September 1, 2000

Mr. Harold B. Ray
Executive Vice President
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3 - ISSUANCE OF AMENDMENTS ON ENGINEERED SAFETY FEATURES TIMING (TAC NOS. MA7153 AND MA7154)

Dear Mr. Ray:

The Commission has issued the enclosed Amendment No. 169 to Facility Operating License No. NPF-10 and Amendment No. 160 to Facility Operating License No. NPF-15 for San Onofre Nuclear Generating Station, Units 2 and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated November 8, 1999, as supplemented by letters dated March 16 and May 24, 2000.

The amendments revise Surveillance Requirement (SR) 3.8.1.18 of TS 3.8.1, "A.C. Sources-Operating." The amendments revise the SR to read: Verify the timing of each sequenced load block is within its timer setting ±10% or ±2.5 seconds, whichever is greater, with the exception of the 5 second load group which is -0.5, +2.5 seconds, for each programmed time interval load sequence.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,
/RA/

L. Raghavan, Senior Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-361 and 50-362

Enclosures:
1. Amendment No. 169 to NPF-10
2. Amendment No. 160 to NPF-15
3. Safety Evaluation

cc w/encls: See next page

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Accession No. ML0037 *No major changes to SE. **See previous concurrence

OFFICE	PDIV-2/PM	PDIV-D/LA	*DSSA/SRXB	*DE/EEIB	OGC NLO w/ comments	PDIV-2/SC
NAME	**RAssa/LRaghavan:am	CJamerson	FAkstulewicz	CHolden		SDembek
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

THE CITY OF ANAHEIM, CALIFORNIA

DOCKET NO. 50-361

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 169
License No. NPF-10

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Southern California Edison Company, et al. (SCE or the licensee), dated November 8, 1999, as supplemented by letters dated March 16 and May 24, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-10 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 169 , are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Stephen Dembek, Chief, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: September 1, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 169

FACILITY OPERATING LICENSE NO. NPF-10

DOCKET NO. 50-361

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE	INSERT
3.8-13	3.8-13

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify the timing of each sequenced load block is within its timer setting ± 10% or ± 2.5 seconds, whichever is greater, with the exception of the 5 second load group which is -0.5, +2.5 seconds, for each programmed time interval load sequence.	24 months

(continued)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

THE CITY OF ANAHEIM, CALIFORNIA

DOCKET NO. 50-362

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 160
License No. NPF-15

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Southern California Edison Company, et al. (SCE or the licensee) dated November 8, 1999, as supplemented by letters dated March 16 and May 24, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-15 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 160 , are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Stephen Dembek, Chief, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: September 1, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 160

FACILITY OPERATING LICENSE NO. NPF-15

DOCKET NO. 50-362

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE	INSERT
3.8-13	3.8-13

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify the timing of each sequenced load block is within its timer setting ± 10% or ± 2.5 seconds, whichever is greater, with the exception of the 5 second load group which is -0.5, +2.5 seconds, for each programmed time interval load sequence.	24 months

(continued)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. NPF-10

AND AMENDMENT NO. 160 TO FACILITY OPERATING LICENSE NO. NPF-15

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

THE CITY OF ANAHEIM, CALIFORNIA

SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

DOCKET NOS. 50-361 AND 50-362

1.0 INTRODUCTION

By application dated November 8, 1999 (PCN-454), and supplemented by letters dated March 16 and May 24, 2000, Southern California Edison Company, et al. (SCE or the licensee), requested changes to the Technical Specifications (TSs) for San Onofre Nuclear Generating Station (SONGS), Units 2 and 3. The proposed changes would revise the timer setpoints and associated tolerances for the time delay relays used in the Engineered Safety Features (ESF) load sequencer in Surveillance Requirement (SR) 3.8.1.18 of TS 3.8.1, "A.C. Sources - Operating." Specifically, the amendments would revise the acceptance criteria for each timer from ±10 percent of its design interval to ±10 percent of its setting or ±2.5 seconds, whichever is greater, with the exception of the 5-second load group for which the requested criteria are -0.5, +2.5 seconds. The SR ensures that the overall functional capability of the emergency diesel-generator (DG) system is maintained within design-basis requirements.

The reason for these amendments is that the manufacturer's stated accuracy for the timer (Agastat time delay relays) used to sequence ESF loads is ±10 percent of the setting at a constant temperature. The current TS requirement of ±10 percent of the interval is more restrictive and has resulted in many recorded test failures when the actual system performance was acceptable. The licensee has performed analyses to demonstrate that the wider tolerance is acceptable. The load sequencing relays used in SONGS Units 2 and 3 were tested on a 24-month basis as required by SR 3.8.1.18. As-found timing data from these tests indicated a 12.8-percent failure rate when using the current SR timer tolerance of ±10 percent of the design interval. Based on the proposed tolerance of ±10 percent of the timer setpoint, the failure rate would be reduced to 3.4 percent. With a timer tolerance of ±2.5 seconds, the failure rate would be 0.56 percent. The proposed TS changes increase timer tolerances and reduce the surveillance failure rates.

The corresponding TS Bases were also changed to include a matrix of sequenced loads. The matrix specified the allowable deviations from nominal starting times for each load group. The changes to the Bases clarified that the calibration requirement for timer setpoint was ±0.5 seconds (±10 percent of a nominal 5-second interval,) while the relaxed tolerances, as specified in the matrix, would apply to as-found timer setpoints obtained during surveillance testing.

In response to the NRC staff's request for additional information dated January 18, 2000 (ML003675488), the licensee provided clarifying information by letters dated March 16 (ML003693173) and May 24, 2000 (ML003719150). This information was within the scope of the original application and *Federal Register* notice and did not change the staff's initial no significant hazards consideration determination.

2.0 BACKGROUND

The Class 1E electrical power distribution system ac sources consist of the offsite power sources (preferred or normal power sources and alternate(s)) and the onsite standby power sources (Train A and Train B DG). The onsite Class 1E ac distribution system is divided into two redundant load trains so that the loss of either train does not prevent the minimum safety functions from being performed. Each train has connections to two preferred (offsite) power sources and a single DG.

A DG starts automatically on a safety injection actuation signal (SIAS) or on an ESF bus undervoltage signal. After the DG has started, it will automatically tie to its respective bus after the connection to offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage. The DGs will also start and come to rated voltage and frequency without tying to the ESF bus on an SIAS alone. On an SIAS with a loss of voltage signal (LOVS), an undervoltage signal strips nonpermanent and nonessential loads from the ESF bus. When the DG is tied to the ESF bus, loads are then sequentially connected to their respective ESF bus by the load sequence relays. The sequencing logic controls the permissive and starting signals to breaker control circuits to prevent overloading the DG by automatic load application. The required loads are reconnected to the ESF bus in a predetermined sequence in order to prevent overloading the DG.

Within 107 seconds after an SIAS is received, all auto-connected loads needed to recover the unit or maintain it in a safe condition are returned to service. Additional loads may be manually connected by the operators as permitted by the emergency operating instructions.

Proper sequencing of loads, including tripping of nonpermanent and nonessential loads, is a required function for DG operability.

The purpose of the sequencing logic and timers is to ensure that the DG is loaded in the proper intervals so that adequate voltage and frequency are maintained. The TSs, which are based on the Combustion Engineering Standard Technical Specifications, conservatively require ±10 percent of sequence interval as the allowable timer tolerance.

As stated in the Bases for TS 3.8.1 in NUREG-1432, "Standard Technical Specifications for Combustion Engineering Plants," the ac sources and associated automatic load sequence timers are required to be operable in Modes 1, 2, 3, and 4 to ensure the following:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of anticipated operational occurrences 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 design-basis accident.

The licensee continues to follow the guidance stated in paragraph 2.a.(2) of Regulatory Guide 1. 108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants," that each DG is required to demonstrate proper operation for the DG loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, before connecting the DGs to their respective buses, all loads are shed except the high pressure safety injection (HPSI) pumps, if connected; load center feeders; and those motor control centers (MCCs) that power Class 1E loads (referred to as "permanently connected" loads). At or near rated voltage and frequency, the DGs are then connected to their respective buses. Loads are then sequentially connected to the bus by the load sequence relays. The sequencing logic controls the permissive and starting signals to load breakers to prevent overloading of the DGs during load application. The load sequence start time tolerance ensures that sufficient time exists for the DG governor and voltage regulator to restore frequency and voltage before applying the next load, and that safety analysis assumptions regarding ESF equipment response times are not violated.

3.0 EVALUATION

The licensee proposed to revise the acceptance criteria of SR 3.8.1.18 for each timer from ±10 percent of its design interval to ±10 percent of its setting or ±2.5 seconds, whichever is greater, with the exception of the 5-second load group for which the criteria are -0.5, +2.5 seconds.

The corresponding SR Bases will also be changed to include a matrix of sequenced loads as shown.

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA
(UNIT 2 TRAIN A DG)

		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.

This matrix is for Unit 2 Train A DG load sequence timer acceptance criteria. A similar matrix is included in the Bases section for other DGs. This matrix will identify the deviations from nominal start times that are acceptable for each load group. The change to the Bases will clarify that the calibration requirement for the timer setting is ±0.5 second (±10 percent of a nominal 5-second interval), while the relaxed acceptance criteria, as specified in the matrix, will apply to as-found timer settings obtained during surveillance testing. As proposed, during performance of SR 3.8.1.18, test results outside of the as-left calibration tolerance (±0.5 second) but within the as-found tolerance of the matrix do not constitute surveillance test failures but shall be evaluated for proper relay operation. This evaluation will consider the relay manufacturer's stated accuracy (±10 percent of setting at a constant temperature) and any other test conditions that may be relevant to the relay's performance. The relay may be replaced, adjusted, or accepted as-is should the evaluation determine that the as-found test results are acceptable and the relay is fully capable of performing its specified safety function.

The licensee stated that each unit has a population of 32 load sequencing relays controlling a total of 33 individual loads. These relays are tested on a 24-month basis as required by SR 3.8.1.18. Surveillance data collected since initial plant startup document approximately 532 individual tests. As-found timing data from these tests indicate a 12.8-percent failure rate when using the current SR acceptance criterion of ±10 percent of design interval. On the basis of an acceptance criterion of ±10 percent of setting (consistent with the manufacturer's design specification), the failure rate would be reduced to 3.4 percent. On the basis of an acceptance criterion of ±2.5 seconds, the failure rate would be only 0.56 percent.

Observed failures appear to be distributed randomly across the population of relays, with no obvious patterns related to relay setpoint or location.

The load sequencing relays are currently tested and calibrated in accordance with maintenance procedures SO2-II-11.1A (Unit 2, Train A), SO2-II-11.1B (Unit 2, Train B), SO3-II-11.1A (Unit 3, Train A), SO3-II-11.1 B (Unit 3, Train B), and SO123-II-11.152. Initial as-found timing of a relay is recorded and compared to its acceptance range. If outside the acceptance range, the relay is recalibrated and subjected to three consecutive timing tests. If the relay times are within the as-left acceptance range for three consecutive tests, the relay is returned to service. If the relay will not stay within its as-left acceptance range for three consecutive tests, it is replaced. Relays with as-found values inside the as-left acceptance range are subjected to two more timing tests to ensure that all relays returned to service have passed three consecutive timing tests. The licensee has retained this replacement criterion in TS bases Table 3.8.1-1 which would provide assurance that the degraded relays that might pass relaxed sequencing acceptance criteria are not left in service. Because changes to the TS bases are controlled by TS 5.4 and are subject to 10 CFR 50.59 requirements, there are adequate regulatory controls to ensure that any changes to the criterion will be evaluated.

Approval of the proposed amendments will have no impact on the surveillance methodology or interval. The proposed amendments merely establish a more appropriate as-found acceptance criterion, which will eliminate unnecessary surveillance failures. Surveillance failures require administrative tracking and additional analysis to assess operability and reportability of the condition. On the basis of the historical testing data previously cited, approximately 95 percent of the past surveillance failures would have been avoided if the proposed acceptance criterion had been in use. Analysis has shown that the proposed acceptance criteria will have no negative impact on plant safety.

The timing requirement of SR 3.8.1.18 is important for two reasons: (1) to prevent DG overload as a result of loads starting too close together in time and (2) to support the assumed starting time of equipment in the various safety analyses. SCE has performed analyses using the proposed expanded timing tolerance that demonstrate that acceptable safety system performance will be maintained. Descriptions of these analyses follow.

3.1 Electrical Analyses

Electrical system performance has been analyzed by performing dynamic voltage analyses assuming a timer tolerance of ±2.5 seconds for all load groups. A tolerance of ±2.5 seconds creates the possibility of overlap of adjacent load groups (i.e., one load group starts 2.5 seconds late and the following load group starts 2.5 seconds early, resulting in two load groups starting at the same time).

All possible combinations of adjacent load groups overlapping have been evaluated and shown to be acceptable with respect to performance of the electrical system and the DGs. Therefore, specific timer tolerance data were not used.

Although a tolerance of ±2.5 seconds for the 5-second load group is acceptable with respect to the loading capability of the DGs, the as-found tolerance for this load group will be -0.5, +2.5 seconds. This tolerance ensures that the voltage transient as a result of starting this load group when powered from the offsite source will not interfere with the loss of voltage signal/degraded grid voltage with safety injection actuation signal (LOVS/DGVSS) circuitry. The LOVS/DGVSS circuit senses the 4-kV bus voltage just before time T = 4.5 seconds and transfers the bus to the DG if the voltage is below the degraded voltage setpoint. If the 5-second load group were to start before T = 4.5 seconds, the resulting voltage dip could appear to be a degraded voltage condition and cause an undesirable actuation of the DGVSS relay scheme. To avoid this potential interference, the as-found tolerance for early starting of the 5-second load group will be restricted to -0.5 second. The acceptable as-found tolerance is therefore -0.5, +2.5 seconds.

In the case of the 30-second load group, which includes only the auxiliary feedwater (AFW) pump, the electrical analysis was performed assuming a timer tolerance of +2.5 seconds for this and adjacent load groups, which is the worst combination of starting conditions as it includes overlapping starting of the AFW pump and emergency chillers. This is a more severe load condition for the DGs than the +3.0 seconds requested in these amendments for this load group.

The 35-second load group includes only the emergency chiller units. The electrical analysis performed for this group assumed a timer tolerance of +2.5 seconds for this and adjacent load groups, which is the worst combination of starting conditions as it includes overlapping starting of the AFW pump and the emergency chillers. This is a more severe load condition for the DGs than the +3.5 seconds requested in these amendments for this load group.

On December 16, 1999, and January 13, 2000, the staff had telephone discussions with the licensee regarding the electrical calculation (E4C-082, Rev. 1, dated October 24, 1994). Based on these discussions, by letter dated January 18, 2000, the staff documented its request for additional information (RAI). By letters dated March 16, and May 24, 2000, the licensee provided its responses to the staff's RAI. The licensee's responses are discussed below.

The licensee stated that the total load of the DG used for the calculation is conservative and bounds the loads shown in the updated final safety analysis report (UFSAR), Table 8.3-1. The licensee also stated that the calculated motor acceleration times are consistent with the vendor-supplied acceleration times.

Regarding momentary load surges during the DG loading sequence, the licensee stated that the calculated maximum transient power (approximately 5800 kW) exceeds the 2-hour rating of 5170 kW only during the last sequence step (simultaneous starting of AFW pump and chillers). This maximum transient power lasts a very short time (approximately 2 seconds). The DG has a 1-minute rating of 8550 kW per National Electrical Manufacturers Association Standard MG1. Moreover, the load surges do not exceed the DG 2-hour rating during load sequence testings. The staff finds the licensee's response reasonable.

With respect to the starting power factor (0.2) for small motors, the licensee stated that the assumed starting power factor of 0.2 for the equivalent motor control center (MCC) motor loads could be nonconservative for the DG power profile, especially when cable impedance is included. The starting power factors of some motors could be greater than 0.2 and the resistance of the cable for a small motor is greater than the reactance. However, the staff finds that the assumed starting power factor of 0.2 for the equivalent MCC motor load would not impact the DG voltage profile because the voltage profile is determined by kVA load and the starting power factor would not change the kVA value of the motor load. Additionally, the equivalent MCC motor loads used in the calculation are conservative. Therefore, the staff finds the assumed starting power factor of 0.2 for the equivalent MCC motor loads acceptable.

Regarding the impact of breaker coordination when two loads start simultaneously, the licensee reviewed the relay-setting calculations for ESF 4.16-kV load breakers and determined them to be adequate for starting overlapping load groups. Protective relays that could potentially trip the upstream supply breakers while starting multiple loads are discussed below. There are four incoming breakers for each ESF 4.16-kV bus as follows:

a. DG breaker

   There are no overcurrent relays (51 relay) in the DG breaker protection scheme. The DG is protected under a short circuit condition by 151/27 (voltage restraint overcurrent) relays. The 151/27 relays will not initiate tripping of the DG breaker during multiple motor starting.

a. Bus tie breaker between ESF 4.16-kV buses 2A04 (2A06) and 3A04 (3A06)

   The overcurrent (151) relay for this breaker is set at 2400A at 4.36 kV. This relay setting was established to protect the source transformer as the backup overcurrent relay of downstream overcurrent relays for 4.16 kV-loads. The current (multiple motor starting current and the maximum bus current) during multiple motor starting is much less than the relay setting current. The 151 relay will not initiate tripping of the bus tie breaker during multiple motor starting.

b. Bus incoming breaker from the reserve auxiliary transformer

The overcurrent (151) relay for this breaker is set at 4200A at 4.36 kV. This relay setting was established to protect the source transformer. The relay functions as the backup overcurrent relay of downstream overcurrent relays for 4.16-kV loads. The current (multiple motor starting current and maximum bus current) during multiple motor starting is much less than the relay setting current. The 151 relay will not initiate tripping of the bus tie breaker during multiple motor starting.

c. Bus incoming breaker from the unit auxiliary transformer

The overcurrent (151) relay for this breaker is set at 4200A at 4.36 kV. This relay setting was established to protect the source transformer. The relay functions as the backup overcurrent relay of downstream overcurrent relays for 4.16-kV loads. The current (multiple motor starting current and maximum bus current) during multiple motor starting is much less than the relay setting current. The 151 relay will not initiate tripping of the bus tie breaker during multiple motor starting.

Based on the licensee's review of relay-setting calculations for ESF 4.16-kV load breakers, the staff finds them to be adequate for starting overlapping load groups.

In conclusion, the staff finds that the licensee has evaluated all possible combinations of adjacent load groups overlapping and shown acceptable performance of the electrical system and the DGs.

3.2 System Impact Analysis

Process system performance has been analyzed for each system that could potentially be affected by the wider timer tolerances assumed in the electrical analyses previously described. Flow requirements, potential flow diversions, and the availability of supporting system components and equipment were evaluated. The performance of all systems potentially affected by the wider timer tolerance were shown to be acceptable. The licensee provided this analysis.

3.3 Safety System Analyses

Applicable safety analyses were reviewed to determine the acceptability of the proposed change in timer tolerance. The response times for each system were evaluated. It was determined that the existing overall system response times can be maintained by reallocating existing margin for individual components, where needed, to accommodate the increased timer tolerance without increasing the overall system response time.

For example, the existing analysis for the containment spray system, the most limiting system, demonstrates that an overall system response time of $\leq$26.9 seconds is acceptable. This analysis allocates 1.0 second for timer tolerance, 4.0 seconds for pump acceleration, and includes additional unallocated margin of 0.9 second. These intervals can be reallocated as follows with no overall increase to the system response time: 2.5 seconds for timer tolerance, 1.9 seconds for pump acceleration, and 1.5 seconds of unallocated margin.

Other systems credited in the safety analyses were evaluated in a similar manner. In all cases, it was determined that the increase in timer tolerance can be accommodated without increasing the overall response time for any system. In analyses in which the allocated time for pump acceleration was reduced to accommodate the increased timer tolerance, the actual acceleration times were reviewed to ensure that the actual times were consistent with the electrical analyses and were less than the assumed times. These analyses are provided.

3.4 Software Modeling Verification

In accordance with Branch Technical Position PSB-1, Section 4, analytical techniques and assumptions used in voltage analysis were verified against actual measurements. The results of the computer program for dynamic simulation were compared to the preoperational transformer tap verification test data gathered in 1981. In this case, a minimum switchyard voltage of 218.5 kV (the same as in the test) was used. Resulting analytical voltage at the 4-kV and 480-V ESF buses was compared to the voltage measured during the preoperational tests. The analysis results at the 4-kV and 480-V ESF buses were conservative when compared to the actual measured voltages. The analytical voltage dips were more severe than measured plant performance. The comparison of analytical results to the plant performance shows that the PSB-1 acceptance criteria have been met.

In addition, a special ESF test was performed on Unit 3 in September 1995 during the Cycle 8 refueling outage. During this special test, the licensee started two HPSI pumps on Train A and a single HPSI pump on Train B at time t=0. The analytical acceptance criteria used for this test were a minimum Train A voltage equal to 75.5 percent of nominal bus voltage and a minimum Train B voltage equal to 82.5 percent of nominal bus voltage. The test demonstrated that these criteria were satisfied.

A test cannot be performed to simulate worst-case accident conditions with overlapping load groups. Therefore, the test results must be supplemented with analytical results. The licensee concluded that a close match exists between analytical values and actual test values under the starting scenario for the two HPSI pumps. On the basis of the above information, the licensee has demonstrated by analysis that all possible combinations of adjacent load groups overlapping are acceptable with respect to performance of the electrical system and the DG.

3.5 Response Times

In the SONGS plant, sequencing of ESF loads onto the safety-related electrical busses at Units 2 and 3 is controlled by individual sequence time relay for each load. The load sequence timing relays begin timing when there is a safety injection actuation signal (SIAS) and the 4-kV bus voltage is available. The permanently connected loads (e.g. motor control centers) and high pressure safety injection pump are connected to the 4-kV bus with no delay, followed by the low-pressure safety injection (LPSI) pump at 5 seconds. The AFW pump is loaded to the 4-kV bus at 30 seconds. The TS changes (SR 3.8.1.18) proposed that the allowable as-found tolerances for the automatic load sequence timer setpoint be within a range of -0.5 and +2.5 seconds for the LPSI system, and ±3 seconds for the AFW system. In support of the proposed changes, the licensee reviewed existing transient and accident analyses and evaluated the values of total response times used in safety analyses for actuation of both LPSI and AFW systems.

The licensee's analysis indicated that in the existing analysis of the limiting loss-of-coolant accident, a total LPSI system response time of 41.2 seconds was assumed on SAIS. The staff found that the assumption for the value of the LPSI response time was conservative since it was greater than the time limit of 41 seconds specified in Table 3.3.100-2 of the licensee controlled specifications (LCS). For the safety analyses used in reload applications, a value of 52.7 seconds was assumed for the total AFW response time. The staff found that the analytical value of the AFW response time was adequate since it was consistent with the time limit required by the LCS.

In response to the staff's request for additional information, the licensee provided the individual response time for each component involved in the ESF actuation signal response. For LPSI actuation, the total response time of 41.2 seconds included 1.0 second for ESF actuation signal response and 10 seconds for DG start delays. In addition, the LPSI response time also included +2.5 seconds for timer tolerance, 5.0 seconds for timer setpoint, 22.5 seconds for LPSI pump acceleration, and an additional margin of 0.2 second. For AFW actuation, the response time of 52.7 seconds represented a sum of the response times for each component involving in actuation of the AFW system. The component response times were 1.0 second for ESF actuation signal response, 10 seconds for DG start delays, +3.0 seconds for timer tolerance, 30 seconds for timer setpoint, 8.0 seconds for AFW pump acceleration, and 0.7 second for additional margin. The staff found that the timer setpoints and associated tolerances proposed in TS SR 3.8.1.18 for LPSI and AFW systems actuation were appropriately included in the total response times and the calculating total response times were equal to that used in the existing transient and accident analyses. Therefore, the staff concluded that the proposed TS SR 3.8.1.18 was acceptable.

3.6 Summary

The staff has reviewed the proposed changes to revise the acceptance criteria for each timer from ±10 percent of its design interval to ±10 percent of its setting or ±2.5 seconds, whichever is greater, with the exception of the 5-second load group for which the requested criteria are -0.5, +2.5 seconds. On the basis of its review, the staff finds that the licensee resolved the staff's concerns satisfactorily. The staff concludes that the licensee's request to revise the acceptance criteria for each timer is acceptable. The staff's conclusion is based on the following: (1) all possible combinations of adjacent load groups overlapping have been evaluated and shown to be acceptable with respect to performance of the electrical system and DGs, (2) the overall ESF response times in the TS and the safety analyses are maintained even though the timer tolerance is increased, and (3) the replacement criterion described in TS bases Table 3.8.1-1, would provide assurance that the degraded relays that might pass relaxed sequencing acceptance criteria are not left in service. Any changes to the TS bases are controlled by TS 5.4 and are subject to 10 CFR 50.59 requirements. Also, the staff finds that the revised TS Bases section is consistent with the requested change of the acceptance criteria for each timer.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the California State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (64 FR 67339). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

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