Southern California Edison Company

P. O. BOX 800

2244 WALNUT GROVE AVENUE

ROSEMEAD, CALIFORNIA 91770

M. O. MEDFORD
MANAGER OF
NUCLEAR REGULATORY AFFAIRS

TELEPHONE
(818) 302-1749

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

Gentlemen:

Subject: Docket Nos. 50-206, 50-361 and 50-362
Response to 10 CFR 50.63, "Loss of all Alternating Current Power"
San Onofre Nuclear Generating Station
Units 1, 2 and 3

On June 21, 1988, the NRC amended its regulations by adding a new section, 10 CFR 50.63, which requires that each light-water-cooled nuclear power plant to be able to withstand and recover from a Station Blackout (SBO) event of a specified duration.

Southern California Edison has evaluated San Onofre Units 1, 2 and 3 against the requirements of 10 CFR 50.63 using guidance provided by NUMARC 87-00 as endorsed by the NRC. By this guidance, Unit 1 has been classified as an Alternate AC unit and Units 2 and 3 as AC independent. Consistent with the requirements of 10CFR50.63,the complete evaluation of Unit 1 is provided as Enclosure I to this letter, and the complete evaluation of Units 2 and 3 in Enclosure II.

If you have any questions or comments, please contact me.

Very truly yours,

SR Ward for MO Medford

Enclosures

cc: J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3

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ENCLOSURE I

# RESPONSE TO STATION BLACKOUT RULE FOR SAN ONOFRE UNIT 1

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR, Part 50. A new section, 50.63, was added which requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Utilities are expected to have the baseline assumptions, analyses and related information used in their coping evaluation available for NRC review. It also identifies the factors that must be considered in specifying the station blackout duration. Section 50.63 requires that, for the station blackout duration, the plant be capable of maintaining core cooling and appropriate containment integrity. Section 50.63 further requires that each licensee submit the following information:

1. A proposed station blackout duration including a justification for the selection based on the redundancy and reliability of the onsite emergency AC power sources, the expected frequency of loss of offsite power, and the probable time needed to restore offsite power;

2. A description of the procedures that will be implemented for station blackout events for the duration (as determined in I above) and for recovery therefrom; and

3. A list and proposed schedule for any needed modifications to equipment and associated procedures necessary for the specified SBO duration.

The NRC has issued Regulatory Guide 1.155 "Station Blackout" which describes a means acceptable to the NRC Staff for meeting the requirements of 10 CFR 50.63. Regulatory Guide (RG) 1.155 states that the NRC Staff has determined that NUMARC 87-00 "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout At Light Water Reactors" also provides guidance that is in large part identical to the RG 1.155 guidance and is acceptable to the NRC Staff for meeting these requirements.

Table 1 to RG 1.155 provides a cross-reference between RG 1.155 and NUMARC 87-00 and notes where the RG takes precedence.

Southern California Edison has evaluated San Onofre Unit 1 against the requirements of the SBO rule using guidance from NUMARC 87-00 and the additional areas where RG 1.155 takes precedence. The results of this evaluation are detailed below.

## A. Proposed Station Blackout Duration

NUMARC 87-00, Section 3 was used to determine a proposed SBO duration of four hours.

The following plant factors were identified in determining the proposed station blackout duration:

1. AC Power Design Characteristic Group is P1, based on:

   a. Expected frequency of grid-related LOOPs - does not exceed once per 20 years;

   b. Estimated frequency of LOOPs due to extremely severe weather places the plant in ESW Group 1;

   c. Estimated frequency of LOOPs due to severe weather places the plant in SW Group 1;

   d. The offsite power system is in the I1/2 Group;

2. The emergency AC power configuration group is C based on:

   a. There are two emergency AC power supplies not credited as alternate AC power sources; and

   b. One emergency AC power supply is necessary to operate safe shutdown equipment following a loss of offsite power.

3. The target EDG reliability is 0.95.

   a. A target EDG reliability of 0.95 was selected based on having a nuclear unit average EDG reliability for the last 100 demands greater than 0.95.

4. An alternate AC (AAC) power source will be utilized at San Onofre Unit 1 which meets the criteria specified in Appendix B to NUMARC 87-00.

   The AAC power source is available within one hour of the onset of the station blackout event and has sufficient capacity and capability to operate systems necessary for coping with a station blackout for the required SBO duration (four hours) to bring and maintain the plant in safe shutdown. An AC independent coping analysis was performed for the one hour required to bring the AAC power source on line.

   The AAC power source at San Onofre Unit 1 consists of the Dedicated Safe-Shutdown (DSD) System diesel generator installed to satisfy 10 CFR 50, Appendix R requirements. The DSD system is designed to be placed in operation when a fire in designated fire zones affects the ability to establish hot shutdown and achieve and maintain cold shutdown conditions with normal safe shutdown systems. The DSD uses portions of existing plant systems plus the following additional major components: an independent 4160V diesel generator; an independent 4160V and 480V distribution system; an independent power supply for an auxiliary feedwater pump; DSD panel; and the necessary piping and valves to perform the functions required for safe shutdown. A simplified one-line diagram of the DSD system is provided in Figure 1.

B. Procedure Description

1. AC Power Restoration - SCE currently has a station procedure that contains provisions for restoration of AC power. The procedure, SO2/3-13.1, "Station Blackout" is controlled and implemented by San Onofre Units 2 and 3. In the event that San Onofre Unit 1 becomes blacked out, actions necessary to restore power to the switchyard would be fulfilled by Unit 2/3 operators. This procedure will be reviewed and modified as necessary to meet NUMARC 87-00, Section 4.2.2.

2. Severe Weather - San Onofre Unit 1 does not currently have a procedure detailing operator actions prior to onset of severe weather. San Onofre Unit 1 is in ESW Group 1 and SW Group 1 and does not need to incorporate a 2-hour shutdown provision as part of severe weather response. SCE will develop a severe weather response procedure in accordance with NUMARC 87-00, Section 4.2.3.

3. Station Blackout Response - San Onofre Unit 1 currently has an SBO response procedure, SO1-1.0-60. This procedure will be reviewed and modified as necessary to satisfy the requirements of NUMARC 87-00, Section 4.2.1.

4. Coping Procedures - The San Onofre Unit 1 station blackout response procedure, SO1-1.0-60, includes necessary operator steps to cope with the SBO and bring on-line the AAC power supply. No plant modifications are necessary to satisfy the requirements of the SBO rule. Minor procedure changes will be implemented in the SBO response procedure to ensure all of the provisions of NUMARC 87-00, Section 7 are included.

C. Proposed Modifications and Schedule

No modifications to the DSD diesel generator are necessary to satisfy the AAC power supply requirements of NUMARC 87-00. Procedures are currently in place for operation of the DSD diesel generator. Minor changes will be made as necessary to ensure operation of this system under the conditions of a station blackout event.

The AAC source has the capacity and capability to power the equipment necessary to cope with a SBO in accordance with NUMARC 87-00, Section 7 for the required coping duration.

1. Condensate Inventory For Decay Heat Removal (Section 7.2.1)

It has been determined from Section 7.2.1 of NUMARC 87-00 that 13,200 gallons of water are required for decay heat removal for 1 hour. The minimum permissible condensate storage tank level per technical specifications provides 150,000 gallons of water (currently being changed to 190,000 gallons), which exceeds the required quantity for coping with a 1-hour station blackout.

a. No plant modifications or procedure changes are needed to utilize these water sources.

2. Class 1E Batteries Capacity (Section 7.2.2)

A battery capacity calculation has been performed pursuant to NUMARC 87-00, Section 7.2.2 to verify that the Class 1E batteries have sufficient capacity to meet station blackout loads for one hour.

3. Compressed Air (Section 7.2.3)

Air-operated valves relied upon to cope with a station blackout for one hour can either be operated manually or have sufficient backup sources independent of the preferred and blacked out unit's Class 1E power supply. Valves requiring manual operation or that need backup sources for operation are identified in plant procedures.

4. Effects of Loss of Ventilation (Section 7.2.4)

a. The steady state ambient air temperature for the steam driven AFW pump room (the dominant area of concern for a PWR) during a station blackout induced loss of ventilation was not calculated because the San Onofre Unit 1 steam driven AFW pump is located in an open area under the west feedwater heater deck. The exhaust from this pump is piped to a remote outside location. Therefore, ambient conditions (temperature and humidity) are not substantially affected by the pump operation.

b. Control Room Complex

The assumption in NAMARC 87-00, Section 2.7.1 that the control room will not exceed 120°F during a station blackout has been assessed.

The control room at San Onofre Unit 1 does not exceed 120°F during a station blackout. Therefore, the control room is not a dominant area of concern.

5. Containment Isolation (Section 7.2.5)

The plant list of containment isolation valves has been reviewed to verify that valves which must be capable of being closed or that must be operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's Class 1E power supplies. No plant modifications and/or associated procedure changes were determined to be required to ensure that appropriate containment integrity can be provided under SBO conditions.

6. Reactor Coolant Inventory (Section 2.5)

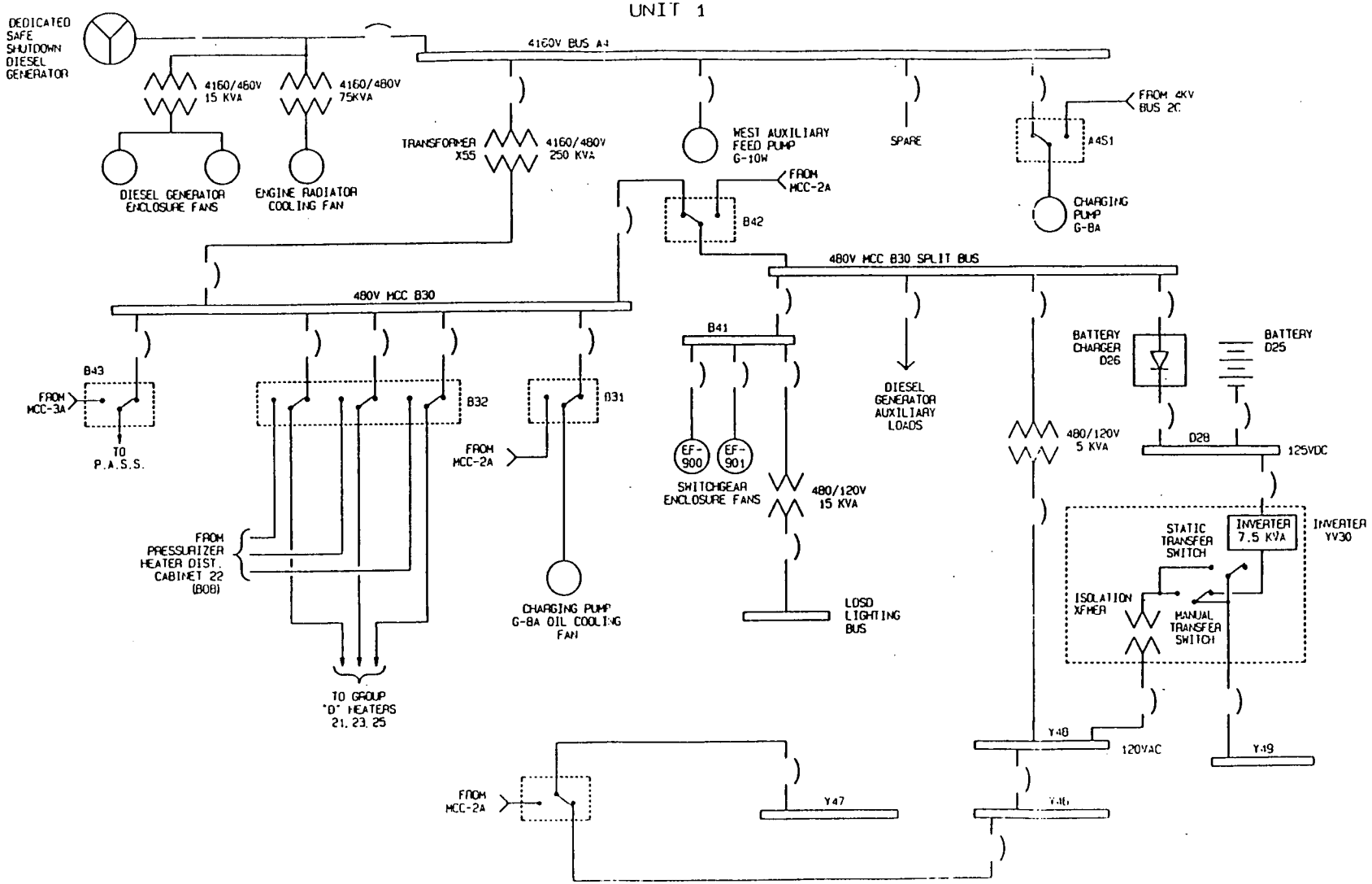
The AAC source powers the necessary make-up systems to maintain adequate reactor coolant system inventory to ensure that the core is cooled for the required coping duration.

The procedure changes identified in Parts A, B and C above will be completed one year after the notification provided by the Director, Office of Nuclear Reactor Regulation in accordance with 10 CFR 50.63(c)(3)

MJT:stabo

# FIGURE 1

## DEDICATED SAFE SHUTDOWN SYSTEM
## SIMPLIFIED ONE LINE DIAGRAM
UNIT 1



ENCLOSURE II

Enclosure II

# RESPONSE TO STATION BLACKOUT RULE
## FOR SAN ONOFRE UNITS 2 AND 3

On Tuesday, June 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR, Part 50. A new section, 50.63, was added which requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Utilities are expected to have the baseline assumptions, analyses and related information used in their coping evaluations available for NRC review. It also identifies the factors that must be considered in specifying the station blackout duration. Section 50.63 requires that, for the station blackout duration, the plant be capable of maintaining core cooling and appropriate containment integrity. Section 50.63 further requires that each licensee submit the following information:

1. A proposed station blackout duration including a justification for the selection based on the redundancy and reliability of the onsite emergency AC power sources, the expected frequency of loss of offsite power, and the probable time needed to restore offsite power;

2. A description of the procedures that will be implemented for station blackout events for the proposed duration (as determined in 1 above) and for recovery therefrom; and

3. A list and proposed schedule for any needed modifications to equipment and associated procedures necessary for the specified SBO duration.

The NRC has issued Regulatory Guide 1.155 "Station Blackout" which describes a means acceptable to the NRC staff for meeting the requirements of 10 CFR 50.63. Regulatory Guide 1.155 states that the NRC staff has determined that NUMARC 87-00 "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout At Light Water Reactors" also provides guidance that is in large part identical to the Regulatory Guide 1.155 guidance and is acceptable to the NRC Staff for meeting these requirements.

Table 1 to Regulatory Guide 1.155 provides a cross-reference between Regulatory Guide 1.155 and NUMARC 87-00 and notes where the Regulatory Guide takes precedence.

Southern California Edison has evaluated San Onofre Units 2 and 3 against the requirements of the Station Blackout rule using guidance from NUMARC 87-00 and the additional areas where the Regulatory Guide takes precedence. The results of this evaluation are detailed below.

A. PROPOSED STATION BLACKOUT DURATION

NUMARC 87-00 Section 3 was used to determine a proposed station blackout duration of 4 hours.

The following plant factors were identified in determining the proposed station blackout duration. The following modifications will be implemented to attain this proposed coping duration category:

1. Install cable and conduit between DC Buses A and C and DC Buses B and D (but do not connect);

2. Modify Station procedures to require that during a station blackout event, load group A is connected to battery C and load group B is connected to battery D with the installed cables after approximately 3 hours in the SBO event.

Separately, batteries A and B will power their respective loads for less than 4 hours. Batteries C and D will power their loads for in excess of 12 hours. By cross connecting load groups A and C and load groups B and D, all 4 load groups will be powered for the 4 hour SBO coping duration.

The following plant factors were identified in determining the proposed station blackout duration:

1. AC Power Design Characteristic Group is P1 based on:

   a. Expected frequency of grid-related Loss of Offsite Power events (LOOPs) does not exceed once per 20 years;

   b. Estimated frequency of LOOPs due to extremely severe weather (ESW) places the plant in ESW Group 1;

   c. Estimated frequency of LOOPs due to severe weather (SW) places the plant in SW Group 1;

   d. The offsite power system is in the I1/2 Group;

2. The emergency AC power configuration group is C based on:

   a. There are two emergency AC power supplies not credited as alternate AC power sources.

   b. One emergency AC power supply is necessary to operate safe shutdown equipment following a loss of offsite power.

3. The target Emergency Diesel Generator (EDG) reliability is 0.950.

   A target EDG reliability of 0.950 was selected based on having a nuclear unit average EDG reliability for the last 100 demands > 0.95 and the Emergency Alternating Current power (EAC) Group classified as Group C.

B. PROCEDURE DESCRIPTION

1. AC Power Resoration - SCE currently has a station procedure that contains provisions for restoration of AC power. The procedure, SO2/3-13.1, "Station Blackout" is controlled and implemented by San Onofre Units 2 and 3. In the event that San Onofre Units 2 and 3 become blacked out, actions necessary to restore power to the switchyard would be fulfilled by Unit 2/3 operators. This procedure will be reviewed and modified as necessary to meet NUMARC 87-00, Section 4.2.2

2. Severe Weather - San Onofre Units 2 and 3 do not currently have a procedure detailing operator actions prior to onset of severe weather. San Onofre Units 2 and 3 are in ESW Group 1 and SW Group 1 and do not need to incorporate a 2-hour shutdown provision as part of severe weather repsonse. SCE will develop a severe weather response procedure in accordance with NUMARC 87-00, Section 4.2.3.

3. Station Blackout Repsonse - San Onofre Units 2 and 3 currently have an SBO reponse procedure SO23-13.1, "Station Blackout". This procedure will be reviewed and modified as necessary to satisfy the requirements of NUMARC 87-00, Section 4.2.1.

4. Coping Procedures - The San Onofre Units 2 and 3 blackout reponse procedure, SO23-13.1 includes necessary operator steps to cope with the SBO. The addition of cable and conduit to cross connect station batteries are the only Plant modifications necessary to satisfy the requirements of the SBO rule. Minor procedure changes will be implemented in the SBO response procedure to ensure all of the provisions of NUMARC 87-00, Section 7 are included.

C. PLANT MODIFICATIONS AND PROPOSED SCHEDULE

The ability of San Onofre Units 2 and 3 to cope with a station blackout for four hours in accordance with NUMARC 87-00, Section 3.2.5 and as determined in Section 'A' above; was assessed using NUMARC 87-00 Section 7 with the following results:

1. Condensate Inventory for Decay Heat Removal

It has been determined from Section 7.2.1 of NUMARC 87-00 that 53,000 gallons of water are required for decay heat removal for the proposed 4 hour station blackout duration. The minimum permissible condensate storage tank level per technical specifications provides 424,000 gallons of water, which exceeds the required quantity for coping with a four hour station blackout.

2. Class 1E Battery Capacity

The Class 1E battery was determined to be inadequate to meet station blackout loads for the proposed station blackout duration. The following modifications are necessary to provide the additional capacity to meet the proposed station blackout durations:

a. Install cable and conduit between DC Buses A and C and DC Buses B and D (but do not connect);

b. Modify Station procedures to require that during a station blackout event, load group A is connected to battery C and load group B is connected to Battery D with the installed cable after approximately 3 hours into the SBO event (exact cross connect time window to be determined by analysis later).

3. Compressed Air

Air-operated valves relied upon to cope with a station blackout for the proposed 4 hour SBO duration can either be operated manually or have sufficient backup sources independent of the preferred and blacked out unit's Class 1E power supply. Valves requiring manual operation are identified in plant procedures.

4. Effects of Loss of Ventilation

The calculated steady state ambient air temperature for the steam driven AFW pump room (the dominant area of concern for a PWR) during a station blackout induced loss of ventilation is 106.9°F.

The assumption in NUMARC 87-00, Section 2.7.1 that the control room will not exceed 120°F during a station blackout has been assessed. The control room for San Onofre Units 2 and 3 will not exceed 120°F during a station blackout. Therefore, the control room is not a dominant area of concern.

Reasonable assurance of the operability of station blackout response equipment in the above area(s) has been assessed using Appendix F to NUMARC 87-00. No modifications or associated procedures are required to provide reasonable assurance for equipment operability.

5. Containment Isolation

The plant list of containment isolation valves has been reviewed to verify that valves which must be capable of being closed or that must be operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's Class 1E power supplies. No plant modifications and associated procedure changes were determined to be required.

6. Reactor Coolant Inventory

The ability to maintain adequate reactor coolant system inventory to ensure that the core is cooled has been assessed for 4 hours. The generic analyses listed in Section 2.5.2 of NUMARC 87-00 were used for this assessment and are applicable to the specific design of San Onofre Units 2 and 3. The expected rates of reactor coolant inventory loss under SBO conditions do not result in core uncovery in a SBO of 4 hours. Therefore, makeup systems in addition to those currently available under SBO conditions are not required to maintain core cooling under natural circulation.

The plant modifications described above will be completed within two years and associated procedure changes identified above will be completed within one year after the notification provided by the Director, Office of Nuclear Reactor Regulation in accordance with 10 CFR 50.63(c)(3).

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