SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONAL℠ Company

Dwight E. Nunn
Vice President

November 8, 1999

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

Subject: **Docket Nos. 50-361 and 50-362**
Engineered Safety Features Timing
Proposed Technical Specification Change NPF-10/15-454
San Onofre Nuclear Generating Station
Units 2 and 3

References:

1. Letter dated May 29, 1996, from Dwight E. Nunn (SCE) to Document Control Desk (NRC), same subject

2. Letter dated September 23, 1998, from James W. Clifford (NRC) to Harold B. Ray (SCE), Subject: "Request For Additional Information For Load Sequencer Time Delay Relay Amendment (TAC Nos. M95865 and M95866)"

3. Letter dated December 22, 1998, from A. E. Scherer (SCE) to Document Control Desk (NRC), Subject: "Docket Nos. 50-361 and 50-362, Engineered Safety Features Timing, Proposed Technical Specification Change NPF-10/15-454, San Onofre Nuclear Generating Station, Units 2 and 3"

Gentlemen:

Enclosed are Amendment Application Numbers 191 and 176 to Facility Operating Licenses NPF-10 and NPF-15 for San Onofre Nuclear Generating Station Units 2 and 3, respectively. The amendment applications consist of Proposed Change Number (PCN) 454. PCN-454 was originally submitted by Reference 1 and was withdrawn by Reference 3. Southern California Edison's (SCE's) intent, stated in Reference 3, to resubmit our request in 1999, to include the additional information requested by Reference 2, is accomplished by the present submittal.

A001

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949-368-1480
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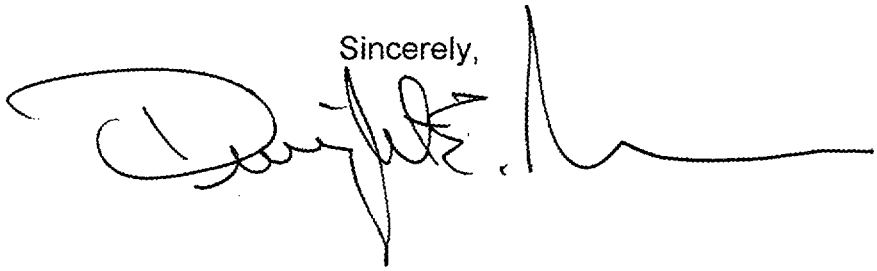
PCN-454 revises the acceptance criteria for the Agastat time delay relays used in the Engineered Safety Features load sequencer in Surveillance Requirement 3.8.1.18 of Technical Specification 3.8.1, "A.C. Sources - Operating." Surveillance Requirement 3.8.1.18 requires that each automatic load sequence timer operate within ± 10% of its design interval.

This submittal demonstrates that a wider tolerance is acceptable. Enclosures 1 and 2 provide documentation.

Southern California Edison requests this amendment be issued effective as of its date of issuance, to be implemented within 30 days from the date of issuance.

If you would like additional information on this Technical Specification change request, please let me know.

Sincerely,



Enclosures

cc: E. W. Merschoff, Regional Administrator, NRC Region IV*
J. A. Sloan, NRC Senior Resident Inspector, San Onofre Units 2 and 3*
L. Raghavan, NRC Project Manager, San Onofre Units 2 and 3
S. Y. Hsu, Department of Health Services, Radiologic Health Branch*

*less Enclosure 2

ENCLOSURE 1

DESCRIPTION AND NO SIGNIFICANT HAZARDS CONSIDERATIONS
OF PROPOSED CHANGE NUMBER
NPF-10/15-454
(PCN-454)

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN, CALIFORNIA EDISON COMPANY, ET AL. for a class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 2 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-361 Amendment Application No. 191

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10CFR50.90, hereby submit Amendment Application No. 191. This amendment application consists of Proposed Change No. PCN-454 to Facility Operating License NPF-10. PCN-454 is a request to revise the acceptance criteria of Surveillance Requirement 3.8.1.18.

Subscribed on this 8th day of November, 1999.

Respectfully Submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: _____
Dwight E. Nunn
Vice President

State of California
County of San Diego

On 11/8/99 before me Mariane Sanchez,

personally appeared Dwight E. Nunn, personally known to me ~~(or proved to me on the basis of satisfactory evidence)~~ to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

MARIANE SANCHEZ
Commission #1196482
Notary Public - California
San Diego County
My Comm. Expires Oct 14, 2002

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN, CALIFORNIA EDISON COMPANY, ET AL. for a class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 3 of the San Onofre Nuclear Generating Station	))))))	Docket No. 50-362 Amendment Application No. 176

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10CFR50.90, hereby submit Amendment Application No. 176. This amendment application consists of Proposed Change No. PCN-454 to Facility Operating License NPF-15. PCN-454 is a request to revise the acceptance criteria of Surveillance Requirement 3.8.1.18.

Subscribed on this 8th day of November, 1999.

Respectfully Submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: _____
Dwight E. Nunn
Vice President

State of California
County of San Diego

On ~~11/8~~ MR 11/8/99 before me, Mariane Sanchez,

personally appeared Dwight E. Nunn, personally known to me ~~(or proved to me on the basis of satisfactory evidence)~~ to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

MARIANE SANCHEZ
Commission # 1196482
Notary Public - California
San Diego County
My Comm. Expires Oct 14, 2002

DESCRIPTION AND SAFETY ANALYSIS OF PROPOSED CHANGE NPF-10/15-454 (PCN-454)

PCN-454 is a request to revise Surveillance Requirement (SR) 3.8.1.18 of Technical Specification (TS) 3.8.1, "A.C. Sources- Operating," for San Onofre Nuclear Generating Station Units 2 and 3 (SONGS 2 & 3). PCN-454 also includes for information a change to the Bases of SR 3.8.1.18.

Existing Technical Specifications and Bases

Unit 2: See Attachment "A"
Unit 3: See Attachment "B"

Proposed TS and Bases, PCN 454 (redline and strikeout)

Unit 2: See Attachment "C"
Unit 3: See Attachment "D"

Proposed Technical Specifications and Bases, PCN 454

Unit 2: See Attachment "E"
Unit 3: See Attachment "F"

Supporting References

Both Units: See Enclosure 2

Description of Changes

SUMMARY:

PCN-454 is a request to revise the acceptance criteria for the Agastat time delay relays used in the Engineered Safety Features (ESF) load sequencer in Surveillance Requirement (SR) 3.8.1.18 of Technical Specification (TS) 3.8.1, "A.C. Sources-Operating." SR 3.8.1.18 requires that each automatic load sequence timer operate within $\pm$ 10% of its design interval. The design interval is defined as the difference between the nominal start times (timer settings) of successive load groups. PCN-454 requests a revision to the acceptance criteria for each timer from $\pm$ 10% of its design interval to $\pm$ 10% of its setting or $\pm$ 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 manufacturer's stated accuracy for the Agastat time delay relays used to sequence ESF loads is ± 10% of setting at a constant temperature. The current TS requirement of ± 10% of interval is more restrictive and has resulted in many recorded test failures, when actual system performance was acceptable. Southern California Edison (SCE) has performed analyses that demonstrate that the wider tolerance is acceptable.

PCN-454 also includes for information a change to the SR Bases to include a matrix of sequenced loads. The matrix identifies the deviations from nominal timer settings which are acceptable for each load group. The proposed change to the Bases clarifies that the calibration requirement for timer setting is ± 0.5 seconds (± 10% 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 seconds) 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% 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.

Approval of PCN-454 will complete final disposition of a nonconformance identified in 1993, as discussed in Section 1.7 of the "Background," below.

Additionally, PCN-454 includes for information a change to the acceptance criteria of SR 3.8.1.18 for the containment emergency coolers. The change reflects safety analysis, testing conditions, and design modifications (Reference 7) based on recommendations from NRC Information Notice (IN) 96-45, "Potential Common-Mode Post-Accident Failure of Containment Coolers," dated August 12, 1996. It also includes provisions to allow sequential, overlapping or total steps to meet the requirements of SR 3.8.1.18.

1.0 BACKGROUND

1.1 Technical Specification Requirement

SR 3.8.1.18 of TS 3.8.1, "A.C. Sources- Operating," requires verification that the automatic load sequence timer is operable with an interval between each sequenced load block within ± 10% of its design interval. The SR ensures that the overall emergency diesel generator (DG) system functional capability is maintained within design basis requirements.

1.2 Electrical Power Systems - AC Sources

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's). 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.

The onsite standby power source for each 4.16 kV ESF bus is a dedicated DG. DG's G002 and G003 are dedicated to ESF buses A04 and A06, respectively. In the event of loss of preferred power, an ESF electrical bus may be manually or automatically connected to its DG, as described below, to enable safe reactor shutdown. Analysis of different Design Basis Accident (DBA) scenarios, including the Loss of Coolant Accident (LOCA), demonstrates that the DBA's will be successfully mitigated; that is, the automatic sequencing of the electrical loads to the DG's will occur soon enough to mitigate the DBA, while not overloading the DG's.

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 DG's will also start and come to rated voltage and frequency without tying to the ESF bus on a SIAS alone. On a SIAS with 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 a 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 TS, which are based on the Combustion Engineering Standard Technical Specifications, conservatively require $\pm$ 10% of sequence interval as the allowable timer tolerance.

1.3 Load Sequence Timer Testing Requirements

As stated in the Bases for TS 3.8.1 in NUREG-1432, Standard TS 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 that:

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 DBA.

As required by paragraph 2.a.(2) of Regulatory Guide 1.108, 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, prior to connecting the DG's 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 that power Class 1E loads (referred to as "permanently connected" loads). At or near rated voltage and frequency, the DG's 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 DG's 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 prior to applying the next load, and that safety analysis assumptions regarding ESF equipment response times are not violated.

1.4 Technical Specification Bases

This amendment request is to revise the acceptance criteria of SR 3.8.1.18 for each timer from $\pm$ 10% of its design interval to $\pm$ 10% of its setting or $\pm$ 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. (See Attachment C, D, E and/or F.) This matrix will identify the deviations from nominal start times which are acceptable for each load group. The change to the Bases will clarify that the calibration requirement for timer setting is $\pm$ 0.5 seconds ($\pm$ 10% 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 ($\pm$ 0.5 seconds) 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% 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.

1.5 Sequencer Testing Experience

SONGS 2 & 3 each has a population of 32 load sequencing relays controlling a total of 33 individual loads[1]. These relays are tested on a 24 month basis as required by SR 3.8.1.18. Surveillance data collected since initial plant startup documents approximately 532 individual tests. As-found timing data from these tests indicate a 12.8% failure rate when using the current SR acceptance criterion of ± 10% of design interval. Based on an acceptance criterion of ± 10% of setting (consistent with the manufacturer's design specification), the failure rate would be reduced to 3.4%. Based on an acceptance criterion of ± 2.5 seconds, the failure rate would be only 0.56%.

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

1.6 Changes To Testing Methodology Under Proposed Amendment

The load sequencing relays are currently tested and calibrated in accordance with maintenance procedures SO2-II-11.1A (Unit 2 Train A) (Reference 8), SO2-II-11.1B (Unit 2 Train B), SO3-II-11.1A (Unit 3 Train A), SO3-II-11.1B (Unit 3 Train B) and SO123-II-11.152 (Reference 9). 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 3 consecutive timing tests. If the relay times within the as-left acceptance range for 3 consecutive tests, it is returned to service. If the relay will not stay within its as-left acceptance range for 3 consecutive tests, it is replaced. Relays with as-found values inside the as-left acceptance range are subjected to 2 more timing tests to ensure that all relays returned to service have passed 3 consecutive timing tests. SCE intends to retain this replacement criterion under the proposed amendment to ensure that degraded relays which might pass relaxed sequencing acceptance criteria are not left in service.

Approval of the proposed amendment will have no impact on the surveillance

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[1] Prior to the 1996-1997 time frame, there were 28 relays per Unit. In the 1996-1997 time frame, 4 new relays were added to each Unit for the containment emergency cooling units. Each pair of dome air circulating fans is controlled by a single Agastat relay. The swing component cooling water pump requires 2 relays.

methodology or interval. The proposed amendment merely establishes 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. Based on the historical testing data cited above, approximately 95% of the past surveillance failures would have been avoided if the proposed acceptance criterion had been in use. As described in the Discussion section below, analysis has shown that the proposed acceptance criteria will have no negative impact on plant safety.

1.7 Options Considered To Resolve the Timing Relay Issue

The NRC issued a Notice Of Violation to SCE in Inspection Report (IR) 50-361/95-04 and 50-362/95-04 dated June 7, 1995, stating that "...the licensee failed to take corrective actions to preclude continued failures of Agastat relays in safety-related components." In our response dated July 11, 1995, SCE explained that a number of alternatives were considered to resolve the Agastat relay tolerance issue. The NRC subsequently, in correspondence dated September 22, 1995, changed the violation classification to Noncited after reviewing our proactive approach to finding the best corrective actions related to the inability of Agastat relays to reliably meet TS SR setpoint requirements. As described below, SCE has had an evolving action plan to address the TS requirements. This plan was reviewed and accepted by the NRC in 1988. The sequence of events in this evolution is recounted below:

- The original 1970's plant design for the DG load sequencing used Agastat time delay relays having a tolerance of "± 10% of setting."

- The original 1976 SONGS 2 & 3 combined Final Safety Analysis Report (FSAR) and TS submittal identified the load sequencing timers as "± 10% of setting devices." This was revised in Amendment 26 to the FSAR in 1981 to read ± 10% of its design interval. The 1982 NRC-approved TS contained the more restrictive "± 10% of design interval" requirement, which was more consistent with standard TS.

- Based on 1982-1983 Agastat surveillance data, SCE implemented an enhanced maintenance program to minimize out-of-tolerance test failures. The program resulted in limited improvement. Because a more accurate time delay relay was not available, SCE concluded that the TS was inappropriately written and a TS change was necessary to modify the existing time interval between each load block from "± 10% of design interval" to a tolerance which would meet the relay manufacturer's design specification acceptance criteria.

- In 1983, SCE drafted and initiated internal review of a proposed TS amendment request. The proposed change initially addressed a "± 5% of

design value" criterion which could be supported by analyses. During the internal review, it was determined that "± 10% of design setting" was required to ensure any potential load sequence overlap would be acceptable. However, at that time, there were no dynamic analysis codes to support this change. Therefore, the proposed amendment request was canceled.

- The acceptability of Agastat time delay relay tolerances was subsequently raised as a concern in NRC IR 50-362/87-05, and was tracked by the NRC as Inspector Follow-up Item 50-362/87-05-01. In response to the NRC's concern, SCE conducted a formal evaluation to determine the safety significance and operability impact of the concern. It was concluded that no safety issue existed since TS ESF time response requirements remained within design limits.

- NRC IR 50-362/88-20 reviewed the Agastat issue in detail (NRC Follow-up Item 87-05-01) and concluded that SCE's actions were appropriate. The NRC staff then closed the issue, stating:

  "The inspector previously identified that several Agastat relay timers did not function within the required time interval during integrated ESF testing. The licensee evaluated this condition and concluded that in certain instances the design tolerances for Agastat relay response time would allow the Agastat relay to function slightly outside of the Technical Specification required time interval. The licensee currently readjusts Agastat relays that do not function within the Technical Specification required time interval, and action was being taken to identify an acceptable replacement relay for these applications. Based on discussions with NRR, the inspector determined that the licensee's actions were appropriate. This item is closed."

- In 1989 ASEA and Agastat each developed digital timing relays, but the digital relays did not meet SCE's requirements. ASEA's relay was not 1E qualified, and the Agastat relay had 25 V DC contacts, not the 125 V DC contacts required at SONGS 2 & 3. SCE was also concerned that use of digital relays could introduce a common mode failure mechanism not previously analyzed. SCE concluded that the cost and concerns did not warrant replacing the existing relays. This common mode failure concern was later found to be valid as noted in NRC IN 94-20, which reported a licensee's DGs were found to be inoperable because of the failure of digital timer relays due to voltage spiking. The existing Agastat time delay relays at SONGS 2 & 3 are not susceptible to failure from the voltage spiking reported in IN 94-20.

- During the early 1990s, SCE focused on either designing and building

qualified replacement relays, or obtaining qualified relays that would meet SCE's design requirements. Although these activities were pursued for several years, they were eventually abandoned due to business and legal considerations, with no acceptable relays being available at that time.

- In November 1992, the NRC issued IN 92-77. To document SCE's evaluation of this notice and provide an operability assessment, SCE issued Nonconformance Report (NCR) 93070031 in July 1993. To disposition this NCR, SCE performed electrical calculations (Reference 1) and engineering analyses (Reference 3) with newly available PC-based dynamic modeling software to demonstrate that no undesirable interactions occur due to overlapping load groups. These analyses demonstrated that the existing relays are adequate and do not require replacement. The final disposition step of NCR 93070031 required that a TS amendment request be submitted. Note that this disposition step differs from SCE's previous 1987 evaluation which recommended that suitable replacement relays be evaluated when available.

- NCR 93070031 documented that the DG and ESF systems were not adversely affected by the time response, and that there was minimal safety significance.

Based on the above, SCE believes that the best alternative for resolving the Agastat relay timing issue is to revise the acceptance criteria for the relays used in the ESF load sequencer, as requested herein.

2.0 DISCUSSION

The timing requirement of SR 3.8.1.18 is important for two reasons: 1) to prevent DG overload due to 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.

2.1 Electrical Analyses

Electrical system performance has been analyzed by performing dynamic voltage analyses assuming a timer tolerance of $\pm$ 2.5 seconds for all load groups. A tolerance of $\pm$ 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). Figure 1 illustrates this.

ELECTRICAL ANALYSIS

(WORST CASE STARTING SEQUENCES WITH OVERLAPPING LOAD GROUPS)

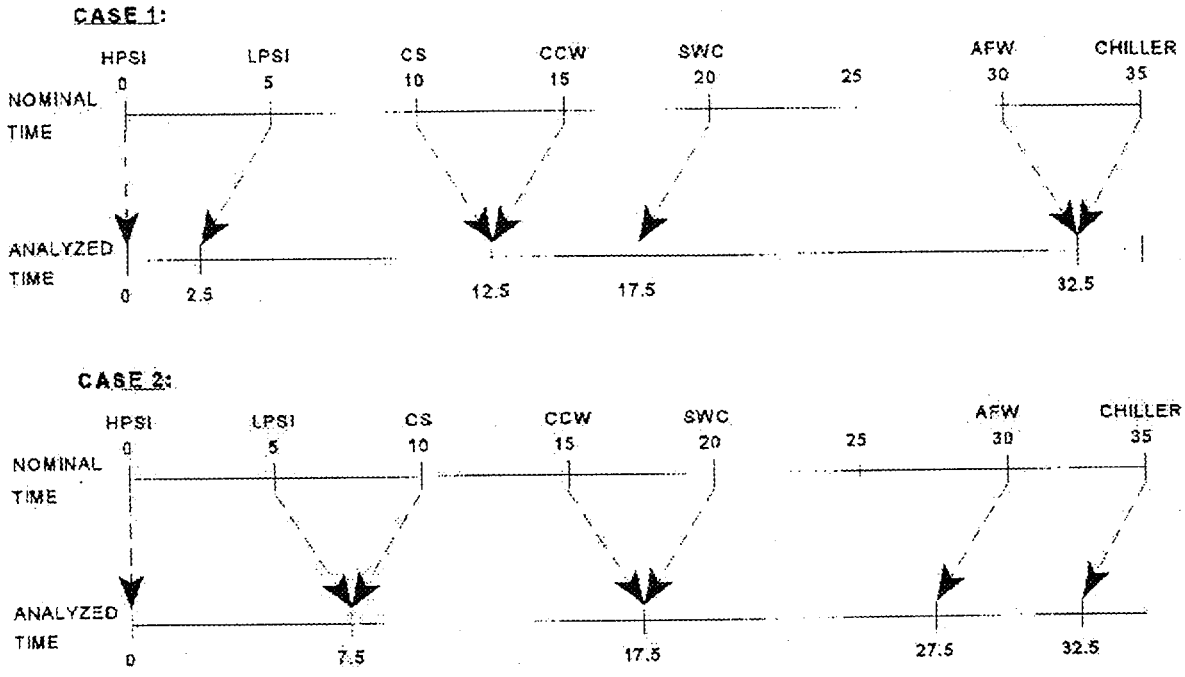

Figure 1 - OVERLAPPING LOAD GROUPS

All possible combinations of adjacent load groups overlapping have been evaluated and shown to be acceptable with respect to electrical system and DG performance. Therefore, specific timer tolerance data were not used. Additional assumptions related to loading are listed in Section 3 of Reference 1. The analyses are provided in Enclosure 2.

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 ensures that the voltage transient due to 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 prior to 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 prior to 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 seconds. 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 DG's than the ± 3.0 seconds requested in this PCN 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 emergency chillers. This is a more severe load condition for the DG's than the ± 3.5 seconds requested in this PCN for this load group.

2.2 System Impact Analysis

Process system performance has been analyzed for each system which could potentially be impacted by the wider timer tolerances assumed in the electrical analyses described above. 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. This analysis is documented in References 2 and 3, which are provided in Enclosure 2.

2.3 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 ≤ 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 seconds. 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. Figure 2 illustrates this example.

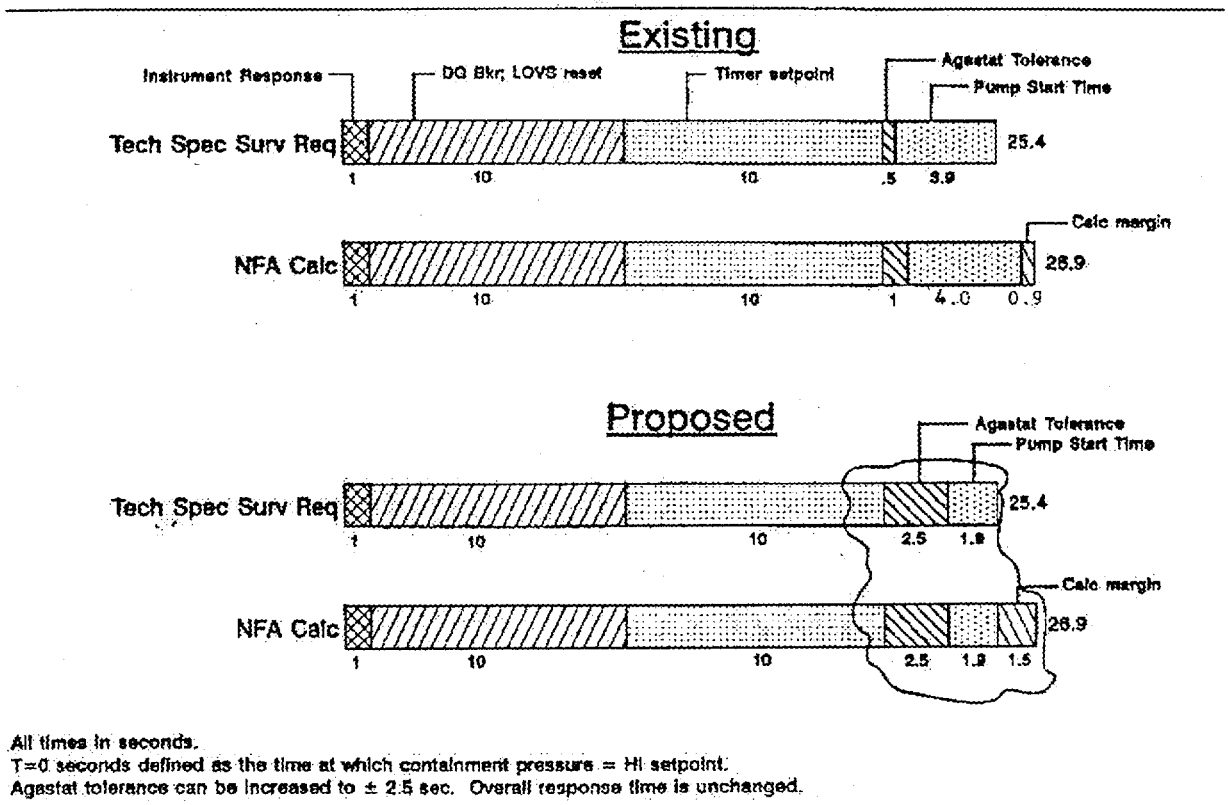

Figure 2 - EXAMPLE OF RESPONSE TIME ANALYSIS

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 where 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 documented in References 2, 4, 5, and 6, provided in Enclosure 2.

2.4 Software Modeling Verification

In accordance with Branch Technical Position PSB-1 Section 4, analytical techniques and assumptions used in voltage analyses were verified against actual measurements. The results of the computer program for dynamic simulation were compared to the pre-operational 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 voltages at the 4 kV and 480 V ESF buses were compared to those measured

during the preoperational tests. The analysis resulted in voltages at the 4 kV and 480 V ESF buses that 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. This software modeling verification was submitted to the NRC by letter dated January 18, 1995.

In addition, a special ESF test was performed on Unit 3 in September, 1995 during the Cycle 8 refueling outage. During this special test SCE 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% of nominal bus voltage and a minimum Train B voltage equal to 82.5% of nominal bus voltage. The test demonstrated that these criteria were satisfied. This verification was submitted to the NRC by letter dated May 31, 1996.

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 results of our August, 1993 dynamic analysis simulating the Unit 2 ESF test with one HPSI pump starting indicated a close match between the calculated voltage and frequency values and the actual test values. With the validity of our analytical model thus established, we have concluded that a close match exists between analytical values and actual test values under the two HPSI pumps starting scenario. Based on the above, we have demonstrated by analysis that all possible combinations of adjacent load groups overlapping are acceptable with respect to electrical system and DG performance.

3.0 AMENDMENT PROPOSAL

Southern California Edison proposes to amend SR 3.8.1.18 from its present wording:

> **Verify interval between each sequenced load block is within ± 10% of design interval for each emergency and shutdown load programmed time interval load sequence.**

The proposed revised wording is:

> **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.**

The wording of the NOTE remains unchanged:

> **Credit may be taken for unplanned events that satisfy this SR.**

NO SIGNIFICANT HAZARDS CONSIDERATIONS:

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10 CFR 50.92. A proposed amendment to a facility operating license involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. A discussion of these standards as they relate to this amendment request follows.

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of any accident previously evaluated?

   Response: No

   The proposed change would expand the current surveillance acceptance criteria to more accurately reflect the characteristics of the installed plant equipment. The diesel generators (DG's) have sufficient capacity to maintain adequate voltage and frequency during load sequencing with the expanded tolerance. The overall Engineered Safety Features (ESF) response times in the Technical Specifications and safety analyses are maintained even though the timer tolerance is increased. Therefore, the consequences of any accident previously evaluated are not increased. The DG load sequence timers are not of themselves a credible initiator of any accident, so the probability of an accident has not been increased. The timers will function acceptably to support the equipment needed for accident mitigation, so the consequences of an accident are not increased. Therefore, the probability or consequences of any accident previously evaluated are not increased.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   This amendment request does not involve any change to plant equipment or operation. In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DG's in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident such as a loss of coolant accident. Increasing the timer tolerance will not create the possibility of a new or different kind of accident from any previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

   Response: No

   This amendment does not change the manner in which safety limits, limiting safety settings, or limiting conditions for operations are determined. The actual response times have not been altered by this amendment. Therefore, operation of equipment will not be affected. Accordingly, this amendment will not involve a significant reduction in a margin of safety.

ENVIRONMENTAL CONSIDERATION:

Southern California Edison has determined that the proposed Technical Specification change involves no changes in the amount or type of effluent that may be released offsite, and results in no increase in individual or cumulative occupational radiation exposure. As described above, the proposed TS amendment involves no significant hazards consideration and, as such, meets the eligibility criteria for categorical exclusion set forth in 10CFR51.22(c)(9).

REFERENCES:

1. E4C-082 Rev 1, CCN N-3 System Dynamic Voltages During DBAs

2. Letter from S.D. Root to A.J. Thiel dated March 24, 1995,"Review of ESF Integrated Load Sequence Testing Design Response Time Requirements - Units 2 Cycle 8 San Onofre Nuclear Generating Station, Units 2&3"

3. System Impact Analysis [for NCR 93070031] by Kirk Wells, dated January 31, 1995.

4. N-4080-026 Suppl A Rev 0: LOCA Containment P/T

5. N-4080-027 Suppl A&B Rev 0: MSLB Containment P/T

6. N-4080-003 Rev 5: Containment Spray and Emergency Cooling Unit Actuation Times, CCN1

7. Design Change Package (DCP) 2&3-2077.00SE, "Containment ECUs Sequence Time Modification"

8. SO2-II-11.1A, "Surveillance Requirement Unit 2 ESF Train A Loss of Voltage (LOVS), Degraded Voltage (SDVS, DGVSS), and Sequencing Relays and Circuits Test"

9. SO123-II-11.152, "Circuit Device Tests and Overall Functional Test"

10. Letter dated September 23, 1998, from James W. Clifford (NRC) to Harold B. Ray (SCE), Subject: "Request For Additional Information For Load Sequencer Time Delay Relay Amendment (TAC Nos. M95865 and M95866)"

ATTACHMENT A

EXISTING TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18

UNIT 2

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify interval between each sequenced load block is within ± 10% of design interval for each emergency and shutdown load programmed time interval load sequence.	24 months

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the DGs to their respective buses, all loads are shed except load center feeders and those motor control centers that power Class 1E loads (referred to as "permanently connected" loads). Upon reaching 90% of rated voltage and frequency, the DGs are then connected to their respective buses. Loads are then sequentially connected to the bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The 10% load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 ±0.5 seconds. The tolerance is based on a design interval of 5 seconds.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

ATTACHMENT B

EXISTING TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18

UNIT 3

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify interval between each sequenced load block is within ± 10% of design interval for each emergency and shutdown load programmed time interval load sequence.	24 months

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the DGs to their respective buses, all loads are shed except load center feeders and those motor control centers that power Class 1E loads (referred to as "permanently connected" loads). Upon reaching 90% of rated voltage and frequency, the DGs are then connected to their respective buses. Loads are then sequentially connected to the bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The 10% load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 ±0.5 seconds. The tolerance is based on a design interval of 5 seconds.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

ATTACHMENT C

PROPOSED TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18
(Redline and Strikeout)

UNIT 2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify ~~interval between~~ the timing of each sequenced load block is within ~~± 10% of design interval for each emergency and shutdown load programmed time interval load sequence~~ 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)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

~~As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the DGs to their respective buses, all loads are shed except load center feeders and those motor control centers that power Class 1E loads (referred to as "permanently connected" loads). Upon reaching 90% of rated voltage and frequency, the DGs are then connected to their respective buses. Loads are then sequentially connected to the bus by the programmed time interval load sequence.~~ Under accident conditions, electrical loads are sequentially connected to a DG bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The ~~10%~~ load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses. Table B 3.8.1-1 provides a matrix of loads sequenced by the ESF timing logic. The timer as-left setting requirement and the as-found acceptance criteria are provided in Table B 3.8.1-1.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 ~~±~~ + 2.5/-0.5 seconds. The tolerance is based on a design interval of 5 seconds.

This testing may include any series of sequential, overlapping, or total steps so that all load sequence timers are verified.

(continued)

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA

		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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18 (continued)

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. This surveillance is performed in SR 3.8.1.19. The sequence relays tested under SR 3.8.1.18 are required to support proper DG loading sequence.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during an actual or simulated loss of offsite power signal (LOVS/DGVSS/SDVS) in conjunction with actual or simulated ESF actuation signals (SIAS, CCAS, CSAS, EFAS-1, and EFAS-2). Multiple ESF actuation signals are initiated to simulate worst case DG load sequencing conditions.

In lieu of actual demonstration of shedding, connection, and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire load shedding, connection, and loading sequence is verified.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

ATTACHMENT D

PROPOSED TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18
(Redline and Strikeout)

UNIT 3

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify ~~interval between~~ the timing of each sequenced load block is within ~~± 10% of design interval for each emergency and shutdown load programmed time interval load sequence~~ 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)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

~~As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the DGs to their respective buses, all loads are shed except load center feeders and those motor control centers that power Class 1E loads (referred to as "permanently connected" loads). Upon reaching 90% of rated voltage and frequency, the DGs are then connected to their respective buses. Loads are then sequentially connected to the bus by the programmed time interval load sequence.~~ Under accident conditions, electrical loads are sequentially connected to a DG bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The ~~10%~~ load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses. Table B 3.8.1-1 provides a matrix of loads sequenced by the ESF timing logic. The timer as-left setting requirement and the as-found acceptance criteria are provided in Table B 3.8.1-1.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 ~~±~~ + 2.5/-0.5 seconds. The tolerance is based on a design interval of 5 seconds.

This testing may include any series of sequential, overlapping, or total steps so that all load sequence timers are verified.

(continued)

BASES

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA

		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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18 (continued)

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. This surveillance is performed in SR 3.8.1.19. The sequence relays tested under SR 3.8.1.18 are required to support proper DG loading sequence.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during an actual or simulated loss of offsite power signal (LOVS/DGVSS/SDVS) in conjunction with actual or simulated ESF actuation signals (SIAS, CCAS, CSAS, EFAS-1, and EFAS-2). Multiple ESF actuation signals are initiated to simulate worst case DG load sequencing conditions.

In lieu of actual demonstration of shedding, connection, and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire load shedding, connection, and loading sequence is verified.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

ATTACHMENT E

PROPOSED TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18

UNIT 2

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)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

Under accident conditions, electrical loads are sequentially connected to a DG bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DG due to high motor starting currents. The load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses. Table B 3.8.1-1 provides a matrix of loads sequenced by the ESF timing logic. The timer as-left setting requirement and the as-found acceptance criteria are provided in Table B 3.8.1-1.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 + 2.5/-0.5 seconds. The tolerance is based on a design interval of 5 seconds.

This testing may include any series of sequential, overlapping, or total steps so that all load sequence timers are verified.

(continued)

BASES

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA

		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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18 (continued)

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. This surveillance is performed in SR 3.8.1.19. The sequence relays tested under SR 3.8.1.18 are required to support proper DG loading sequence.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during an actual or simulated loss of offsite power signal (LOVS/DGVSS/SDVS) in conjunction with actual or simulated ESF actuation signals (SIAS, CCAS, CSAS, EFAS-1, and EFAS-2). Multiple ESF actuation signals are initiated to simulate worst case DG load sequencing conditions.

In lieu of actual demonstration of shedding, connection, and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire load shedding, connection, and loading sequence is verified.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

ATTACHMENT F

PROPOSED TECHNICAL SPECIFICATIONS AND BASES
SURVEILLANCE REQUIREMENT 3.8.1.18

UNIT 3

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)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

Under accident conditions, electrical loads are sequentially connected to a DG bus by the programmed time interval load sequence. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DG due to high motor starting currents. The load sequence start time tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses. Table B 3.8.1-1 provides a matrix of loads sequenced by the ESF timing logic. The timer as-left setting requirement and the as-found acceptance criteria are provided in Table B 3.8.1-1.

For the Containment Emergency Cooling Units only, the sequenced time is the actual start time of the Component Cooling Water pumps plus 5 + 2.5/-0.5 seconds. The tolerance is based on a design interval of 5 seconds.

This testing may include any series of sequential, overlapping, or total steps so that all load sequence timers are verified.

(continued)

TABLE B 3.8.1-1: DG LOAD SEQUENCING TIMER ACCEPTANCE CRITERIA

		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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18 (continued)

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. This surveillance is performed in SR 3.8.1.19. The sequence relays tested under SR 3.8.1.18 are required to support proper DG loading sequence.

The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note which acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during an actual or simulated loss of offsite power signal (LOVS/DGVSS/SDVS) in conjunction with actual or simulated ESF actuation signals (SIAS, CCAS, CSAS, EFAS-1, and EFAS-2). Multiple ESF actuation signals are initiated to simulate worst case DG load sequencing conditions.

In lieu of actual demonstration of shedding, connection, and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire load shedding, connection, and loading sequence is verified.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

Enclosure 2

SUPPORTING REFERENCES

CONTENTS OF ENCLOSURE 2

1. E4C-082 Rev 1, CCN N-3 System Dynamic Voltages During DBAs

2. Letter from S.D. Root to A.J. Thiel dated March 24, 1995,"Review of ESF Integrated Load Sequence Testing Design Response Time Requirements - Units 2 Cycle 8 San Onofre Nuclear Generating Station, Units 2&3"

3. System Impact Analysis [for NCR 93070031] by Kirk Wells, dated January 31, 1995.

4. N-4080-026 Suppl A Rev 0: LOCA Containment P/T

5. N-4080-027 Suppl A&B Rev 0: MSLB Containment P/T

6. N-4080-003 Rev 5: Containment Spray and Emergency Cooling Unit Actuation Times, CCN1

7. Design Change Package (DCP) 2&3-2077.00SE, "Containment ECUs Sequence Time Modification"

8. SO2-II-11.1A, "Surveillance Requirement Unit 2 ESF Train A Loss of Voltage (LOVS), Degraded Voltage (SDVS, DGVSS), and Sequencing Relays and Circuits Test"

9. SO123-II-11.152, "Circuit Device Tests and Overall Functional Test"

10. Letter dated September 23, 1998, from James W. Clifford (NRC) to Harold B. Ray (SCE), Subject: "Request For Additional Information For Load Sequencer Time Delay Relay Amendment (TAC Nos. M95865 and M95866)"