risk improvement. Currently, an alignment where the spare battery charger maintains the battery's cell parameters within acceptable limits is permitted indefinitely. Qualitatively, with the proposed CT, the risk improves because the spare battery charger must be capable of being powered from an independent source (e.g., diesel generator) beyond 72 hours up to 7 days. Plant management awareness also increases since the normal plant battery charger alignment must be restored in the proposed CT to avoid shutting down the unit. These are positive risk improvement contributors. Other than the risk of shutting down the unit, there are no other identified negative risk contributors. As such, this qualitative assessment is considered sufficient, and a quantitative risk evaluation has not been performed.

NRC Question 5:

Per RGs 1.174 and 1.177, provide the deterministic basis for the proposed battery Completion Time extension.

SCE Response:

The Probabilistic Risk Assessment (PRA) evaluation submitted previously concluded that a 30-day battery CT is acceptable. Battery replacement CT is 21 days as described in item 1 below. Upgrade to 1800 AH batteries also requires construction activities as described in item 2 below for a total CT of 30 days. The 21-day CT and the one-time 30-day CT will be provided in the revised submittal.

1. Battery Replacement (bounding time for any maintenance activity) requires:
    a. Remove all cells and refurbish (repaint) the racks.
    b. Install new cells.
    c. Equalize charge.
    d. Perform discharge test.
    e. Equalize charge.
    f. Perform Return-To-Service surveillances.

2. Battery Upgrade requires item 1 above and:
    a. Remove battery racks and shower.
    b. Relocate battery room temperature instruments.
    c. Paint room.
    d. Install new battery racks.

NRC Question 6:

Provide the load profiles for all safety-related batteries that would be affected by the proposed TS changes.

SCE Response:

Load profiles for affected safety-related batteries, with battery capacity allocation, are provided in Attachment 2 to this Enclosure. Some values are preliminary and are subject to final review and approval. These will be provided with the revised submittal.

NRC Question 7:

Revise TS 5.5.2.16 wording to be consistent with the wording that was agreed upon at the July 12, 2006, TSTF-360 public meeting.

SCE Response:

The wording for TS 5.5.2.16, Battery Monitoring and Maintenance Program, will be revised to be consistent with the wording that was agreed upon at the July 12, 2006, TSTF-360 public meeting, to read:

> "This Program provides for battery restoration and maintenance, which includes the following:
>
> a. Actions to restore battery cells with float voltage < 2.13 V, and
> b. Actions to verify that the remaining cells are above 2.07 V when a battery cell or cells have been found less than 2.13 V, and
> c. Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates."

NRC Question 8:

Provide a regulatory commitment to relocate specific gravity monitoring to the proposed Battery Monitoring and Maintenance Program. This is consistent with the industry resolution that was reached following the July 12, 2006, TSTF-360 public meeting.

SCE Response:

SCE will relocate specific gravity monitoring to the proposed Battery Monitoring and Maintenance Program. This commitment will be added to the list of regulatory commitments in the revised submittal. This specific gravity monitoring will be performed prior to each battery discharge test.

NRC Question 9:

On page 18 of the license amendment request dated March 30, 2007 (Agency-wide Documents Access and Management System Accession No. ML070950192), the licensee stated the following:

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.

Describe 'the margins available' portion of this statement.

SCE Response:

The proposed increased Completion Times pertain to out-of-limit conditions for cell voltage, electrolyte level, and electrolyte temperature and recognize that there are available margins in the battery design.

Individual cell voltages are monitored, and actions are taken in accordance with the battery maintenance program to restore battery cells with float voltage of < 2.13 V. The battery terminal voltage is normally maintained at a float voltage of 131.5 V (2.267 Vpc) that keeps the battery cells at the maximum state-of-charge and capacity which provides a qualitative margin.

The electrolyte level is monitored to battery manufacturer's recommendations to maintain the electrolyte level between the high and low electrolyte level mark on the battery jar. Battery cells maintained at the recommended electrolyte level retain the maximum capacity which provides a qualitative margin.

The electrolyte temperature of the pilot cells is an accurate representation of the temperature of the battery bank because: 1) batteries have a very large thermal inertia, 2) SONGS Units 2 and 3 batteries are designed with sufficient margins (i.e., temperature, aging, and design), and 3) procedures are available to monitor and correct the cause of low battery room temperatures when an alarm is received at 66 degrees F (low limit is 60 degrees F).

The maximum electrolyte temperature variation between individual cells is in the range of ± 1 degree F due to evenly distributed air flow in the battery rooms. The electrolyte temperature is normally between 73 and 77 degrees F which provides up to 11% battery capacity margin. Due to the very large thermal inertia of the battery, it is highly probable that the room temperature excursion would be corrected prior to the battery electrolyte reaching its minimum design limit of 60 degrees F.

NRC Question 10:

Consistency with TSTF-360 and the Standard TSs is not an adequate basis for granting an amendment to the TSs. Provide a detailed justification for each proposed change that included this rationale as the basis for approval. Examples include the basis provided for proposed changes to limiting condition for operation (LCO) 3.8.4 (Change 2), LCO 3.8.5 (Change 2), and LCO 3.8.6 (Changes 3, 8, 12, 13,14, 16, and 17).

SCE Response:

Section 4.0, EVALUATION, and associated sections of the submittal will be revised in a new submittal to provide a detailed justification for each proposed change. Reference to "consistency with TSTF-360 or IEEE 450" will be minimized and used only when appropriate.

NRC Question 11:

On page 32 of the license amendment request, the licensee stated the following:

"The new 400 [ampere] (A) swing chargers and existing 300A 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."

However, the San Onofre Nuclear Generating Station Updated Final Safety Analysis states:

"The capacity of each Class 1E battery charger is based on the largest combined demand of all the steady-state loads and the charging current required to restore the battery from the design minimum charge state to a 95% charged state within 12 hours, irrespective of the status of the plant during which these demands occur. This is in compliance with the requirements of Regulatory Guide 1.32 (See Paragraph 8.3.2.2.1.4)."

Describe the discrepancy in the capability of the Class 1E battery chargers.

SCE Response:

The Updated Final Safety Analysis Report (UFSAR) reflects the current design (non-cross-tied buses) and licensing basis and safety analysis. This proposed amendment revises the SONGS design basis to allow DC bus cross-tie operation and 24 hours to recharge a battery. Following NRC approval of this proposed amendment, the UFSAR will be revised.

Power is maintained to DC equipment during recharging of the batteries by the connected battery charger(s). Since there is continuous DC power available to the required equipment, the extended duration of the recharge does not impact availability or operability of electrical or mechanical equipment credited in the safety analyses.

NRC Question 12:

The TS Bases are provided for information only and have no regulatory standing; therefore, the staff cannot use them in evaluating the proposed changes. Provide a detailed justification for each proposed change in lieu of referencing the TS Bases for additional supporting information. Examples include item (1) on page 15 and item (6) on page 18 of the license amendment request.

SCE Response:

Section 4.0, EVALUATION, and associated sections of the submittal will be revised in a new submittal to provide a detailed justification for each proposed change in lieu of referencing the TS Bases for additional supporting information.

Attachment 1 to Enclosure

June 4, 2007 letter from Jan G. Reber (EnerSys) to Ashok Wadhwa (SCE),
Subject: Float Current's Relationship to Battery State of Charge

EnerSys
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Reading, PA 19612-4145
800-538-3627 x 1680
Fax 610-208-1971
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Jan G. Reber
Director of Engineering
RP Flooded Products
Technology & Engineering

June 4, 2007

Mr. Ashok Wadhwa
Design Engineering Organization
San Onofre Nuclear Generating Station
14300 Mesa Road, G50B
San Clemente, CA 92672

Re: Float current's relationship to battery state of charge.

Dear Mr. Wadhwa,
EnerSys states the following with respect to float current monitoring:

1. A stabilized float current is a necessary condition of a fully charged battery. EnerSys believes that specific values of float current, which are relatively stable throughout the battery's useful life, are normally indicative of the battery's state of charge when the battery is near full charge and the pilot cell parameters of voltage, temperature, and level are within bounds.

2. Under these conditions, float current can be substituted for specific gravity verification to represent the approach of end of charge.

3. These float current values are specific to a unique installation, but can be sufficiently approximated for a type of battery construction so as to allow a specified value to indicate that the battery has achieved at least a noted percentage of its full capacity. For EnerSys systems, this limiting value of float current for the 2GN-15 batteries is 0.75 amps and for 2GN-23 batteries it is 1.50 amps when the batteries have reached a state of charge in excess of 98% of the batteries available capacity.

4. Aging does impact the float current, but it is expected to be within the noted ranges for the batteries serviceable life.

If you have any further question, please contact me.

Sincerely

Jan G. Reber

cc: J. Gagge, S Weik, B. Ross, File 352

Attachment 2 to Enclosure

SONGS Class 1E Battery Load Profiles

SONGS Class 1E Battery Load Profiles, Correction Factors and Margins

1800 AH Batteries (Subsystem A & B batteries presently are 1260 AH):

90-minute LOVS/SIAS Profile

Subsystem	Amperes per Time (min)								Battery Capacity			Battery Correction Factor and IEEE 485 Sizing Margin				
	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Amp-Hours required	Capacity required	Amp-Hours rated	Correction Factors (CF) Float Current CF	Electrolyte Temp CF	Battery Aging CF	Calculated Margin (60F)	Calculated Margin (50F)
	0-1	1-29	29-30	30-89	89-90	90-120	120-239	239-240								
A	461.15	165.40	165.40	165.54	241.37				254.43	14.1%	1800	2.0%	11% for 60F 19% for 50F	25.0%	43.45%*	39.40%*
B	468.90	170.07	170.07	170.21	249.08				261.54	14.5%					42.54%*	38.38%*
C	130.20	107.38	107.38	62.38	76.56				116.69	6.5%					81.54%*	80.27%*
D	101.68	93.04	93.04	55.04	55.04				101.70	5.7%					85.90%*	84.82%*
A-C Cross-tie	591.35	272.78	272.78	227.92	317.93				371.12	20.6%	1800	2.0%	11% for 60F	25.0%	10.49%*	NA
B-D Cross-tie	570.58	263.11	263.11	225.25	304.12				363.24	20.2%					13.63%*	NA

4-hour SBO Profile

Subsystem	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Amp-Hours required	Capacity required	Amp-Hours rated	Float Current CF	Electrolyte Temp CF	Battery Aging CF	Calculated Margin (60F)	Calculated Margin (50F)
A	329.09	183.73	221.56	145.74	145.74	145.74	145.74	230.11	606.41	33.7%	1800	2.0%	11% for 60F 19% for 50F	25.0%	22.36%*	16.75%*
B	336.43	188.10	228.97	149.57	149.57	149.57	149.57	233.94	622.10	34.6%					20.54%*	14.89%*
C	130.20	107.38	107.38	62.38	62.38	62.38	62.38	76.56	272.64	15.1%					69.68%*	67.52%*
D	101.68	93.04	93.04	55.04	55.04	55.04	55.04	55.04	239.30	13.3%					76.51%*	74.75%*
A-C Cross-tie**	459.29	291.11	420.79	208.12	208.12	208.12	151.88	250.43	768.10	42.7%	1800	2.0%	11% for 60F	25.0%	8.66%*	NA
B-D Cross-tie**	438.11	281.14	399.68	204.61	204.61	204.61	155.18	239.55	763.84	42.4%					10.27%*	NA

1260 AH Batteries (Subsystem A & B):

90-minute LOVS/SIAS Profile

Subsystem	Amperes per Time (min)								Battery Capacity			Battery Correction Factor and IEEE 485 Sizing Margin				
	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Amp-Hours required	Capacity required	Amp-Hours rated	Correction Factors (CF) Float Current CF	Electrolyte Temp CF	Battery Aging CF	Calculated Margin (60F)	Calculated Margin (50F)
	0-1	1-29	29-30	30-89	89-90	90-120	120-239	239-240								
A	461.15	165.40	165.40	165.54	241.37				254.43	20.2%	1260	2.0%	11% for 60F	25.0%	9.48%*	NA
B	468.90	170.07	170.07	170.21	249.08				261.54	20.8%					7.96%*	NA

4-hour SBO Profile

Subsystem	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Amp-Hours required	Capacity required	Amp-Hours rated	Float Current CF	Electrolyte Temp CF	Battery Aging CF	Calculated Margin (60F)	Calculated Margin (50F)
A	329.09	183.73	221.56	145.74	145.74	145.74	145.74	230.11	606.41	48.1%	1260	2.0%	11% for 60F	25.0%	2.59%*	NA
B	336.43	188.10	228.97	149.57	149.57	149.57	149.57	233.94	622.10	49.4%					0.46%*	NA

For "Load Profile" and "Margin" details refer to Calculation E4C-017.1 Rev 3 and E4C-017 Rev 19, CCN 92.

Increase in loads during period 5 for LOVS/SIAS and periods 3 and 8 for SBO reflect random loads.

Asterisks (**) indicate that CPC calculator and inverter are isolated at 30 and 120 minutes respectively.

Calculated margins with asterisk (*) are preliminary and subject to final review & approval.