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Manager of
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June 19, 2006

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

SUBJECT: **Docket Nos. 50-361 and 50-362**
Response to NRC Request for Information
Proposed Change Number (PCN)-548
Battery and DC Sources Upgrades and Cross-Tie
San Onofre Nuclear Generating Station, Units 2 and 3

References: (1) Letter from Brian Katz (SCE) to Document Control Desk, dated February 28, 2006, Subject: "Proposed Change Number (PCN)-548, Revision 1, Battery and DC Sources Upgrades and Cross-Tie"

(2) Letter from N. Kalyanam (USNRC) to Richard M. Rosenblum (SCE), dated May 16, 2006, Subject: "REQUEST FOR ADDITIONAL INFORMATION (RAI) ON THE PROPOSED TECHNICAL SPECIFICATION AMENDMENT REQUEST TO UPGRADE BATTERY AND DC SOURCES INCLUDING A BATTERY CROSS-TIE CAPABILITY WITH AN EXTENDED 30-DAY BATTERY COMPLETION TIME (TAC NOS. MD0300 AND MD0301)

Dear Sir or Madam:

This letter responds to the Request for Additional Information (RAI) from the NRC staff reviewers (Reference 2) regarding the subject license amendment request, PCN-548, originally submitted as Reference 1.

The responses are provided in Enclosure 1.

A001

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If you have any questions or require additional information, please contact Jack Rainsberry at (949) 368-7420.

Sincerely,

Lynn Pressey for AES

Enclosure: 1. Responses to NRC Questions

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

Enclosure 1

Response to NRC Questions

REQUEST FOR ADDITIONAL INFORMATION
SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3
AMENDMENT REQUEST TO UPGRADE BATTERY AND DC SOURCES
INCLUDING A BATTERY CROSSTIE CAPABILITY WITH AN
EXTENDED BATTERY COMPLETION TIME
(TAC NOS. MD0300 AND MD0301)

Page references are from the license amendment request (LAR) application dated February 28, 2006, from Southern California Edison (SCE, the licensee) for San Onofre Nuclear Generating Station, Units 2 and 3 (SONGS 2 and 3).

1. The licensee's preventive maintenance risk estimates for the 30-day battery completion time (CT) for change in core damage frequency (ΔCDF), change in large early release frequency (ΔLERF), incremental conditional core damage probability (ICCDP), and incremental conditional large early release probability (ICLERP) are within the Regulatory Guide (RG) 1.174 and RG 1.177 acceptance guidelines for a very small change. However, risk estimates for ICCDP (1.87E-6) and ICLERP (4.0E-7) during corrective maintenance do not meet the RG 1.177 acceptance guidelines of 5E-7 and 5E-8, respectively, and require further justification for an extended corrective maintenance 30-day battery CT. Please include a discussion on common-cause evaluation and operator actions required for corrective maintenance and performance of the battery cross-tie.

   RESPONSE: The risk estimates for ICCDP and ICLERP during corrective maintenance were performed based on potential common-cause failure of the remaining available batteries with no credit given for inspection of the extent of condition of the remaining available batteries. In lieu of the higher incurred risk of potential common cause failure (CCF) of the other batteries, SONGS is committed to perform an operability assessment of the remaining available batteries to verify that a common-cause failure condition does not exist when any 1E battery is rendered inoperable due to failure. By performing such an inspection and assessment for CCF and confirming CCF is not present, the corrective maintenance risk would reduce to the preventive maintenance risk which meets the RG 1.177 acceptance guidelines. If CCF is present for other batteries, then SONGS would enter the appropriate TS for multiple failed batteries.

   Per plant procedures, maintenance electricians will confirm functionality of other batteries (i.e., similar failure has not occurred on other batteries). The results of the evaluation will be verified in an operability assessment to evaluate the extent of the condition. This evaluation will assess whether the other similar components are operable or inoperable for (or susceptible to) the same common-cause.

   Common-cause evaluation and operator actions required for performance of the battery cross-tie will be performed in accordance with plant procedures and operating instructions. These procedural steps will include confirmation that prior to completing

the cross-tie that the subsystem to be cross-tied to is available to support both subsystems.

2. Cumulative Risk

Please provide a discussion on cumulative risk impact of previous changes and/or current risk-informed requests. The discussion should confirm SONGS' risk-informed changes are incorporated into the risk evaluation for the proposed extended battery completion time and that the SONGS' probabilistic risk analysis (PRA) includes the cumulative impact of these changes.

RESPONSE: All previous changes that have been implemented in the plant have been incorporated in the PRA model used to assess this application. This includes previously approved risk-informed allowed outage time extensions and the risk-informed in-service testing program. The actual risk impacts of previous changes are included in the periodic PRA data update. There are no other risk-informed requests that are currently awaiting NRC approval.

3. External Events

The LAR does not provide an evaluation with respect to the potential risk impact of external events (seismic, fires, high winds, floods and other (HFO)). The evaluation as provided by the licensee in Reference 2 is limited to a discussion of external event peer review results for seismic and fire events. HFO events were not specifically addressed by the licensee in the submittal or the RAI. Please provide an assessment (qualitative or quantitative) as to the risk impact of external events (seismic, fire and HFO) on the proposed extended 30-day battery CT.

RESPONSE: All risk results provided in the LAR quantitatively include the impact of external events including seismic and fire. It is SONGS continuing practice to include the contributions of internal and external events risk in all past and future applications of PRA (including all license submittals and configuration risk management practices).

High winds, floods, and other external events were screened when evaluated for the Individual Plant Examination of External Events (IPEEE)[Reference: IPEEE For SONGS 2 & 3, December 15, 1995]. In the examination, high winds and floods were screened due to the high wind and flood capacity of the facilities in relation to the low frequency of capacity challenging high winds and floods. The scope of the high winds analysis included hurricanes and tornados. The most likely event is a wind induced loss of offsite power, which is explicitly included in the loss of offsite power initiating event frequency. For more significant damage, it was concluded that the only tornado capable of damaging safety related equipment and structures is an F5 Fujita scale tornado, which has a return frequency of 8E-8/year. Per ASME PRA Standard (ASME RA-Sb-2005, December 30, 2005) Requirement IE-C4, a screening criteria of 1E-7/year is used to eliminate initiating events from further evaluation. Therefore, high winds can contine to be screened. Additionally, a high wind sufficient to damage the structure housing a DC

battery/bus would also damage the adjacent room housing the same train battery/bus whether it was cross-tied or not. Therefore, high winds risk does not impact this application.

External floods caused by the probable maximum flood (PMF) and the probable maximum precipitation (PMP) events were assessed in the IPEEE. In the analysis, floods were deemed to be risk insignificant based on the location of potential external flood sources and the designed grading of the land to preclude the PMP.

Other external events include transportation accidents from Interstate 5 and the adjacent railroad tracks. These risks are re-evaluated on a tri-annual basis based on the changing transport frequencies, shipment sizes, cargoes and accident probabilities. The most recent study [Reference: SONGS Units 2 & 3, 2005 Offsite Hazards Update, October 2005] confirmed that the asphyxiant, toxic hazard, explosive/flammable hazard frequencies are each less than 1E-6/year. Because the DC buses, switches, and batteries are located in the auxiliary control building with many intervening structures (including the containment building) between the DC system and the highway and railroad, low frequency transportation accidents would not have a risk impact on the DC system cross-tie configuration.

In summary, seismic and fire risk estimates were quantified and explicitly included in the original LAR and subsequent RAI response. The risk of HFO in the IPEEE was reviewed and reconfirmed to be risk insignificant as it applies to this application.

4. Tier 2 Evaluation

A specific Tier 2 analysis is not referenced in the LAR although a Tier 2 discussion with respect to compensatory measures is referenced in Reference 2. The licensee's Tier 2 evaluation concluded that no risk significant configurations exist based solely on the low risk increase of the proposed extended 30-day battery cross-tie CT. The Nuclear Regulatory Commission staff is concerned that the licensee's Tier 2 evaluation is not consistent with the guidance of RG 1.177, Section 2.3, "Evaluation of Risk Impact," Subsection, "Tier 2," which states that reasonable assurance must be provided that risk-significant plant equipment outage configurations will not occur when specific plant equipment is out of service. RG 1.177 states that one appropriate method to evaluate such combinations of equipment out of service is to use the Tier 1 ICCDP and ICLERP acceptance guidelines to identify risk-significant configurations associated with the proposed change. This information is required to ensure that the Tier 2 evaluation in Reference 2 meets the guidance of RG 1.177.

RESPONSE: SONGS performed a Tier 2 evaluation to identify potential risk significant configurations given a DC bus subsystem is cross-tied to a same train DC bus subsystem. The Safety Monitor software used by SONGS is able to assess and rank the importance of all remaining available components given a specific plant configuration. The ranking shows the risk for each available component if that component were removed from service while in the given configuration. The lists of important available components for

the cross-tied case and the base case (no cross-tie with all batteries available) were compared to determine whether there are high risk configurations unique to the cross-tied case. The comparison identified only one unique high risk configuration (i.e., >1E-3/year CDF) for the cross-tied case: removal of an opposite train battery charger without credited alignment of an installed and equivalent swing battery. Such a configuration is limited by the Technical Specification to 2 hours and per the SONGS Maintenance Rule Risk Management Program would not be entered into voluntarily (see response to RAI Question #6 below).

5. Reference 2 states that the seismic PRA requires no modeling changes for replacement batteries B009 and B010. However, batteries B007 and B008 are also being upgraded, which will also replace the existing battery racks. The licensee stated that the seismic PRA will be reviewed again when the upgrade is designed and implemented. Please identify if the additional seismic review is a licensee commitment per the LAR.

   RESPONSE: SONGS commits to verify the seismic capacity of the replacement battery racks and to incorporate the results into the SONGS PRA as appropriate.

6. The LAR discusses the use of the SONGS' risk monitor to avoid high-risk configurations but does not provide information on applicable acceptance guidance (Tier 3) used to identify a risk-significant configuration. Please provide this information to complete the review.

   RESPONSE: The Tier 3 requirement for a configuration risk management program to assess risk when a risk-informed TS is applied has been incorporated into the SONGS Maintenance Rule Risk Management Program (MRRMP). This program is administered through plant procedure SO123-XX-10, "Maintenance Rule Risk Management Program Implementation." In the procedure, the following guidelines are provided which control the instantaneous and cumulative incremental risk:

(The following in an excerpt from plant procedure SO123-XX-10, "Maintenance Rule Risk Management Program Implementation," page 13 of 41:)

6.5 Action Thresholds Based on Quantitative Considerations

6.5.1 The established quantitative risk management actions thresholds consider temporary risk increases associated with the configuration-specific CDF, as well as the Incremental Core Damage Probability (ICDP) and Incremental Large Early Release Probability (ILERP).

6.5.2 Maintenance configurations with a configuration-specific CDF in excess of 10^{-3}/year should be carefully considered before voluntarily entering such conditions. If such conditions are entered, it should be for very short periods of time and only with a clear detailed understanding of which events cause the risk level.

6.5.3 ICDP and ILERP, for a specific planned configuration, with respect to establishing risk management actions, should be considered as follows:

ICDP		ILERP
> 10^{-5}	- configuration should not normally be entered voluntarily	> 10^{-6}
10^{-6} - 10^{-5}	- assess non quantifiable factors - establish risk management actions	10^{-7} - 10^{-6}
< 10^{-6}	- normal work controls	< 10^{-7}

In the MRRMP program, plant configurations with an instantaneous core damage frequency of greater than 1E-3/year and/or a large early release frequency of 1E-4/year are high risk configurations that are not entered into voluntarily. In addition, the MRRMP procedure ensures that the cumulative incremental risk of planned configurations are managed to acceptable levels (as shown in the table of the procedural steps above).

7. Table 3, Line 7, on page 13 of Attachment I of Reference 1 estimates the single allowed outage time risk ICCDP as 1.87E-6. The risk estimate appears to be inconsistent with the guidance of RG 1.177 in that the estimate appears to use 15 days instead of the proposed CT of 30 days when estimating ICCDP. Note c for Table 3 states that battery

replacement and testing requires 30 days, which is given as the mean duration in Table 3, Line 10. Please explain the discrepancy.

RESPONSE: This comment is correct, the ICCDP should be for 30 days with an ICCDP of 3.76E-6.

8. Reference 2 discusses additional technical specification (TS) changes including CT and surveillance test intervals (STIs) not related to the proposed risk-informed 30 day battery cross-tie CT. The RAI response qualitatively accepts the additional risk based on conformance to either TSTF-360 Revision 1, IEEE 450-2002, or with a specific risk assessment statement. Please discuss whether these additional STI, CT and TS changes were addressed in the modified SONGS risk estimate of the proposed 30 day battery crosstie CT.

RESPONSE: The additional STI, CT and TS changes were not quantitatively addressed in the modified SONGS risk estimate of the proposed 30 day battery crosstie CT.

The majority of changes involve editorial, clarification, improved test methods and /or revised format changes. However, there are eight changes that may have risk impact and they are considered here.

Three surveillances (i.e: monitoring float voltage, float current and pilot cell voltage) are proposed to be performed every 31 days instead of every 7 days as are presently performed per the current TS. The acceptability of the longer interval is based on the vast accumulated experience by the nuclear industry at large and SONGS in particular. We have observed that the weekly data gathered during the past 20 years has remained virtually unchanged.

Figure 1 below demonstrates that the DC bus float voltage measured does not significantly change over time (refer to the 10 month sample period shown in Figure 1). The float voltage values measured weekly at the battery terminals were essentially unchanged. This observation is typical for all 8 Class 1E batteries installed at SONGS. The float voltage stayed between 131V-132V, equal or greater than 2 Volts above the minimum Operable Voltage of 129V.

Also, based on industry experience and specific SONGS observation, the cell internal resistance stays constant, therefore float current of a battery and the measured pilot cell voltage, due to the constant applied float voltage, would remain constant over weekly and monthly observation periods. Therefore, increasing interval between these surveillances from 7 days to 31 days will not likely affect the calculated risk.

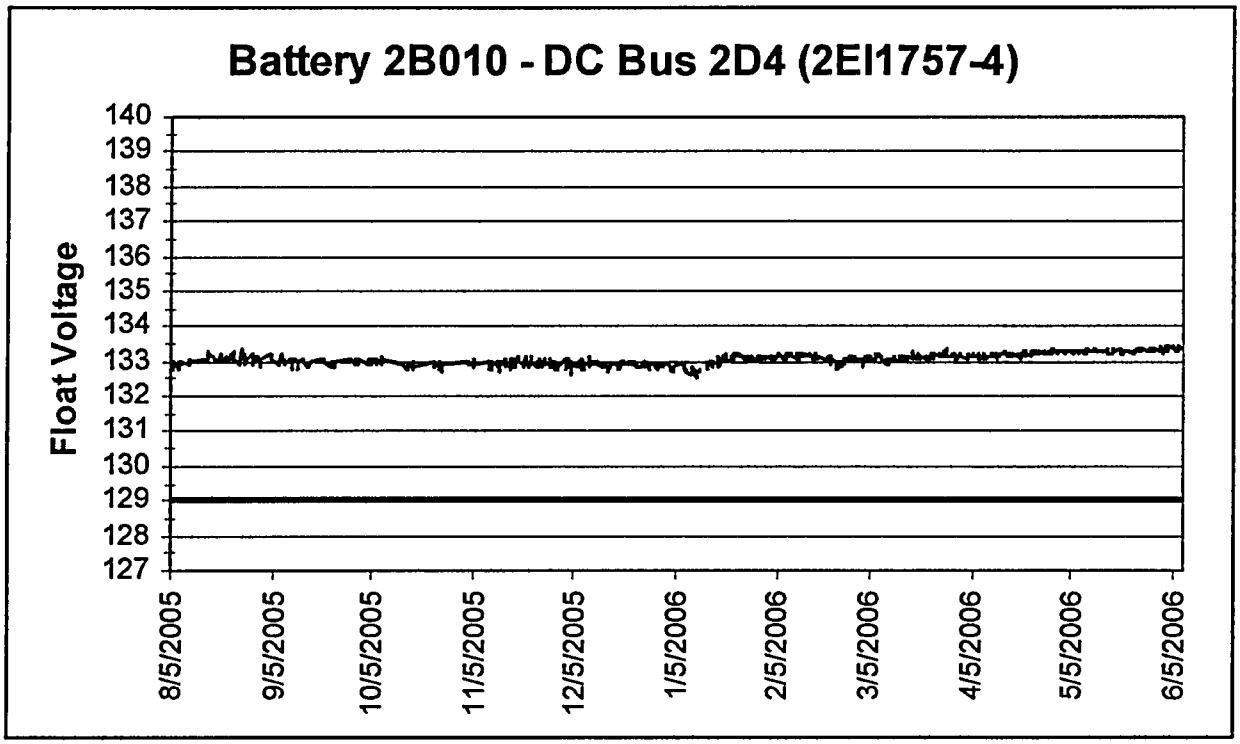

Figure 1 – Float Voltage at the DC Bus 2D4 over a 10 Month History

Similarly, a fourth change involves a change in battery service testing from a 24 month frequency to a 30 month frequency to coincide with the 60 month modified performance test. In practice, the modified performance test, which is a combined service and performance test, will be performed every 30 months. A modified performance test is comprised of two parts, the first part tests a battery by subjecting it to the most severe service load profile, and the second part is a constant current capacity discharge test which continues until the acceptance criteria (1.75Volts per cell (Vpc)) is reached. This test is more rigorous than the service test and will be performed consistently every 30 months which will provide a more consistent data base for trending due to the performance of the same test (the modified performance test) to meet the service and performance test requirements.

A sensitivity analysis was performed to assess the change in baseline CDF and LERF that conservatively simulates and bounds the above four changes by assuming that the battery failure probability for all batteries increases linearly from a 7 day frequency to a 31 day frequency (i.e., failure probabilities were multiplied by 31 / 7 = 4.43). The results show insignificant increases in the baseline CDF (increase of 2E-8/year) and the baseline LERF (increase of less than 1E-9/year).

The last four (4) of the remaining changes involve additional battery requirements, reduced surveillance periods, and a new LCS controlled "Battery Monitoring and Maintenance Program." These changes are likely to increase battery reliability.

Collectively, the changes are qualitatively assessed to be risk neutral to risk beneficial.

9. In Reference 2, the licensee commits to control the battery/bus crosstie using a step-by-step procedure with local independent (second checker) verification and to complete this verification within the 2-hour CT. Please identify whether development of the battery crosstie procedure is a licensee commitment per the LAR.

   RESPONSE: SONGS commits to develop a step-by-step battery crosstie procedure.

10. The SONGS' individual plant examination of external events (IPEEE) references plant improvement measures in Section 7.1, "Plant Improvements, " for both seismic and fire initiators. Please confirm that the improvements for fire and seismic initiators in the IPEEE have been implemented and are reflected in the SONGS extended battery PRA evaluation.

    RESPONSE: In Section 7.1, "Plant Improvements," there were six (6) seismic related recommendations and three (3) fire related recommendations. All recommendations have been implemented and were included in the LAR calculations.

11. Attachment I, Table 2, "SONGS Conditional CDF and LERF Contributions for Preventive Maintenance (PM)," located on page 11 of Reference 1, states in note b, 6 tests * 4 batteries/10 years. Table 2 on page 16 of Reference 2 lists 7 tests * 4 batteries/10 years. Please clarify why the number of service tests has been reduced in the revised submittal. See also revised Table 2, Attachment I included in Reference 2.

    RESPONSE: The number of tests has been adjusted to conservatively reflect closer to actual testing intervals. This number of tests is still conservative to what SONGS expects to perform. Table 2 is correct as submitted in Revision 1 in February.

12. Attachment I, Table 2, "SONGS Conditional CDF and LERF Contributions for Preventive Maintenance (PM)," located on page 11 of Reference 1, lists the proactive multiple jar replacements mean outage duration as 20 days. Table 1 on page 5 of Attachment I states that the duration for jar replacement is 21 days. Please clarify what is the correct jar replacement duration to be used in the estimate of mean duration for Table 2.

    RESPONSE: The mean duration for battery jar replacement on Table 2, page 11 of Attachment I of Reference 1 in February is correct (20 days). The duration of 21 days in Table 1 is a typographical error.