



Southern California Edison Company

23 PARKER STREET
IRVINE, CALIFORNIA 92718

F. R. NANDY
MANAGER OF NUCLEAR LICENSING

May 1, 1990

TELEPHONE
(714) 587-5400

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

Gentlemen:

Subject: Docket Nos. 50-206, 50-361, and 50-362
Supplemental Response to 10 CFR 50.63, "Loss of
All Alternating Current Power," Station Blackout (TAC No. 68599/600)
San Onofre Nuclear Generating Station
Units 1, 2, and 3

Reference: NUMARC 87-00, "Guidelines and Technical Bases for NUMARC
Initiatives Addressing Station Blackout at Light Water Reactors"

In response to a request from the Nuclear Management and Resources Council (NUMARC) to the NUMARC Board of Directors dated January 4, 1990, this letter supplements Southern California Edison's (SCE) Station Blackout (SBO) submittal dated April 17, 1989.

Each light water cooled nuclear power plant is required by 10 CFR 50.63 to be able to withstand and recover from an SBO event of a specified duration. In order to encourage industry-standard SBO programs, NUMARC developed NUMARC 87-00 to provide guidance to utilities for meeting the requirements of the SBO rule. In Regulatory Guide (RG) 1.155, the NRC endorsed the use of NUMARC 87-00 as providing guidance that is in large part identical to the RG 1.155 guidance and is acceptable to the NRC for meeting the SBO rule requirements.

The January 4, 1990, NUMARC letter requested member utilities to confirm that their original SBO submittal was consistent with NUMARC 87-00 guidelines and its clarifications. Member utilities were also requested to identify any deviations from the clarified NUMARC 87-00 guidance, and to acknowledge that a diesel generator target reliability of 0.95 or 0.975 would be maintained. Our SBO program is based on the guidance provided in NUMARC 87-00. Following receipt of the January 4, 1990, NUMARC update letter, SCE began a reevaluation of our April 17, 1989, SBO submittal to assure that the concerns raised in the NUMARC letter were properly addressed. Deviations from the NUMARC guidance and its clarifications were documented during this review and are discussed in

9005040201 900501
PDR ADCK 05000206
P PDC

A050
11

the Enclosures for each unit. With the exception of the enclosed deviations, the SBO program at San Onofre Units 1, 2, and 3 is based upon the methodology contained in NUMARC 87-00, the attachments to the NUMARC letter dated January 4, 1990, and other clarifying NUMARC correspondence.

In addition to identifying the deviations discussed in the enclosures, this letter provides the following clarifications for several aspects of our SBO program as discussed in our April 17, 1989 submittal.

One of the clarifications in the January 4, 1990, NUMARC letter was that, although it was acceptable for Licensees to dispatch operators from the control room to the remote shutdown panel to start and load a Dedicated Shutdown (DSD) diesel, the control room should not be considered as abandoned. Because of this, control room adequacy must be assessed by the Licensee for continued operator action or monitoring during the entire (4 hour) SBO event. In our April 17, 1989, submittal, we did not assess the Unit 1 control room equipment between the time the DSD diesel was loaded and the end of the SBO coping duration. All Unit 1 operator actions required to cope with an SBO event after the DSD diesel is loaded were credited either locally or at the remote shutdown panel. Therefore, we are reanalyzing the San Onofre Unit 1 control room adequacy and battery capacities to ensure they will function during the entire 4 hour duration of the SBO event. The control room and battery analyses are scheduled to be completed by June 30, 1990.

During our review of the station blackout analysis for Unit 1, we changed the methodology used to determine condensate inventory for decay heat removal to be more consistent with NUMARC 87-00. The amount of condensate required using the NUMARC 87-00 methodology is 40,262 gallons, which is less than the 56,400 gallons specified in our April 17, 1989 submittal. Because the minimum permissible auxiliary feedwater storage tank inventory required by the Technical Specifications is 190,000 gallons, this new condensate inventory value does not require procedure or plant modifications.

The condensate inventory methodology was changed for the Units 2 and 3 station blackout analysis to be completely consistent with the NUMARC 87-00 methodology. As a result, the amount of condensate required for decay heat removal has been revised from the 53,000 gallons specified in our April 17, 1989, submittal to 75,000 gallons. However, this revised condensate inventory will not require plant or procedure modifications because it is still less than the minimum permissible condensate storage tank level of 144,000 gallons as specified in the Technical Specifications.

San Onofre Units 2 and 3 may require modifications to comply with the plant lighting requirements of NUMARC 87-00. Following development and approval of SBO procedures, we will determine where emergency lights are required and additional lights will be added, or the existing circuitry modified, as needed. Modifications will also be made to the control room lighting for Units 2 and 3 to ensure that adequate lighting is available during the 4 hour SBO event. These modifications will be completed within two years after notification is provided to SCE by the Director, Office of Nuclear Reactor Regulation in accordance with 10 CFR 50.63(c)(3).

Based on additional evaluation of the Units 2 and 3 125 VDC batteries, SCE has determined that, with the battery design margin removed, the existing batteries will cope for the 4-hour SBO duration. As a result, the battery load group cross connect modification identified in our April 17, 1989, SBO response is no longer required to satisfy the Station Blackout rule.

SCE will maintain an emergency diesel generator (EDG) target reliability of 0.95 for all San Onofre EDG's. SCE will also establish a diesel generator reliability program which will be consistent with the clarified NUMARC 87-00, Appendix D, EDG Reliability Program. This program will be based on NUMARC guidance and will ensure the 0.95 EDG reliabilities are maintained. EDG reliabilities have been calculated in accordance with Nuclear Safety Analysis Center (NSAC) 108 issued September 1986 and were determined to be greater than 0.98 for each individual EDG. Because the Unit 1 DSD diesel is not designed to safety-related standards, we will develop a separate reliability program for it.

If our ongoing evaluations identify the need for any additional deviations, we will provide an additional submittal by June 30, 1990. If you have any questions or comments or need any additional information, please call me.

Very truly yours,



Enclosures

cc: J. B. Martin, Regional Administrator, NRC Region V
C. Caldwell, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3
NUMARC (A. Marion)

NUMARC 87-00
DEVIATIONS
SONGS 1

STATION BLACKOUT ANALYSIS
NUMARC 87-00 DEVIATIONS

SONGS 1

SCE has completed a detailed review of the station blackout files and supporting documentation to verify compliance with the station blackout rule in light of the issues raised in the January 4, 1990, NUMARC letter. The following is a discussion of each deviation taken by SCE with respect to the SBO rule and NUMARC guidance, a description of alternative methodology used, and justification for the acceptability of each deviation. The station blackout files provide more detailed discussions of the deviations listed below and include all supporting documentation and analyses.

1. **RCS Inventory Loss** - Section 2.5 of NUMARC 87-00 includes an assumption that reactor coolant pump (RCP) seal leakage will be 25 gpm per pump as a result of an SBO event. Later clarification from the NRC indicated that a 25 gpm leak rate should be considered as the standard leak rate unless an alternate leakrate is justified. The SONGS 1 SBO analysis assumes that no RCP seal degradation will occur as a result of an SBO event. Therefore, no additional RCP seal leakage was assumed in the analysis. The basis for this deviation is that the SONGS 1 RCP seals are cooled via a DC powered thermal barrier pump during the first hour of an SBO event and by the alternate AC powered charging pump during the remaining three hours of an SBO event. This design assures that seal cooling is maintained and that SBO related RCP seal degradation will not occur.
2. **Condensate Requirements** - Section 7.2.1 of NUMARC 87-00 provides a method for evaluating condensate inventory requirements. The equation includes sensitivity factors for volumetric requirements based on the coping duration of the facility. At San Onofre Unit 1, makeup to the condensate tank is not powered from the Alternate AC (AAC) source. Therefore, the

sensitivity factor for an AAC plant given in NUMARC 87-00 is not fully applicable.

The NUMARC 87-00 AAC sensitivity factor was used for determining the condensate inventory requirements for only the first hour of the coping duration. The four hour coping duration sensitivity factor was used in determining the balance of the condensate requirements for the rest of the four-hour coping duration (3 hours). Makeup capability was not assumed to be available until onsite AC power from the Emergency AC (EAC) or offsite power was restored.

The use of a combination of sensitivity factors instead of a single sensitivity factor may be a deviation from the NUMARC 87-00 guidance. However, we believe that it is appropriate for the San Onofre Unit 1 design.

3. **Loss of Ventilation** - Section 7.2.4 of NUMARC 87-00 provides formulas for evaluating the effects of loss of ventilation. SCE did not utilize the NUMARC methodologies for three HVAC evaluations. Instead, we used the existing Systematic Evaluation Program (SEP) methodologies for loss of HVAC events^[1] which are more rigorous than the NUMARC criteria. The SEP methodologies provide a more representative evaluation of the loss of HVAC effects in the potential dominant areas of concern than the NUMARC formulas. The methodologies utilized in the SEP HVAC evaluation were reviewed and accepted in NUREG-0829^[2] and meet or exceed the requirements of NUMARC 87-00. The Systematic Evaluation Program calculations for loss of ventilation were used to determine temperatures after a 4 hour SBO event in the DC Switchgear Room (Inverter Room), Charging Pump Room and the 480V Switchgear Room. The NUMARC methodologies were used for all other dominant areas of concern.

4. **Containment Isolation** - Section 7.2.5 of NUMARC 87-00 provides criteria for excluding certain types of containment isolation valves from the station blackout analysis. Based on supplemental guidance,^{[3], [4], [6]} SCE has adopted three additional exclusion criteria for containment isolation valves.

The first additional criterion allows exclusion of a valve if it is redundant to an isolation valve that meets the NUMARC exclusion criteria. This criterion is based on NUMARC's response to Question 101 in Enclosure D of their October 27, 1988 letter.

The second additional criterion is based on Reference 5 and allows exclusion of valves that are "always" or "normally" closed but not "locked closed".

The third additional criterion allows exclusion of valves that do not meet the explicit requirements of GDC 56 when, as part of the SEP^[5], the design meets GDC 56 on some other defined basis and has been found acceptable in NUREG-0829 ^[6].

5. **Alternate AC Power Evaluation** - The analyses used to evaluate the adequacy of the SONGS-1 AAC power source contains two deviations from the NUMARC guidelines.

The first deviation involves the equipment to be powered by an AAC power source. The SONGS-1 AAC power source does not energize the station battery chargers. However, as discussed in the cover letter, a detailed evaluation is being performed to verify that the station batteries will be able to perform their required function during an SBO event for the entire 4 hour coping duration without AC power to the battery chargers. This will ensure that the operators will be able to man the control room during the SBO event.

The second deviation involves a test of the AAC power source to show it can be started within one hour of an SBO event. Detailed assessments were performed and procedures written in support of 10 CFR 50 Appendix R activities which included a time and manpower study of the implementing procedure. This study determined that during minimum staff conditions, the Dedicated Shutdown (DSD) diesel generator (AAC power source) could be manually started locally within 20 minutes and could be loaded 2 minutes later. Although a time test has not been performed, the implementing procedure has been walked through. Since this is significantly less than the one hour requirement, the study is considered bounding. However, during the next refueling outage, we will perform this test.

REFERENCES

1. Component Cooling Water System Description SD-S01-330, Revision 2.
1. SONGS 1 Systematic Evaluation Program Topic IX-5,
"Ventilation Systems."
2. NUREG 0829, "Integrated Plant Safety Assessment Systematic Evaluation Program," dated December 1986, Section 4.33, Topic IX-5, Ventilation Systems.
3. NUMARC SBO Letter dated October 17, 1988, Question 101 in Enclosure D.
4. Devonrue Letter dated April 26, 1989, Section III.
5. Songs 1 Systematic Evaluation Program Topic VI-4,
"Containment Isolation Systems."
6. NUREG-0829, Section 4.23, Topic VI-4, Containment Isolation System.

NUMARC 87-00
DEVIATIONS
SONGS 2/3

STATION BLACKOUT ANALYSIS
NUMARC 87-00 DEVIATIONS

SONGS 2/3

SCE has completed a detailed review of the station blackout files and supporting documentation to verify compliance with the station blackout rule in light of the issues raised in the January 4, 1990, NUMARC letter. The following is a discussion of each deviation taken by SCE with respect to the SBO rule and the NUMARC guidance, a description of the alternative methodology, and the justification for acceptability of the deviation. The station blackout files provide more detailed discussions of the deviations listed below and include all supporting documentation and analyses.

1. **RCS Inventory Loss** - Section 2.5 of NUMARC 87-00 includes an assumption that reactor coolant pump (RCP) seal leakage will be 25 gpm per pump as a result of an SBO event. Later NRC correspondence established that a 25 gpm leak rate must be assumed unless otherwise justified. The SONGS 2/3 RCP seals were designed to have no significant degradation as a result of a four hour SBO event. The vendor data, including actual test results, demonstrate that the RCP seal leakage will not increase as a result of a four hour SBO event^[1]. Therefore, the Units 2 and 3 analysis assumed that RCP seal leakage would not increase during an SBO event.
2. **Loss of Ventilation** - Section 7.2.4 of NUMARC 87-00 provides formulas for evaluating the effects of loss of ventilation. SCE did not utilize the NUMARC methodologies for HVAC evaluations of the control room, control room cabinet area, switchgear room, distribution room (inverter room), and auxiliary feedwater pump room. The SONGS 2/3 loss of HVAC evaluations used formulas which account for the same factors as the NUMARC methodology plus other factors to account for more realistic system effects. Therefore, this deviation from the NUMARC 87-00 guidance is acceptable.

Additionally, the control room loss of ventilation calculation was performed for 1 hour only. It was assumed that after 1 hour the control room HVAC would be provided by the non-black-out unit's diesel. However, the evaluations are being updated to reflect the NUMARC guidance. Preliminary assessments indicate that all dominant areas of concern are still less than 120°F.

3. **Containment Isolation** - Section 7.2.5 of NUMARC 87-00 provides criteria for excluding certain types of containment isolation valves from the station blackout analysis. Based on supplemental guidance,^{[2], [3]} SCE has included two additional criteria for exclusion of containment isolation valves.

The first additional criterion allows exclusion of a valve if it is redundant to an isolation valve that meets the NUMARC exclusion criteria. This criterion is based on NUMARC's response to Question 101 in Enclosure D of their October 27, 1988 letter.

The second additional criterion is based on Reference 3 and allows exclusion of valves that are "always" or "normally" closed but not "locked closed".

REFERENCES

1. Kelsi Engineering Report, "O-Ring Static Seal Performance Evaluation Under Loss of Component Water to Reactor Coolant Pumps at Units 2/3," March 20, 1986
2. NUMARC SBO Letter dated October 27, 1988, Question 101 in Enclosure D
3. Devonrue Letter dated April 26, 1989, Section III.

SBO_ENC2.MJT6