UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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October 24, 2008

Ross T. Ridenoure
Senior Vice-President and
Chief Nuclear Officer
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION - NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000361/2008010 and 05000362/2008010

Dear Mr. Ridenoure:

On September 3, 2008, the US Nuclear Regulatory Commission (NRC) completed a component design bases inspection at your San Onofre Nuclear Generating Station Units 2 and 3. The enclosed report documents our inspection findings. The preliminary findings were discussed on July 17, 2008, with Mr. Ed Scherer and other members of your staff. After additional in-office inspection, a final telephonic exit meeting was conducted on September 11, 2008, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The team reviewed selected procedures and records, observed activities, and interviewed cognizant plant personnel.

Based on the results of this inspection, the NRC has identified six findings that were evaluated under the risk significance determination process. Violations were associated with all of the findings. All six of the findings were found to have very low safety significance (Green) and the violations associated with these findings are being treated as noncited violations, consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest any of the noncited violations, or the significance of the violations you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the US Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 612 East Lamar Boulevard, Suite 400, Arlington, Texas 76011; the Director, Office of Enforcement, US Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the San Onofre Nuclear Generating Station.

In accordance with Code of Federal Regulations, Title 10, Part 2.390 of the NRC's Rules of Practice, a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Russell L. Bywater, Chief
Engineering Branch 1
Division of Reactor Safety

Dockets: 50-361;50-362
License: NPF-10
NPF-15

Enclosure:
Inspection Report 05000361/2008010 and 05000362/2008010
w/Attachments: Attachment 1: Supplemental Information

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SUNSI Review Completed: __KDC_ADAMS: X Yes ☐ No Initials: _KDC__
X Publicly Available ☐ Non-Publicly Available ☐ Sensitive X Non-Sensitive

R:REACTORS/SO 2008010 KDC ML 082980701

EB1	EB1	EB1	EB1	EB1	DRP: D	EB1: C
KClayton;	MBloodgood;	LEllershaw	PGage	JAdams	MHay;	RBywater
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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket:	50-361, 50-362
Licenses:	NPF-10, NPF-15
Report Nos.:	05000361/2008010 and 05000362/2008010
Licensee:	Southern California Edison Company (SCE)
Facility:	San Onofre Nuclear Generating Station, Units 2 and 3
Location:	5000 S. Pacific Coast Hwy San Clemente, California
Dates:	June 23-27, 2008 and July 7-17, 2008 onsite July 21-Sept 3, 2008 in office inspection
Team Leader:	K. Clayton, Senior Reactor Inspector, Engineering Branch 1
Team:	L. Ellershaw, PE, Senior Reactor Inspector P. Gage, Senior Operations Engineer Dr. J. Adams, Reactor Inspector
Accompanying Personnel:	G. Skinner, Electrical Contractor (Beckman) C. Baron, Mechanical Contractor (Beckman) M. Bloodgood, Reactor Inspector (in training) Dr. D. Reinert, Reactor Inspector, NSPDP (in training)
Approved By:	Russ Bywater, Chief Engineering Branch 1

SUMMARY OF FINDINGS

IR 05000361/2008010 and 050000362/2008010; June 23-27, 2008, and July 7-17, 2008, onsite with in office inspection the weeks of July 21-September 3, 2008; San Onofre Nuclear Generating Station: baseline inspection, NRC Inspection Procedure 71111.21, "Component Design Basis Inspection."

The report covers an announced inspection by a team of four regional inspectors, two contractors, and two inspectors in training. Six noncited violations (NCVs) were identified. All six violations were of very low safety significance. The final significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified Findings

Cornerstone: Mitigating Systems

- Green. The team identified a noncited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," for failure to ensure that plant conditions were consistent with design calculation inputs and assumptions (rate of established component cooling water heat exchanger tube plugging). Specifically, there were no procedures to verify that the periodic heat treatments of the intake tunnel and intake structure were effective and that the population of shells available for plugging the component cooling water heat exchangers was consistent with the historical data used to develop the engineering calculation and operating instruction curves. As a result, the design basis calculation and operating instructions did not ensure the capability of the heat exchangers to perform their design function during anomalous conditions. The licensee has entered this into their corrective action program as Notification NN 200006369.

  This finding is more than minor in that the performance of the component cooling water heat exchangers is essential in protecting the mitigating systems cornerstone objective (design control and equipment performance attributes) of ensuring the availability, reliability, and capability of systems needed to mitigate the consequences of an accident. Specifically, the existing design analyses did not adequately demonstrate that the component cooling water heat exchangers would perform adequately in the event of anomalous tube plugging events and plant procedures did not ensure that these anomalous events would be detected and mitigated prior to the heat exchangers being plugged. These deficiencies represented reasonable doubt regarding the operability of the component cooling water heat exchangers. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because the deficiency did not result in a loss of safety function of component cooling water Train A for greater than the Technical Specification allowed outage time. Train B was not adversely affected by this event. This finding was reviewed for cross-cutting aspects and none were identified since the performance deficiency is long standing and is not indicative of current licensee performance (Section 1R21.2.11)

- Green. The team identified a noncited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," for failure to properly analyze voltage drop in 125 Volts Direct Current control circuits. Specifically, the licensee failed to consider and analyze the voltage drop that occurs in control circuit elements such as cables, relay contacts, and fuses that could result in considerably lower voltage at the devices than is available at the corresponding distribution panels. The licensee has entered this into their corrective action program as Notifications NN 200051692 and NN 200059581.

  This finding is more than minor because it is associated with the mitigating systems cornerstone objective (design control attribute) of ensuring the availability and reliability of safety systems, and closely parallels inspection manual chapter 0612, Appendix E, Example 3.j, in that there was reasonable doubt regarding the capability of the 125 Volts Direct Current system to perform its intended function pending reanalysis. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because the 125 Volts Direct Current system was determined to have sufficient voltage margin to accommodate the additional voltage drop in the circuit elements that had not been considered. This finding was reviewed for cross-cutting aspects and none were identified (Section 1R21.2.14.1)

- Green. The team identified a noncited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for failure to identify, evaluate, or correct conditions adverse to quality. Specifically, in 2007 the licensee failed to recognize, evaluate, or write an action request when the performance test for Station Battery 2B008 was terminated early due to test equipment issues. The licensee has entered this into their corrective action program as Notification NN 200060319.

  This finding is more than minor because it is associated with the mitigating systems cornerstone objective (equipment performance attribute) of ensuring the availability and reliability of safety systems. Specifically, the failure to verify that battery testing anomalies are recognized, evaluated, and corrected is a condition adverse to quality with respect to ensuring that the battery would be capable of performing its design function. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a Technical Specification allowed outage time, and did not affect external event mitigation. This finding was reviewed for cross-cutting aspects and none were identified (Section 1R21.2.14.3).

- Green. The team identified a noncited violation of 10 CFR 50, Appendix B, Criterion V, "Instruction, Procedures, and Drawings," for failure to follow procedures while performing the battery performance tests. Specifically, on four occasions, performance tests for Battery 2B008 were terminated early instead of continuing the tests until reaching one of the test termination criteria in the applicable test procedure. The licensee has entered this into their corrective action program as Notification NN 200060319.

This finding was more than minor because it was associated with the mitigating systems cornerstone (equipment performance attribute) and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a Technical Specification allowed outage time, and did not affect external event mitigation. This finding has a cross-cutting aspect in the area of human performance (Work Practices component) because the licensee did not ensure that appropriate error prevention techniques were used to avoid deviation from the test termination criteria provided in test procedures [H.4.(a)] (Section 1R21.2.14.4).

- Green. The team identified a noncited violation of Technical Specification 5.5.1.a for inadequate procedures for 480 Volts Alternating Current system grounds. Specifically, the procedures do not identify the deleterious effects of 480 Volts Alternating Current system grounds on connected equipment, or the proper sense of urgency in removing grounds. Due to inadequate procedures for alarm response and abnormal operations, the licensee was slow in responding to a ground alarm on Bus 3B04 in March of 2008. It took 19 hours to identify and remove the ground. This indicated a routine, rather than a prompt response and may have exposed connected equipment to overvoltage for an unnecessarily long period of time. The licensee has entered this into their corrective action system as Notifications NN 200057494 (addresses trending of ground faults) and NN 200057495 (addresses procedure change).

  This finding was more than minor because the procedure deficiency affected the mitigating system cornerstone objective (procedure quality attribute) of ensuring availability, reliability, and capability of systems needed to respond to initiating events to prevent undesired consequences. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because the finding was not a design or qualification deficiency, did not result in a loss of safety function, and did not screen as potentially risk significant due to external events. This finding was reviewed for cross-cutting aspects and none were identified (Section 1R21.2.16).

Cornerstone: Initiating Events

- Green. The team identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," for the failure of operations management, operations training, and engineering to ensure that conditions adverse to quality are promptly identified and corrected. Specifically, multiple reactivity excursions occurred in the plant over the past two years, where corrective actions have been ineffective at addressing blended flow evolutions. The licensee has entered this into their corrective action program as Notifications NN 200062659 (addresses procedure change) and NN 200006366 (addresses common cause evaluation).

  The finding is more than minor because it is associated with the initiating events cornerstone (human performance attribute) and affects the associated cornerstone objective to limit the likelihood of those events that upset plant stability and challenge the critical safety functions during shutdown as well as power operations. If left uncorrected, the conditions would continue to contribute to additional operator errors or significantly impact the operator’s ability to perform blended flow evolutions. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating equipment or functions will not be available. This finding has a crosscutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate problems such that resolutions address causes and extent of condition [P.1(c)] (Section 4OA2).

B. Licensee-Identified Violations.

No findings of significance were identified.

REPORT DETAILS

1 REACTOR SAFETY

Inspection of component design bases verifies the initial design and subsequent modifications and provides monitoring of the capability of the selected components and operator actions to perform their design bases functions. As plants age, their design bases may be difficult to determine and important design features may be altered or disabled during modifications. The plant risk assessment model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectable area verifies aspects of the initiating events, mitigating systems, and barrier integrity cornerstones for which there are no indicators to measure performance.

1R21 Component Design Bases Inspection (71111.21)

The team selected risk-significant components and operator actions for review using information contained in the licensee's probabilistic risk assessment. In general, this included components and operator actions that had a risk achievement worth factor greater than two or a Birnbaum value greater than 1E-6.

a. Inspection Scope

To verify that the selected components would function as required, the team reviewed design basis assumptions, calculations, and procedures. In some instances, the team performed calculations to independently verify the licensee's conclusions. The team also verified that the condition of the components was consistent with the design bases and that the tested capabilities met the required criteria.

The team reviewed maintenance work records, corrective action documents, and industry operating experience records to verify that licensee personnel considered degraded conditions and their impact on the components. For the review of operator actions, the team observed operators during simulator scenarios, as well as during simulated actions in the plant.

The team performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design issues, margin reductions because of modifications, and margin reductions identified as a result of material condition issues. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as failed performance test results; significant corrective actions; repeated maintenance; 10 CFR 50.65(a)1 status; operable, but degraded, conditions; NRC resident inspector input of problem equipment; system health reports; industry operating experience; and licensee problem equipment lists. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in-depth margins.

The inspection procedure requires a review of 20-30 risk-significant and low design margin samples in the following categories: components, operator actions, and operating experience. The sample selection for this inspection was 16 components, five operator actions, and four operating experience items.

The components selected for review are listed below with a brief description of the attributes reviewed for that component. The four operating experience samples and the five operator actions selected for review are located in section 1R21.3 and section 1R21.4 of this report, respectively.

This report covers a transitional period for San Onofre Nuclear Generating Station's corrective action document tracking system. During the first portion of the inspection all corrective action documents were called Action Requests (or ARs). The week of July 1, 2008, the entire site (all units) transitioned to a new corrective action document system that utilizes documents called notifications (or NNs). Therefore, both record types are referenced in this report.

During the week of July 4, 2008, the resident inspectors reviewed documents pertaining to equipment on the sample selection list provided to them from the Component Design Basis Inspection (CDBI) team leader and discovered a loose electrical connection Action Request document with the 2D2 bus (vital 125 volts direct current bus) and its associated 2B008 battery. An event occurred in March 2008 involving the discharge of the 2B008 vital battery below its Technical Specification limit that required entry into a 2-hour Technical Specification Action Statement. While the licensee was preparing to shut down Unit 2 as part of the Action Statement, the problem was found in the battery's output breaker to the 2D2 bus. Several of the fasteners that connected the battery bus to the battery output breaker for this bus were several turns loose. Further review and questioning by the resident inspector staff at San Onofre during the July 4th week led to discussions with NRC senior management about the previous Operability Assessment of this battery and its associated vital bus. The NRC senior regional management staff, along with headquarters management, decided that the CDBI team could continue the review of the 2D2 bus and corresponding 2B008 battery as part of the sample in lieu of a special inspection team because this appeared to be an isolated issue and did not have generic implications for other equipment. The CDBI team would provide a more detailed focus on loose connections on these components as well as the remaining 15 components selected for inspection. The CDBI team found approximately 13 AR documents with loose connection issues, with a majority of these electrical connections found stripped from being over-tightened or found several turns loose. Several of these components that had a history of electrical connection issues were extremely risk-significant, including the Unit 3 Train B Emergency Diesel Generator 3G002, the Unit 2 battery 2B008 and its associated 2D2 bus, and an Emergency Chiller. The CDBI team called NRC Region 4 to discuss these issues with NRC senior management and the decision was made to conduct a special inspection at San Onofre for the loose electrical connection issues. The CDBI team turned over all potential findings regarding loose electrical connections for the 2D2 bus and 2B008 battery as well as the 13 AR's to the NRC Region 4 Special Inspection Team on July 30, 2008. This included all potential findings in training, procedures, and maintenance practices as they related to the 2D2 bus/2B008 battery and the 3G002 Emergency Diesel Generator.

.2 **Results of Detailed Reviews for Components:**

.2.1 Component Cooling Water (CCW) Pump 2P025:

a. Inspection Scope

The team reviewed corrective action documents (listed as Action Requests in the back of the report as ARs) for this component to look for repeat problems and adequate corrective actions to repair; verified motive energy source is safety-grade; reviewed several Inservice Test (IST) results – including procedures, measurement uncertainties and vendor pump curves - to verify the pump was not degraded and that the actual pump performance exceeded the operability curve by an amount that exceeds measurement uncertainties; verified that loss of non-safety grade instrument air would not compromise the ability of the pump to fulfill its safety function during accident conditions; verified the pump will meet its startup time requirement, even in the event of a loss of voltage accident; reviewed permanent plant modification documents to ensure they were performed in accordance with 10 CFR 50.59 and to look for loose bolt conditions; conducted a walk-down to verify general equipment conditions and to examine two permanent plant modifications on this pump.

b. Findings

No findings of significance were identified.

.2.2 Safety Injection Tank 2SIT-10:

a. Inspection Scope

The team reviewed AR documents to determine whether issues involving inadvertent pressure fluctuations are adequately addressed; reviewed pressure and level instrumentation responses and calibrations and pressure/level surveillance procedures to ensure the tank will adequately perform its safety function in the case of a Loss-of-Coolant Accident (LOCA) – compared against assumptions in the LOCA analysis - to ensure important-to-safety parameters are periodically verified and that measurement uncertainties are adequately accounted for; reviewed calculations to verify tank sizing (minimum and maximum liquid volumes and minimum and maximum pressures) and level transducer uncertainties.

b. Findings

No findings of significance were identified.

.2.3 Main Feedwater Isolation Valve 2HV4048:

a. Inspection Scope

The team reviewed AR documents to determine whether issues are being adequately addressed and corrected; reviewed calculations relating IST test acceptance criteria with Design Basis Accident assumptions and compared Design Basis Documents, Updated Safety Analysis Report, and Technical Specification values with those used in the calculations; reviewed procedures and results from IST testing to verify that this component is not degrading; reviewed the Design Basis Document to understand the safety function for this component; reviewed the permanent plant modification documents to ensure that they were performed in accordance with 10 CFR 50.59 and to look for loose bolt conditions.

b. Findings

No findings of significance were identified.

.2.4 Atmospheric Dump Valve 2HV8419:

a. Inspection Scope

The team reviewed AR documents to determine whether issues are being adequately addressed and corrected; reviewed IST procedures and test results to ensure this valve is not degrading and is able to fulfill its safety function; reviewed the accumulator sizing calculations to ensure the accumulator has sufficient capacity and is maintained adequately to provide the motive force for the 8-hour safety function requirement.

b. Findings

No findings of significance were identified.

.2.5 Main Steam Isolation Valve 2HV8204:

a. Inspection Scope

The team reviewed Technical Specifications, Updated Final Safety Analysis Report, Design Basis Documents, calculations, design drawings, and plant procedures to verify the appropriateness of design assumptions, boundary conditions, and models. This review was also conducted to verify that the licensee's analytical methods were appropriate. The team verified that design assumptions and limitations were translated to operational and testing procedures. IST data (i.e., stroke test closed, fail safe test closed, power operated valve non-timed stroke exercise, and position indicator test) was reviewed. Plant personnel were interviewed and a component walk down was conducted to verify that potential degradation was being monitored or prevented. The walk down also verified that the observable material condition would support the design operation, component configuration was being maintained consistent with design assumptions, and the equipment was adequately protected from external events. The team also reviewed operating experience history, maintenance history, and corrective action history to verify that potential degradation was being monitored or prevented and that component replacement was consistent with qualification life.

b. Findings

No findings of significance were identified.

.2.6 High Pressure Safety Injection (HPSI) Pump S21204MP019:

a. Inspection Scope

The team reviewed HPSI Pump S21204MP019, Unit 2, Train B, system hydraulic, Net Positive Suction Head (NPSH), and minimum performance calculations. The team reviewed surveillance test acceptance criteria bases and test results to verify that the pumps had sufficient capacity at the minimum acceptable performance. The team verified that the pump had adequate protection for potential minimum flow and run-out conditions. The team reviewed corrective action documents and maintenance associated with the equipment to verify that degraded conditions were appropriately addressed. The team reviewed operating experience associated with this component to verify that the information was adequately addressed. The team reviewed component modifications, engineering design changes, and field change notices to verify that the performance capability of the equipment was not degraded due to component alterations. The team reviewed operating procedures and control logic associated with the pump and associated equipment to verify that the equipment was capable of performing the design function.

b. Findings

No findings of significance were identified.

.2.7 Emergency Chiller SA1513ME335:

a. Inspection Scope

The team reviewed Emergency Chiller SA1513ME335, Loop B, heat capacity, performance, and set-point calculations to verify that the equipment was capable of performing the design function. The team reviewed surveillance test acceptance criteria bases and test results to verify that the chiller had sufficient cooling capacity. The team reviewed corrective action documents and maintenance associated with the equipment to verify that degraded conditions were appropriately addressed. The team reviewed drawings and control schematics to verify that the component control logic is consistent with design bases. The team reviewed operating procedures and control logic to verify that the equipment was capable of performing the design function. The team reviewed component modifications, engineering design changes, and field change notices to verify that the performance capability of the equipment was not degraded due to component alterations. The team performed a walk down of the emergency chiller and associated components to verify that the material condition and configuration of the equipment was consistent with design requirements.

b. Findings

No findings of significance were identified.

.2.8 Refueling Water Tanks, T005 & T006:

a. Inspection Scope

The team reviewed the Updated Safety Analysis Report, Design Basis Documents, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the tanks to perform their intended function during design basis events. The team reviewed various calculations to evaluate the inventory, instrument uncertainty, and transfer set-point of the tanks. The team reviewed the vortex limit and NPSH calculations for the pumps related to the tanks to verify adequate water level prior to transfer to the containment sumps and that adequate water would be transferred to the containment sump. The team also reviewed operating procedures related to the tanks to ensure they were consistent with the design basis.

b. Findings

No findings of significance were identified.

.2.9 Saltwater Cooling (SWC) Pump, 3P307:

a. Inspection Scope

The team reviewed the Updated Safety Analysis Report, Design Basis Documents, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the pump to perform its intended function during design basis events. The team reviewed SWC system flow calculations and system test acceptance criteria and results to evaluate the capability of the pump to provide the required flow to the CCW heat exchanger under the most limiting accident conditions. The team reviewed the calculations and procedures related to the periodic backwash and heat treatment of the SWC to verify adequate SWC would be available whenever the system was considered operable. The team also reviewed operating procedures related to the pump to ensure that they were consistent with the design basis calculations and the licensing basis. The team also reviewed alternating current flow and voltage calculations to determine whether adequate motive power was available to start and run the pump during worst case degraded voltage and service conditions. The team reviewed maintenance and corrective action documents to determine if the equipment has exhibited adverse performance trends.

b. Findings

No findings of significance were identified.

.2.10 Containment Emergency Sump Motor Operated Valve (MOV), 3HV9303:

a. Inspection Scope

The team reviewed the Updated Safety Analysis Report, Design Basis Documents, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the MOV to perform its intended function during design basis events. The team reviewed Generic Letter 89-10 calculations to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations, including the potential to pressurize the pipe between the normally closed sump isolation valves. The team reviewed electrical calculations to verify the appropriate voltage values were included in the valve calculations. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis. The team reviewed alternating current flow and voltage calculations to determine if adequate motive power was available during worst case degraded voltage and service conditions. The team reviewed motor control center control circuit voltage drop calculations to determine whether MOV contactors had adequate voltage to pick up when required. The team reviewed elementary wiring diagrams to determine whether control logic was in conformance with the design bases.

b. Findings

No findings of significance were identified.

.2.11 Component Cooling Water (CCW) Heat Exchanger, 2E-002:

a. Inspection Scope

The team reviewed the Updated Safety Analysis Report, Design Basis Documents, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the heat exchanger to perform its intended function during design basis events. The team reviewed CCW thermal performance calculations and heat exchanger test acceptance criteria and results to evaluate the capability of the heat exchanger to maintain the required CCW system supply temperature under the most limiting accident conditions. The team reviewed the calculations and procedures related to the periodic backwash and heat treatment of the heat exchanger tubes to verify adequate SWC flow and heat transfer capability would be available whenever the system was considered operable. The team also reviewed operating procedures related to the heat exchanger to ensure they were consistent with the design basis calculations and the licensing basis.

b. Findings

Introduction: The team identified a Green noncited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, "Design Control," for failure to ensure that plant conditions were consistent with design calculation inputs and assumptions (rate of established CCW heat exchanger tube plugging). Specifically, there were no established procedures to verify that the periodic heat treatments of the intake tunnel and intake structure were effective and that the population of shells available for plugging the CCW heat exchangers was consistent with the historical data used to develop the engineering calculation and operating instruction curves. As a result, the design basis calculation and operating instructions did not ensure the capability of the heat exchangers to perform their design function during anomalous conditions.

Description: The SWC system was designed to provide cooling water to the CCW heat exchangers under both normal and post-accident conditions. During normal operation, the operability of the SWC system was verified, in part, based on a set of curves included in operating instructions SO23-2-8, "Saltwater Cooling System Operation," revision 29. These curves provided the operators with the minimum required SWC flow as a function of SWC temperature and CCW heat exchanger differential pressure during normal operation, and with SWC flow as a function of SWC temperature during reverse (backwash) flow operation. During normal operation, the operators verified that the required SWC operating conditions were met and normally initiated backwash of the CCW heat exchangers when the operational limits were approached. The SWC operating instructions also allowed the SWC system to be operable during reverse (backwash) flow operation if the required SWC operating conditions (temperature and flow) were met. To initiate backwash flow, the operators were directed to stop the applicable SWC pump, change manual valve positions, and restart the SWC pump. After operating with backwash flow for some period of time, the process was reversed to restore the normal system configuration. In addition, the plant design did not include instrumentation to monitor CCW heat exchanger differential pressure during backwash operation and the operating procedures did not include any specific time limits for the SWC system to be operable under reverse (backwash) flow operation.

The operating instruction curves were developed by engineering calculation M-0027-023, "CCW/SWC Heat Exchanger Operability," revision 0 (including calculation change notices through CCN-10, February 22, 2008). This calculation determined the minimum SWC flows that would be required to maintain the maximum CCW system supply temperature limit under design basis accident conditions. The calculation considered the performance of the CCW heat exchanger under degraded conditions, assuming that various percentages of the heat exchanger tubes were plugged with debris from the SWC system. The percentage of plugged tubes was correlated to the pressure differential across the tube side of the heat exchanger at various SWC flows. The calculation assumed that an accident could occur when the SWC operating limits had been reached and that the CCW heat exchanger differential pressure would continue to increase during the accident due to additional tube plugging. The assumed rate of tube plugging was based on a review of historical CCW heat exchanger differential pressure data, the maximum rate of tube plugging was extracted from approximately six years of actual plant data and applied to the limiting accident conditions. The resulting curves were intended to represent the limiting SWC "starting points" that provide acceptable performance for a design basis accident with a postulated single failure.

The inspection team questioned if these operating instruction curves would ensure the capability of the SWC system to perform its design function under the most limiting conditions; specifically, the team was concerned that the predicted rate of tube plugging used in calculation M-0027-023 might not bound any anomalous conditions that were not representative of the historical plant data. Anomalous conditions would include an unusually high rate of tube plugging, such as experienced on June 3, 2008, when unexpected rapid fouling of unit 2, train A CCW heat exchanger occurred. Historically, the primary cause of CCW heat exchanger tube plugging was clam shells that were ingested by the SWC pumps and were of sufficient size to plug the 3/4-inch CCW heat exchanger tubes. The plant's strategy to minimize tube plugging included periodic heat treatment of the intake tunnel and intake structure to kill the majority of the clams while they were still less than approximately 3/8-inch long. It was expected that some amount of these shells would carry over the traveling screens and be ingested by the SWC pumps. However, the majority of these small shells were expected to pass through the CCW heat exchangers without causing significant plugging. The team's concern was that, in the event of an ineffective heat treatment, a significant population of larger clams (3/8-inch to 1-inch long) might be allowed to grow prior to the next scheduled heat treatment. In that case, the subsequent heat treatment could result in more rapid plugging of the heat exchangers due to the larger shells. As discussed in Apparent Cause Evaluation (ACE) 080600076-1, a heat treatment of this intake structure was performed on March 30, 2008 and a subsequent heat treatment was performed on May 31, 2008. On June 3, 2008 and following days, this heat exchanger experienced rapid plugging. Subsequent inspections identified a population of larger shells in the intake structure, inferring that the March 30, 2008 heat treatment was not fully effective.

The inspection team determined that there were no specific procedures to verify that the periodic heat treatments of the intake tunnel and intake structure were effective and that the population of shells available for plugging the CCW heat exchangers was consistent with the historical data used to develop the engineering calculation and operating instruction curves. As a result, there was a potential for anomalous conditions that were not bounded by the subject calculation and operating instruction.

Analysis: The failure to assure that plant conditions were consistent with design calculation inputs and assumptions (rate of established CCW heat exchanger tube plugging) is a performance deficiency. This finding is more than minor in that the performance of the CCW heat exchangers is essential in protecting the mitigating systems cornerstone objective (design control and equipment performance attributes) of ensuring the availability, reliability, and capability of systems needed to mitigate the consequences of an accident. Specifically, the existing design analyses did not adequately demonstrate that the CCW heat exchangers would perform adequately in the event of anomalous tube plugging events and plant procedures did not ensure that these anomalous events would be detected and mitigated prior to the heat exchangers being plugged. These deficiencies represented reasonable doubt regarding the operability of the CCW heat exchangers. Using the Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because the deficiency did not result in a loss of safety function of CCW Train A for greater than the Technical Specification allowed outage time. Train B was not adversely affected by this event. This finding was reviewed for cross-cutting aspects and none were identified since the performance deficiency is long standing and is not indicative of current licensee performance.

Enforcement: Title 10 CFR 50, Appendix B, Criterion III, "Design Control," states, in part, that measures be established to assure that applicable regulatory requirements and the design basis, as defined in Section 50.2, are correctly translated into procedures and instructions. Contrary to the above, the licensee failed to ensure that plant conditions were consistent with design basis analyses. Specifically, the licensee failed to ensure that the CCW heat exchangers would perform adequately in the event of anomalous tube plugging events because plant procedures did not ensure that these anomalous events would be detected and mitigated prior to the heat exchangers being plugged. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as Notification 200006369 (AR 080600076), this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 050000361, 050000362/2008010-01, "Inadequate Design Control for Design Basis of CCW Heat Exchangers."

.2.12 Turbine Driven Auxiliary Feedwater Pump Steam Inlet MOV 3HV4716:

a. Inspection Scope

The team reviewed the USAR, Design Basis Documents, selected drawings, calculations, maintenance records, and operating procedures to verify the capability of the motor operated valve to perform its intended function during design basis events. The team reviewed generic letter 89-10 calculations to evaluate the capability of the valve to change position as required under the most limiting accident conditions. The team reviewed the calculations to verify that the most limiting system operating conditions were considered in the calculations. The team reviewed electrical calculations to verify the appropriate voltage values were included in the valve calculations. The team also reviewed operating procedures related to the valve to ensure they were consistent with the design basis calculations and the licensing basis.

b. Findings

No findings of significance were identified.

.2.13 Emergency Diesel Generator 3G002:

a. Inspection Scope

The team reviewed static loading calculations to determine whether the maximum automatic and manual load expected during worst case accident conditions was within the specified ratings of the diesel generators. The team reviewed load sequencing logic and dynamic loading calculations to determine whether the transient loading expected during worst case conditions was within the capability of the diesel generators. The team reviewed Emergency Diesel Generator testing procedures and results to determine whether they were consistent with licensing basis requirements, and whether they demonstrate adequate performance. The team reviewed permissible frequency variations to determine whether they have been properly accounted for in pump performance and diesel loading calculations. The team reviewed maintenance and corrective action documents to determine whether the equipment has exhibited adverse performance trends. The team performed a visual inspection of the Emergency Diesel Generators to assess materiel condition and the presence of hazards.

b. Findings

No findings of significance were identified.

.2.14 125VDC Battery 2B008 and 125VDC Distribution Panel 2D2:

a. Inspection Scope

The team reviewed battery sizing and voltage drop calculations to determine whether the battery would have sufficient capacity and capability to supply its design loads during accident and SBO scenarios. The team reviewed voltage drop calculations to determine whether loads had sufficient voltage to operate when required. The team reviewed battery surveillance test procedures and completed surveillances to determine whether tests were being performed in accordance with Technical Specifications and applicable IEEE standards, and whether the acceptance criteria was consistent with design calculations. The team reviewed vendor manuals, maintenance procedures, completed Maintenance Orders (MO) to determine whether maintenance was performed in accordance with vendor recommendations. The team reviewed system health, maintenance, and corrective action documents to determine whether the equipment has exhibited adverse performance trends. The team performed a visual inspection of batteries, the distribution panels, and their environs to assess material condition, and the presence of hazards.

b. Findings

1. Failure to Correctly Analyze 125VDC Control Circuit Voltage Drop

Introduction: The team identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," for failure to properly analyze voltage drop in 125VDC control circuits.

Specifically, the licensee failed to consider and analyze the voltage drop that occurs in control circuit elements such as cables, relay contacts, and fuses that could result in considerably lower voltage at the devices than is available at the corresponding distribution panels.

Description: Calculation E4C-017 included voltage acceptance criteria of 100 VDC at certain 125 VDC control panels based on the ratings of relays and other devices in the panels. The calculation did not consider or analyze the voltage drop in control circuit elements, including cables, relay contacts and fuses downstream of the panels that could result in considerably lower voltage at the devices than is available at the panel. In some cases the minimum voltage required by devices was actually 100 VDC, so the acceptance criterion was inadequate to assure their operability. In response to the inspector's concerns, the licensee performed preliminary calculations to show that all devices would have adequate voltage based on actual minimum expected panel voltages and estimated circuit lengths.

Analysis: The licensee's failure to consider the voltage drop control circuit elements was a performance deficiency. This finding is more than minor because it is associated with the mitigating systems cornerstone objective (equipment performance attribute) of ensuring the availability and reliability of safety systems, and closely parallels IMC 0612, Appendix E, Example 3.j, in that there was reasonable doubt regarding the capability of the 125 VDC system to perform its intended function pending reanalysis. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because the 125 VDC system was determined to have sufficient voltage margin to accommodate the additional voltage drop in the circuit elements that had not been considered. This finding was reviewed for cross-cutting aspects and none were identified.

Enforcement: Title 10 CFR 50, Appendix B, Criterion III, "Design Control," states, in part, that design control measures be established and implemented to assure that applicable regulatory requirements and the design basis for structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, the licensee failed to implement applicable design bases for the 125 VDC control circuitry. Specifically, the licensee failed to consider or analyze the voltage drop in control circuit elements, including cables, relay contacts and fuses downstream of 125 VDC distribution panels. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as Notifications NN 200051692 and NN 200059581, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000361, 05000362/2008010-02 "Inadequate Design Control for 125 VDC Control Circuits."

2. Omission of Station Black-Out (SBO) Profile during Battery Service Tests

Introduction: The team identified an unresolved item (URI) associated with Technical Specification Surveillance 3.8.4.7 for omission of the SBO profile (and corresponding test duration of 240 minutes) during the battery service test. The calculation for battery size and minimum battery voltage clearly indicates that the SBO condition is more limiting than the Loss of Voltage Signal/Safety Injection Actuation Signal (LOVS/SIAS) condition.

Description: Service test Procedure SO123-I-2.5 used to satisfy Technical Specification Surveillance 3.8.4.7 is based on the LOVS/SIAS profile instead of the more limiting SBO profile. The USAR, section 8.3.2.1.2.1, states that the blackout duty cycles for Batteries A and B can be met for 4 hours per Battery Sizing Calculation E4C-017. Technical Specification 3.8.4.7 requires a battery service test to verify battery capacity is adequate to supply and maintain in operable status the required emergency loads for the design duty cycle. The Institute of Electrical and Electronic Engineers (IEEE) 450-1980 requires the discharge rate and test length for the service test to correspond as closely as possible to the battery duty cycle. Calculation E4C-017 analyzed a 90 minute duty cycle for the LOV/SIAS scenario and a 4 hour duty cycle for the SBO scenario. The load profile required by procedure SO123-I-2.5 requires a discharge rate of 471 Amps for the first minute, 173 Amps for minutes 2 through 89, and 252 Amps for the last minute. The Battery 2B008 duty cycle determined in Calculation E4C-017 for the SBO scenario was 341 Amps for the first minute, 193 Amps for minutes 2 through 29 minutes, 234 Amps for the 30th minute, 155 Amps for minutes 31 through 239, and 238.95 Amps for the last minute. Although the profiles are not directly comparable, Calculation E4C-017 demonstrated that the SBO profile was the more limiting profile for battery sizing, requiring an uncorrected size of 5.01 positive plates per cell vs. 4.60 for the LOV/SIAS profile. In addition, the calculation showed that the SBO profile was more limiting with respect to minimum battery voltage with an expected minimum voltage of 106.72V for the SBO profile vs. 108.81V for the LOV/SIAS profile. The licensee initiated Notification NN 200061041 to address this issue. This issue was opened to determine if the SONGS current licensing basis requires the performance of a service test to demonstrate the capability of the batteries to complete all design duty cycles (including SBO) defined in the USAR. Pending completion of this determination by the NRC, this issue is identified as URI 05000361 and 050000362/2008010-03, "Omission of Station Blackout Profile During Battery Service Tests."

3. Inadequate Corrective Actions for Battery Performance Test Issues

Introduction: The team identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for failure to identify, evaluate, or correct conditions adverse to quality. Specifically, in 2007 the licensee failed to recognize, evaluate, or write an AR for issues that prevented completion of the performance test for Station Battery 2B008 due to test equipment issues.

Description: San Onofre Nuclear Generating Station's (SONGS) battery performance tests were required to be performed in accordance with Maintenance Procedure SO123-1-2.6. The procedure provided three test termination criteria in step 6.3.8, which included battery overall shut down voltage reached, battery cell(s) temperature exceeding 110°F, or any battery intercell connection showing evidence of excessive heating. The team noted that the performance test performed on the Unit 2 station battery 2B008 on January 23, 2007, was terminated because of "load bank not maintaining load." This was not one of the test termination criteria listed in the procedure but the test was marked "Sat" (satisfactory). The licensee failed to recognize, evaluate, or write an AR at that time to document the apparent test equipment failure, or to assess whether the battery performance test needed to be repeated. The team noted that the actual test results showed that the discharge rate and duration of the test were sufficient to establish a battery capacity of at least 100 percent of its ratings. Because the battery is considered operable if its capacity is over 80 percent, operability criteria did not appear to have been violated.

Analysis: The team determined that the licensee's failure to identify, evaluate, or correct conditions adverse to quality was a performance deficiency that was reasonably within their ability to foresee and prevent. Specifically, in 2007, the licensee failed to recognize, evaluate, or take any action when the performance test for Station Battery 2B008 was terminated early due to test equipment issues. This finding was more than minor because it was associated with the mitigating systems cornerstone (equipment performance attribute) and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Using the Inspection Manual Chapter 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. This finding has a cross-cutting aspect in the area of human performance (Work Practices component) because the licensee did not ensure that appropriate error prevention techniques were used to avoid deviation from the test termination criteria provided in test procedures [H.4.a].

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that conditions adverse to quality are promptly identified and corrected. Contrary to this requirement, as of January 23, 2007, the licensee failed to identify, evaluate, or correct conditions adverse to quality involving a test equipment failure that resulted in the early termination of a required battery performance test. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as Notification NN 200060319, this violation is being treated as a NCV consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000361/2008010-04, "Inadequate Corrective Actions for Battery Performance Tests Issues."

4. Failure to Follow Procedures During the Battery Performance Tests

Introduction: The team identified a Green NCV of 10 CFR 50, Appendix B, Criterion V, "Instruction, Procedures, and Drawings," for failure to follow procedures while performing the battery performance tests. Specifically, on four occasions, performance tests for the Unit 2 station battery 2B008 were terminated early, instead of continuing the tests until reaching one of the test termination criteria in the applicable test procedure.

Description: SONGS battery performance tests were required to be performed in accordance with Maintenance Procedure SO123-1-2.6. The procedure provided three test termination criteria in step 6.3.8, which included 1) battery overall shut down voltage reached, 2) battery cell temperature exceeding 110°F, or 3) any battery intercell connection showing evidence of excessive heating. The team noted that performance tests performed on the Unit 2 station battery 2B008 in 2002, 2006, 2007, and 2008, were terminated before the minimum battery voltage was reached and without meeting either of the other two termination criteria. The Maintenance Orders for tests performed in 2002 and 2006 stated that they were terminated early because cell #14 approached reversal voltage. The 2007 test was terminated early due to "load bank not maintaining load." The 2008 test was terminated at four hours without further explanation.

The team noted that none of the conditions encountered during the 2002, 2006, and 2007 tests necessitated early termination since IEEE Standard 450-1980 and step 6.3.1 of the procedure permit temporary interruptions of the tests, during which the conditions noted could have been addressed in order to complete the tests.

Technical Specification 3.8.4.8 requires the battery performance test to be conducted every 60 months until the battery shows evidence of deterioration, or has reached 85 percent of the expected life, at which time the interval becomes 12 months. The team noted that the 85 percent service life point for Battery 2B008 was reached in October 2006, and that annual performance tests have been performed since then. Technical Specifications Bases and IEEE Standard 450-1980, state that degradation is indicated when the battery capacity drops by more than 10 percent relative to its capacity on the previous performance test, or when it is below 90 percent of the manufacturer’s rating. The 10 percent criteria is based on measured battery capacity at its minimum voltage (fully discharged), compared with the prior performance test. By ending the capacity tests prior to reaching battery minimum voltage, it was not possible to perform quantitative measurement of battery degradation in accordance with IEEE-450-1980. Therefore, since at least 2002, the licensee has been unable to quantitatively evaluate the technical specification testing frequency based on the 10 percent degradation criteria. The team noted that sufficient data was available in the existing test reports to determine that battery capacity was at least 100 percent, so the increased test frequency does not appear to have been improperly delayed. Since the battery is considered operable if its capacity is over 80 percent and measured capacity for the tests in question were at least 100 percent, operability criteria have not been violated.

<u>Analysis</u>: The team determined that the licensee’s failure to perform station battery capacity testing in accordance with station procedures was a performance deficiency that was reasonably within their ability to foresee and prevent. Specifically, the licensee terminated battery capacity tests before reaching the battery minimum average voltage per cell, as specified by IEEE Standard 450-1980, or encountering any of the other test termination criteria. This finding was more than minor because it was associated with the mitigating systems cornerstone (equipment performance attribute) and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Traditional enforcement does not apply because the finding did not have any actual safety consequences or potential for impacting the NRC's regulatory function, and was not the result of any willful violation of NRC requirements. Using the IMC 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it was not a design issue resulting in loss of function, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. This finding has a cross-cutting aspect in the area of human performance (Work Practices component) because the licensee did not ensure that appropriate error prevention techniques were used to avoid deviation from the test termination criteria provided in test procedures [H.4.a].

<u>Enforcement</u>: Title 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions and procedures. SONGS Procedure SO123-1-2.6 provided termination criteria for

performance tests to enable a consistent method of measuring battery degradation. Contrary to the above, on June 10, 2002, on February 18, 2006, on January 23, 2007, and on February 20, 2008, battery performance testing was not accomplished in accordance with the required procedure in that the testing was terminated prior to reaching battery minimum voltage, or other allowable termination criteria specified in the procedure. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as Notification NN 200060319, this violation is being treated as a NCV consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000361/2008010-05, "Failure to Follow Procedures during the Battery Performance Tests."

2.15 Reserve Auxiliary Transformer 2XR2:

a. Inspection Scope

The team reviewed alternating current load flow calculations to determine whether the transformer had sufficient capacity to support its required loads under worst case accident loading and grid voltage conditions. The team reviewed maintenance procedures and records to determine whether maintenance was adequate to assure operability of automatic functions during accident conditions. The team reviewed system health and corrective action documents to assess any adverse equipment operating or maintenance trends.

b. Findings

No findings of significance were identified.

.2.16 480 Volt Alternating Current (VAC) Load Center 3BO4:

a. Inspection Scope

The team reviewed alternating current load flow calculations to determine whether the bus was loaded within its ratings under accident and degraded voltage conditions. The team reviewed undervoltage protection calculations and logic to determine whether connected loads were adequately protected. The team reviewed alarm response procedures to determine whether they were adequate to address abnormal conditions. The team reviewed vendor technical manuals and maintenance procedures and records to determine whether maintenance was performed in accordance with vendor recommendations. The team reviewed system health and corrective action documents to assess any adverse equipment operating or maintenance trends.

b. Findings

Inadequate Alarm Response Procedures for 480 VAC Grounds

Introduction: The team identified a Green NCV of Technical Specification 5.5.1.a for inadequate procedures for 480 VAC system grounds. Specifically, the procedures do not identify the deleterious effects of 480 VAC system grounds on connected equipment, or the proper sense of urgency in removing grounds. Due to inadequate procedures for alarm response and abnormal operations, the licensee was slow in responding to a ground alarm on Bus 3B04 in March, 2008. It took 19 hours to identify and remove the ground. This indicated a routine, rather than a prompt response and may have exposed connected equipment to overvoltage for an unnecessarily long period of time.

Description: The 480 VAC electrical distribution system at SONGS is ungrounded. Ungrounded three phase electrical systems are capable of providing continuity of service in the presence of a single line to ground fault on the system. However, in the case of a solid single phase to ground fault, the line to ground voltage on the unfaulted phases will increase by a factor of 1.73. In the case of an intermittent or arcing ground fault, line to ground voltage could increase to several times normal values. In either case, the insulation systems of connected equipment such as motors will be subjected to increased stresses and possible failure.

The SONGS 480 VAC electrical distribution system is equipped with ground detection relays that provide annunciation in the control room in case a ground occurs.
The procedures for responding to 480 VAC system ground alarms include Alarm Response Instruction SO-15-63.B, and Operating Instruction SO23-6-33, Ground Isolation. Neither of these procedures identifies that a ground alarm indicates the presence of an overvoltage condition on the affected 480 VAC system, or alerts operators to the increased possibility of secondary faults. The compensatory actions stated in Procedure SO-15-63.B simply require monitoring ground volts once an hour. This conveys a lack of urgency in removing grounds. In addition, the procedure does not identify prudent measures that could be taken to prevent secondary grounds. Because of train separation, a ground will only affect one 480 VAC train at a time. This enables compensatory actions such as starting redundant loads on the unaffected train and securing loads on the affected train to isolate them from the overvoltage. Although, Procedure SO23-6-33 provides for evaluating starting of redundant equipment, this step is provided to avoid loss of functions when de-energizing power supplies, rather than a proactive measure to transfer functions to the unaffected train to protect equipment. Entries in AR 080300460 for response to a ground alarm on Bus 3B04 in March, 2008, showed that it took 19 hours to identify and remove the ground. This indicated a routine, rather than a prompt response and may have exposed connected equipment to overvoltage for an unnecessarily long period of time.

Analysis: The failure to provide an adequate alarm response procedure was a performance deficiency as demonstrated by the event in March of 2008. This finding was more than minor because the procedure deficiency affected the mitigating system cornerstone objective (procedure quality attribute) of ensuring availability, reliability, and capability of systems needed to respond to initiating events to prevent undesired consequences. Using the IMC 0609, "Significance Determination Process," Phase 1 Worksheets, the finding is determined to have very low safety significance (Green) because it was not a design or qualification deficiency, did not result in a loss of safety function, and did not screen as potentially risk significant due to external events. This finding was reviewed for cross-cutting aspects and none were identified.

Enforcement: SONGS, Units 2 and 3, Technical Specifications 5.5.1.a, requires, in part, procedures recommended by Regulatory Guide 1.33, Appendix A. Section 5 of Appendix A recommends procedures for abnormal, off-normal, or alarm conditions and states that these procedures identify the meaning of the annunciator, the immediate operator actions and the long-range actions. Contrary to the above, July 18, 2008, Alarm Response Instruction SO3-15-63.B and Operating Instruction SO26-6-33 were inadequate, in that they failed to adequately identify the meaning of the alarm, and provide appropriate immediate and long-range operator actions. Specifically, the instructions did not identify the potential for the presence of harmful overvoltage or provide appropriate actions for responding to the condition. Since this finding was of very low safety significance and has been entered into the licensee's corrective action program as Notifications NN 200057494 (addresses ground fault trending) and NN 200057495 (addresses procedure change), this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000361, 05000362/2008010-06, "Inadequate Procedures for 480 VAC Bus Grounds."

.3 **Results of Reviews for Operating Experience:**

.3.1 Inspection of Information Notice (IN) 2006-15, Vibration-Induced Degradation and Failure of Safety-Related Valves.

a. Inspection Scope

The team reviewed this IN, which documented vibration-induced degradation of safety-related valves manufactured by Fisher Controls, Henry Pratt Company, and Flowserve Corporation. The team reviewed the licensee response to this IN by reviewing the procedures associated with monitoring and control of vibration-induced damage to various types of valves, including those manufactured by these companies. The team requested and reviewed a list of valves installed at San Onofre Units 2 and 3 - of which there were approximately 150 - and searched the AR database using a sample of specific valve numbers (approximately 15 percent sample) to identify whether any of these valves had experienced vibration-induced degradation.

b. Findings

No findings of significance were identified.

.3.2 Inspection of IN 2006-21, Operating Experience Regarding Entrainment of Air into Emergency Core Cooling and Containment Spray Systems.

a. Inspection Scope

The team reviewed the licensee's evaluation of IN 2006-21, which documented operating experience regarding possible air entrainment into emergency core cooling and containment spray systems under post accident conditions. The licensee performed this evaluation under AR 061001406-01, which included a reference to calculation M-0012-036, Postulated Transient Recirculation Flow from Refueling Water Storage Tanks, Revision 2. The team reviewed calculation M-0012-036, which evaluated the potential of air entrainment from the refueling water storage tank and the potential of air reaching the Emergency Core Cooling System pumps. In addition, the team interviewed engineering and operations personnel regarding the post accident operation of these systems from both the refueling water storage tank and containment sump to verify that system operation was consistent with the analyzed condition.

b. Findings

No findings of significance were identified.

.3.3 Inspection of IN 1997-40, Potential Nitrogen Accumulation Resulting from Back-Leakage from Safety Injection Tanks.

a. Inspection Scope

The team reviewed the licensee's response to IN 1997-40. The licensee conducted an evaluation on December 31, 1997, which did not reveal any occurrences of nitrogen accumulation due to back-leakage from the Safety Injection Tanks into the Emergency Core Cooling System. The team reviewed operating and maintenance procedures for the Emergency Core Cooling System to verify that proper guidance was provided to operators to ensure that gasses, including nitrogen, do not accumulate in the system. The team reviewed the isometric drawing of the Emergency Core Cooling System to verify that the vent paths encompassed the high points of the system. The licensee is currently performing actions in response to Generic Letter 08-02 for which the required action date has not yet been reached.

b. Findings

No findings of significance were identified.

.3.4 Inspection of IN 2006-26, Failure Of Magnesium Rotors In MOV Actuators.

a. Inspection Scope

In response to IN 2006-26, the licensee initiated AR 061101243 dated November 22, 2006, to address the identified concerns. The team reviewed the AR and all documents referenced therein, to assure that the licensee’s actions were appropriate and fully addressed those concerns. The team also verified, by review of daily logs, that the environmental conditions (i.e., temperature and humidity) used by the licensee to support their conclusions with respect to the potentially degrading conditions identified in the IN, were appropriate. Further, the team was able to verify through review of the licensee’s Generic Letter 89-10 program that the population of valves identified by the licensee as being subject to the conditions of the Information Notice was complete.

b. Findings

No findings of significance were identified.

.4 **Results of Reviews for Operator Actions:**

The team selected risk-significant components and operator actions for review using information contained in the licensee’s probabilistic risk assessment. This included components and operator actions that had a risk achievement worth factor greater than two or Birnbaum value greater than 1E-6.

a. Inspection Scope

For the review of operator actions, the team observed operators during simulator scenarios associated with the selected components as well as observing simulated actions in the plant.

Inspection procedure 71111.21 requires a review of three to five relatively high-risk operator actions. The sample selection for this inspection was five operator actions.

The selected operator actions were:

- Reactor Coolant Pump Seal Heat Exchanger tube leak into the Component Coolant Water system with a failure of the main turbine to trip during subsequent reactor trip

- Reactivity management during blended flow evolutions such as delithiation

- Loss of Offsite Power with Emergency Diesel Generator malfunctions

- Steam Generator Tube Rupture with failed Main Steam Isolation Valve and Main Feed Isolation valve on the affected steam generator

- Loss of a class 1E 125 VDC bus D2 with a failed open steam generator safety relief valve

b. Findings

No findings of significance were identified.

4 OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Reviews of Identification and Resolution of Problems

a. Inspection Scope

The team chose one issue for a more in-depth review to verify that the licensee personnel had taken corrective actions commensurate with the significance of the issue. The team noted that several reactivity management issues were identified within the licensee's Corrective Action Process. The team reviewed the corrective actions associated with a sample of these conditions focusing on Action Requests which addressed blended flow evolutions and the Chemical and Volume Control System. When evaluating the effectiveness of the licensee's corrective actions, the following attributes were considered:

- Timeliness of corrective actions and/or repairs to components
- Repetitive reactivity excursions from blended flow evolutions, indicating possible ineffective corrective actions
- Functionality/operability of components which affect reactivity

Documents reviewed are listed in the attachment.

b. Findings

Introduction: The team identified a Green NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure of operations management, operations training, and engineering to ensure that conditions adverse to quality are promptly identified and corrected. Specifically, multiple reactivity excursions occurred in the plant over the past two years, where corrective actions have been ineffective at addressing blended flow evolutions.

Description: The team noted that several reactivity management issues were identified within the licensee's corrective action process. The team reviewed the corrective actions associated with a sample of these conditions focusing on ARs which addressed blended flow evolutions and the chemical and volume control system. The team noted the occurrence of a significant number of reactivity events during the past two and one-half years (January 2006 to June 2008). Associated with the specified time interval, the team determined that an average occurrence of more than one reactivity condition per week was identified, of which at least one every two months involved blended flow operations. Based on this observation, the team performed a review of ARs associated with blended flow evolutions. The team noted the following:

> Since the licensee's inception of the reactivity management program, two assessments have been performed at approximately two-year intervals. The initial assessment, documented in AR 050600107, was accomplished in June 2005 by a combination of in-house and peer evaluators. The team noted that this effort was conducted only six months after the program's origination and focused on the program's structure and compliance effectiveness as it pertains to industry guidance. The assessment documented that training was not provided for all work groups directly impacted.
>
> The second assessment, documented in AR 070900159, was a self assessment performed in 2007 to evaluate the implementation and effectiveness of the reactivity management program as it pertains to the same industry guidance as before. The self-assessment once again identified that not all stakeholders received initial or continuing training on their associated program responsibilities. Although some equipment reliability concerns were discussed in the self-assessment, the sampled ARs reviewed by the team supported the equipment response as indicated in the field support analysis sections. Recommended remedial actions included procedure changes and training on blended makeup operations. However, the team noted that several Action Requests have documented blended flow issues since these actions were implemented. The team acknowledged that some training was provided to operating crews as part of their normal requalification program during 2008. The team concluded that these remedial measures have not been effective.
>
> The team noted three conditions which addressed procedures associated with reactivity control aspects. AR 071000317 identified the need to incorporate a procedure change to SO23-3-2.2 "Makeup Operations," Revision 21, to ensure proper blend settings on the borate and dilute flow controllers before returning the makeup mode selector switch to automatic, or leave the switch in manual if blend settings are not verified. Although AR 071000317 documented the specified procedure changes as been completed in Revision 22, the team observed that the latest procedure change (Revision 23) had included flow setting steps after having placed the mode selector switch in automatic.

In addition, Procedure SO23-3-2.2, step 6.6.19, allows adjusting flow controller settings for blended flow evolutions; however, it also required any such changes be annotated in the Nuclear Control Operator (NCO) log. Procedure SO123-0-A1, "Conduct of Operations," Revision 14, section 6.4.9 identifies the NCO log as an official site document providing an overall plant record of significant operating events." As documented in AR080600116, multiple changes in flow settings occurred during blended flow operations on June 1, 2008. However, the team verified that no entries were made in the NCO logs as required by procedure step 6.6.19.

The team observed that Procedure SO23-3-2.2 was revised in January of 2008 (Revision 22 reference AR 071001452-3) to raise the minimum flow setting criteria for boric acid makeup flow to greater than 2 gallons per minute, since low flow controller settings contribute to control system inaccuracy. The team noted that section L&S 3.1 of the procedure was changed to identify the inaccuracy for low boric acid flow conditions and prevent such occurrences for blended flows of raising pure water vice lowering boric acid flow. Contrary to the procedure, on June 1, 2008, boric acid flow was dropped to 1.6 gallons per minute and remained less than 2.9 gallons per minute over the makeup evolution or to the power response.

Licensee staff indicated that ACE's are utilized for level three or higher classifications of reactivity events. The team noted that procedure SO123-XV-91, "Reactivity Management Implementation," Revision 2, section 6.11.2 states for level three or higher a possible cause evaluation be accomplished on a case by case basis. Regarding blended flow evolutions, the team found only two occasions which were categorized at level three. Following one instance, documented in AR 071100792, a Direct Cause Evaluation (DCE) was performed. The team found that in the other level three event, as annotated in AR 070700065, no Cause Evaluation was performed and thus no corrective actions identified. As a result, most AR's annotating blended flow difficulties incurred by licensed operators were classified as level four or five with narrowly focused actions, if any, such that each event was treated as an isolated case.

The team observed that even with a DCE as an assigned task, Procedure SO123-XV-50 "Corrective Action Process," Revision 7, section 6.9.1.2, considered evaluations of site operating experience, industry operating experience, and determining corrective actions to prevent recurrence as optional. Additionally, for an ACE, the same options are stated only if a Common Cause Evaluation is performed in lieu of an ACE; thus, the evaluation of site operating experience is not applicable. The team concluded that multiple opportunities existed during the past two and one-half years to identify corrective actions to preclude blended flow reactivity events.

During the team’s last week onsite a meeting was held to discuss these observations regarding reactivity oversight with the licensee as well as the Branch Chief for Engineering Branch 1 from the Division of Reactor Safety of the Region IV office. During this meeting the licensee’s Operations Director communicated to the Branch Chief and team that additional corrective actions, beyond those already implemented or planned as part of the reactivity oversight group recommendations were not necessary. The team concluded that the corrective actions taken and planned were ineffective as indicated by the continuous trend of reactivity management events.

Analysis: The performance deficiency associated with this finding was the failure of operations management (ineffective management by the reactivity oversight group), operations training (ineffective training on these events), and engineering personnel (mechanical issues with the batch controller and inability to complete installation of equipment to preclude some of these issues) to implement adequate corrective actions to prevent these reactivity excursions. The finding is more than minor because it is associated with the initiating events cornerstone (human performance attribute) and affects the associated cornerstone objective to limit the likelihood of those events that upset plant stability and challenge the critical safety functions during shutdown as well as power operations. If left uncorrected, the conditions would continue to contribute to additional operator errors or significantly impact the operator's ability to perform blended flow evolutions. Using the IMC 0609, "Significance Determination Process," Phase 1 Screening Worksheets, the finding is determined to have very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating equipment or functions will not be available. This finding has a crosscutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate problems such that resolutions address causes and extent of condition [P.1.(c)].

Enforcement: The regulations in Title 10 of CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," state in part that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material, and equipment, and nonconformance's are promptly identified and corrected. Contrary to the above, between January 1, 2006, and June 30, 2008, multiple deficiencies involving reactivity management issues identified by the licensee and entered into the corrective action program were not corrected and continue to occur. However, because the finding is of very low safety significance and has been entered into the licensee's new corrective action program as Notifications NN 200062659 (addresses procedure change) and NN 200006366 (addresses common cause evaluation), this violation is being treated as a NCV, consistent with Section VI.A of the Enforcement Policy: NCV 05000361, 05000362/2008010-07, " Inadequate Corrective Actions for Reactivity Events."

4OA6 Meetings, Including Exit

On July 17, 2008, the team leader presented the preliminary inspection results to Mr. Ed Scherer, Director, Nuclear Regulatory Affairs, and other members of the licensee's staff. On September 11, 2008, the Engineering Branch 1 Chief conducted a telephonic exit meeting with Mr. Ridenoure and other members of the licensee's staff. The licensee acknowledged the findings during each meeting. While some proprietary information was reviewed during this inspection, no proprietary information was included in this report.

4OA7 Licensee Identified Violations

No findings of significance were identified.

Attachment: 1 - Supplemental Information

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel
R. Ridenoure, CNO, Sr. VP, and Site Manager
E. Scherer, Director, NRA
J. Reilly, VP, Engineering Services
A. Hochevar, Station Manager
K. Johnson, Manager, Design Engineering
T. Yackle, Director, Operations
M. Short, Director, Nuclear Oversight

NRC personnel
D. Loveless, Senior Reactor Analyst, Region IV
G. Warnick, Senior Resident Inspector, SONGS

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000361; 05000362/2008010-01	NCV	Inadequate Design Control for Design Basis of CCW/CWC Heat Exchangers (1R21.2.11)
05000361; 05000362/2008010-02	NCV	Inadequate Design Control for 125VDC Control Circuits (1R21.2.14.1)
05000361; 05000362/2008010-03	URI	Omission of Station Blackout Profile During Battery Service Tests (1R21.2.14.2)
05000361/2008010-04	NCV	Inadequate Corrective Actions for Battery Performance Test Issues (1R21.2.14.3)
05000361/2008010-05	NCV	Failure to Follow Procedures During the Battery Performance Tests (1R21.2.14.4)
05000361; 05000362/2008010-06	NCV	Inadequate Procedures for 480 VAC System Grounds (1R21.2.16)
05000361; 05000362/2008010-07	NCV	Inadequate Corrective Actions for Reactivity Events (40A2)

LIST OF DOCUMENTS REVIEWED

In addition to the documents called out in the inspection report, the following documents were selected and reviewed by the team to accomplish the objectives and scope of the inspection and to support any findings:

Action Requests

930500081	050700549	061001697	070801013
970900408	050701607	061001698	070801046
981101445	050801233	061001789	070801063
990302025	051000729	061100354	070801396
990801013	051001114	061100634	070900159
000100562	051100747	061100714	070900365
000200411	051200478	061101106	070900384
001100920	060100422	061101243	070900547
010901053	060100999	061101250	070900711
011001711	060101152	061101692	071000587
020601551	060101159	070100063	071000901
020701508	060120817	070100371	071001091
020800811	060200377	070100499	071001452
030101629	060200599	070101104	071100792
030102296	060201081	070101383	071200996
030202237	060201528	070101434	071201105
030202237	060300008	070200254	071201294
030300125	060300900	070200495	071201393
030300661	060301020	070300161	080100576
030301185	060500485	070300185	080100597
030600531	060500578	070301055	080100702
031000026	060500834	070400046	080101004
031000264	060600109	070400088	080101072
031100614	060600239	070400389	080101122
031100924	060600564	070400447	080101185
031200173	060600921	070400701	080200288
040300714	060600979	070400993	080200592
040401569	060601355	070500432	080201055
040401649	060700747	070500439	080201394
040500921	060700806	070500593	080201438
040700701	060700878	070500820	080300460
040701362	060701285	070501022	080300491
040800664	060800056	070501169	080300619
040801026	060800601	070501189	080300673
040801061	060800603	070501385	080301117
040801171	060800843	070600347	080400613
040801333	060800980	070600413	080400668
040801372	060801229	070600607	080400813
040900319	060900352	070600862	080500060

041101031	060900770	070601000	080500286
041101251	060900839	070700065	080500859
050100457	060900881	070700216	080501171
050300741	060901108	070700459	080600073
050301561	060901110	070700489	080600076
050600107	061000406	070700909	080600116
050601315	061000820	070701028	080600438
050601324	061001150	070701212	GR-0035
050700073	061001371	070800069	
050700141	061001379	070800940	
050700169	061001406	070800993	

Notifications Written from the Inspection

200006366	200054737	200057494	200059581
200047962	200054738	200057495	200060319
200048442	200054739	200057527	200061041
200048884	200056981	200058348	200062659
200051692	200056986	200059004	
200054736	200057484	200059017	

Calculations

M-0026-011, "CCW Flow/Pressure Distribution Analysis," CCN-10
Misc-PEC-119, "3410 MWT Plant Safety Injection Tank Sizing," 9/7/1972
J-BHA-060, "Scaling Calculation for Safety Injection Tank Level Transmitters," Rev 1
J-BHA-002, "Instrument Uncertainties for SIT Narrow Range Pressure Loops," Rev. 0
M-0056-034, "Dynamic Simulation of MFIV Closure," Rev. 0
M-AOV-SP-2HV8419, "Setpoint Calculation for AOV 2HV8419," Rev. 0
M 41.35, "Sizing of Nitrogen Storage Bottle for Valve Actuation," 3/17/1981
J-BHA-011, "Containment Emergency Sump (Wide Range) Level Loop Uncertainties," Rev. 0
J-BHA-012, "Containment Emergency Sump High Level Setpoint," Rev. 1
M-0027-017, "Backup Nitrogen Supply for the CCW Surge Tanks," Rev. 0
M-0027-023, "CCW/SWC Heat Exchanger Operability," Rev. 0
M-0027-029, "CCW/SWC Heat Exchanger Performance Tests," Rev. 0
M-0027-035, "CCW System Letdown Heat Exchanger Bypass Sizing Calculation," Rev. 0
M-1204-002-04A, "Valve Seat Leakage to a Refueling Water Storage Tank," Rev. 0
M-8910-SP-3HV4716, GL 89-10 Setpoint Calculation: 3HV4716, Rev. 3
M-8910-SP-2HV9302, GL 89-10 Setpoint Calculation: 2HV9302, Rev. 2
M-8910-SP-3HV9302, GL 89-10 Setpoint Calculation: 3HV9302, Rev. 2
M-8910-SP-2HV9303, GL 89-10 Setpoint Calculation: 2HV9303, Rev. 2
M-8910-SP-3HV9303, GL 89-10 Setpoint Calculation: 3HV9303, Rev. 3
M-8910-SP-2HV9304, GL 89-10 Setpoint Calculation: 2HV9304, Rev. 2
M-8910-SP-3HV9304, GL 89-10 Setpoint Calculation: 3HV9304, Rev. 2

M-8910-SP-2HV9305, GL 89-10 Setpoint Calculation: 2HV9305, Rev. 3
M-8910-SP-3HV9305, "GL 89-10 Setpoint Calculation: 3HV9305," Rev. 2
M-0012-01D, "NPSH of ESF Pumps," Rev. 2
N-0240-006, "RWST Tech Spec Requirement," Rev. 0
N-4060-030, "Containment Flooding Level," Rev. 1
N-6060-003, "LOCA ESF Leakage, CR & Offsite Doses – AST," Rev. 0
N-6060-004, "LOCA RWST Releases, CR & Offsite Doses – AST," Rev. 0
SO23-452-F, "Salt Water Cooling System Pump Sizing," Rev. 1
J-GJA-055, "Emergency Chiller Low Chilled Water Temperature Setpoint," Rev. 0
J-GJA-075, ICCN C-1, "ECW Oil Heater Temperature Control Switch Setpoint," Rev. 2
M-0073-130, ICCN C-2, "Evaluation of ECW System Surveillance Test Result"
M-0073-88, "Evaluation for Chiller Performance," Rev. 0
M-0073-83, "Plant Emergency Chilled Water System Equipment Sizing Calcs."
M-0073-87, "Pressure Drop Emergency Chilled Water System"
EC-119, "Emergency Chiller Freon Level –Units 2/3," Rev. 0
M-0075-052, "Units 2&3 Trains A and B Emergency Room Cooler Capacity Verification"
J-PEC-24/S-PEC-10, "Sizing of HP & LP Safety Injection Pumps"
M-0073-034, "Aux. Bldg. Control Area 9'-0" El. Chiller Room Emer. Heat Load Calc."
M-0041-096, "Maximum Differential Pressure Across MSIV," Rev. 0
N-4080-027, with CCN N-6, "Containment P-T Analysis For Design Basis MSLB," Revision 1
E4C-017, "125V Battery & DC System Sizing," CCN-94, Rev. 19
E4C-017.1, "Class 1E 125VDC System Data/Loading," Rev. 3
E4C-082, "System Dynamic Voltages During DBA," Rev. 3
E4C-084, "Unit 2 MCC Control Circuit Voltage Analysis," ECN No. A44808, Rev. 0
E4C-085, "Unit 3 MCC Control Circuit Voltage Analysis," ECN No. A44809, Rev. 0
E4C-088, "Emergency Diesel Generator Loading," Rev. 4
E4C-090, "Auxiliary System Voltage Regulation," Rev. 5
E4C-102, "GL 89-10 MOV Voltages During Design Basis Accident," Rev. 3
E4C-109, "CLASS 1E 125V DC System Protection Calculation," Rev. 4
E4C-123, "Voltage Requirements for 120VAC Vital Buses," Rev. 1
J-BHA-082, "Indicator TLU, Alarm Set-points, and Strapping Data for Safety Injection Tank Level Loops," Rev. 0
J-BHB-021, "RWST 2(3) T005 & T006 Level Loop Uncertainties and Minimum Volume Required During Modes 5&6," Rev. 0
J-EPA-002, "TLU for Saltwater Flow to CCW Heat Exchangers 2(3)E001A & 2(3)E002B, Rev. 1
M-0012-036, Postulated Transient Recirculation Flow from Refueling Water Storage Tanks," Rev. 2
M-42750, "Safety Injection System Recirculation Realignment Function Failure Modes and Effects Analysis," Rev. 0
M-8910-1301-OB-001, GL 89-10 "Operational Basis Calculation for the AFW Pump Turbine Stop Valve," Rev. 0
N-4060-015, "Sump Level vs. Volume: Normal, Emergency, and Wide Range Containment Area," Rev. 0
M-0073-041, ICCN 1, "Aux. Bldg Ctrl Area El. 30'-0", Heat Load & Equip Sizing Normal & Emergency"
M-0012-033, ICCN-1, "HPSI Pump Tech. Spec. Minimum Performance Requirements," Rev. 2
E4C-130, "TLU Calc for Undervoltage Relay Circuit at Class 1E 4KV Switchgear," ECN, Rev. 1

No. A4780
E4C-131, "125V DC Control Circuit Analysis for Class 1E 4kV and 480V Circuit Breaker Operation," Rev. 1

Completed Inservice Tests

SO23-3-3.60.4, Salt Water Cooling Pump, April 9, 2008, April 10, 2008, April 29, 2008, May 13, 2008, May 19, 2008, June 5, 2008

Design Basis Documents

DBD-SO23-740, "Safety Injection, Containment Spray, and Shutdown Cooling Systems," Rev. 9
DBDSO23-400, Component Cooling Water System, Rev. 11
DBD-SO23-410, Saltwater Cooling System, Rev. 8
DBD-SO23-740, Safety Injection, Containment Spray, and Shutdown Cooling Systems, Rev. 9
DBD-SO23-780, Auxiliary Feedwater System, Rev. 8
DBD-SO23-800, "Auxiliary Building Emergency Chill Water System," Rev. 9
DBD-SO23-740, "Safety Injection, Containment Spray, and Shutdown Cooling Systems," Rev. 9
DBD-SO23-360, "Reactor Coolant System," Rev. 10
DBD-SO23-TR-AA, "Accident Analysis Topical Report"
DBD-SO23-120, "6.9kV 4.16kV and 480V Electrical System," Rev. 6
DBD-SO23-140, "Class 1E 125V DC System," Rev. 6
DBD-SO23-750, "Emergency Diesel Generator," Rev. 3
DBD-SO23-TR-SF, "Single Failure Topical Report," Rev. 5
DBD-SO23-400, "Component Cooling Water System Design Basis Document," Rev. 11
DBD-SO23-365, "Steam Generators and Secondary Side Design Basis Document, Rev. 9

Drawings

40111A, "P&I Diagram: Reactor Coolant System," Rev. 40
40111B, "P&I Diagram: Reactor Coolant System," Rev. 31
40111D, "P&I Diagram: Reactor Coolant System," Rev. 10
40112A, "P&I Diagram Safety Injection System," Rev. 33
40112C, "P&I Diagram Safety Injection System," Rev. 19
40112D, "P&I Diagram Safety Injection System," Rev. 23
40113A, "P&I Diagram Safety Injection System," Rev. 17
40113B, "P&I Diagram Safety Injection System," Rev. 16
40123A, "P&I Diagram: Rector Coolant Chemical and Volume Control System," Rev. 24
40124B, "P&I Diagram: Reactor Coolant Chemical and Volume Control System," Rev. 33
40040, "Tube Plug Map for Component Cooling Water Heat Exchanger S21203WE001," Rev. 5
40041, "Tube Plug Map for Component Cooling Water Heat Exchanger S21203WE002," Rev 10
40042, "Tube Plug Map for Component Cooling Water Heat Exchanger S31203WE001," Rev. 5
40043, "Tube Plug Map for Component Cooling Water Heat Exchanger S31203WE002," Rev. 4
40112A, "P&I Diagram – Safety Injection System," Rev. 33
40112B, "P&I Diagram – Safety Injection System," Rev. 35
40112C, "P&I Diagram – Safety Injection System," Rev. 19

40112D, "P&I Diagram – Safety Injection System," Rev. 23
40113A, "P&I Diagram – Safety Injection System," Rev. 17
40113B, "P&I Diagram – Safety Injection System," Rev. 16
40126A, "P&I Diagram – Component Cooling Water System (Salt Water Pumps)," Rev. 28
40126B, "P&I Diagram – Component Cooling Water System (Salt Water Pumps)," Rev. 28
40127A, "P&I Diagram – Component Cooling Water System," Rev. 29
40127B, "P&I Diagram – Component Cooling Water System," Rev. 38
40127C, "P&I Diagram – Component Cooling Water System," Rev. 44
40127D, "P&I Diagram – Component Cooling Water System," Rev. 15
40127E, "P&I Diagram – Component Cooling Water System," Rev. 18
40127F, "P&I Diagram – Component Cooling Water System," Rev. 34
40127G, "P&I Diagram – Component Cooling Water System," Rev. 15
40180A, "Auxiliary Building Emergency Chilled Water System Loop B," Rev.31
40180B, "Auxiliary Building Emergency Chilled Water System," Rev. 9
40180C, "Auxiliary Building Emergency Chilled Water System Loop B," Rev. 13
40180D, "Aux Bldg Emergency Chilled Water System – Water Chiller E335," Rev.15
40112A, "P&I Diagram – Safety Injection System," Rev. 33
40112B, "P&I Diagram – Safety Injection System," Rev. 35
40112C, "P&I Diagram – Safety Injection System," Rev.18
40112D, "P&I Diagram – Safety Injection System," Rev. 23
30644, "Elementary Diagram Reactor High Pressure Safety Injection Pump P019," Rev. 15
32116, "One Line Diagram 480V Loadcenter," Rev. 13
32118, "One Line Diagram 480V Loadcenter," Rev. 19
32122, "One Line Diagram 480V Loadcenter," Rev. 13
48778, "Pressurizer Heater Map," Rev. 3
32171, "One Line Diagram Pressurizer Heaters Distribution Panels," Rev. 12
40141C, "Main Steam System, Electro-Hydraulic Valve 2HV-8204"
40141G, "Main Steam System"
30142, "One Line Diagram 480V Motor Control Center 2BJ (ESF)," Rev. 29
30172, "One Line Diagram Class 1E 124V DC and 125VAC Power System," Rev. 16
30174, "One Line Diagram 125V DC Distribution Switchboard 2D2," Rev. 21
30263, "Elementary Diagram Electrical Aux – 40V Bus 2B04 & 3B04 Metering," Rev. 21
32017, "One Line Diagram 4160V Switchgear Bur 3A04 (ESF)," Rev. 16
32113, "One Line Diagram Diesel Generator Protection," Rev. 7
32164, "One Line Diagram 480V Motor Control Center 3BZ (ESF)," Rev. 35
32328, "Elementary Diagram Elect. Aux. 4.16kV Bus 3A04 DG 3G002 Breaker," Rev. 25
32329 Sht. 1, "Elementary Diagram Diesel Generator 3G002 Protection AC System," Rev. 12
32329 Sht. 2, "Elementary Diagram Diesel Generator 3G002 Protection AC System," Rev. 8
32330, "Elementary Diagram Diesel Generator 3G002 Protection DC System," Rev. 12
32342 Sht. 1, "Elementary Diagram Diesel Generator 3G002 Control DC System," Rev. 12
32342 Sht. 2, "Elementary Diagram Diesel Generator 3G002 Control DC System," Rev. 10
32342 Sht. 3, "Elementary Diagram Diesel Generator 3G002 Control DC System," Rev. 9
32342 Sht. 4, "Elementary Diagram Diesel Generator 3G002 Control DC System," Rev. 10
32342 Sht. 5, "Elementary Diagram Diesel Generator 3G002 Control DC System," Rev. 12
5105074, "One Line for Operation Position 1 thru 6," Rev. 7
5105075, "One Line for Operation Position 7 thru 14," Rev. 9
5105076, "One Line for Operation Position 15 thru 19," Rev. 7

Maintenance Work Orders

MO 07040293000, "IST Loop Flow Inst. Cal. Pump 1st Req. Maint." 2/28/2008
MO 05110847000, "IST LIST Pressure Gauge Calibration," 9/20/2006
MO 06080564000, "IST Loop Flow Inst. Cal. Pump 1st Req. Maint.", 6/6/2007
MO 04121873000, "Loop Level Instrumentation Calibration," 1/26/2006
MO 04121881000, "Loop Level Instrumentation Calibration," 1/25/2006
MO 04121880000, "Loop Level Instrumentation Calibration," 1/25/2006
MO 04121894000, "Loop Pressure Instrumentation Calibration," 1/25/2006
MO 04121895000, "Loop Pressure Instrumentation Calibration," 1/20/2006
MO 04121896000, "Loop Pressure Instrumentation Calibration," 1/20/2006
MO 04121894000, "Pressure Instrumentation Calibration," 1/23/2006
MO 10016014001, "Replace Hydraulic Dump Valves"
CM 08060875000, "no title"
PM 08052498000, "no title"
PM 08051945000, "no title"
CM 08011406000, "no title"
CM 08010792000, "no title"
MO 01111509000, "no title"
MO 03022903000, "no title"
MO 05011306000, "no title"
MO 05062182000, "no title"
MO 05080446000, "no title"
MO 06031767000, "no title"
MO 06070902000, "no title"
MO 06070902000, "no title"
MO 06081267000, "no title"
MO 06091358000, "no title"
MO 06100894000, "no title"
MO 07020581000, "no title"
MO 07090743000, "no title"
MO 07101712000, "no title"
MO 07031974000 for Valve 2HV9336, "no title"
MO 07031975000 for Valve 3HV9336, "no title"
MO 07011556000 for Valve 2HV9337, "no title"
MO 07011557000 for Valve 3HV9337, "no title"
MO 07011558000 for Valve 2HV9339, "no title"
MO 07011559000 for Valve 3HV9339, "no title"
MO 06100088000, "Snoop for nitrogen leakage at all assessable valves, tubing and transmitter connections and man-way on S21204MT010." 6/29/2007
MO 06031230000, "Snoop for nitrogen leakage at all assessable vales, tubing and transmitter connections and man-way on S21204MT010." 3/16/2006
MO 03031674000, "Replace Section of Tubing and Fittings Between 2LT0341 and S21204MR056," 3/20/2004
MO 03031113000, "Investigate for nitrogen leaks and repair and or generate AR for future repair," 3/20/2003

MO 03030234000, "Investigate for nitrogen leaks and repair and or generate AR for future repair," 3/12/2003
MO 06121233000, "Filling and Venting Instrument Xmtrs / Sensing Lines and Position Verification / Seal Wiring of Instrument Xmtrs Sensing Line Valves," 1/12/2008
MO 04101832000, "Support of Train A LOVs Procedure Load Sequence for 2A0406, Component Cooling Pump 2P025," 10/17/2005
MO 06110701000, "Support of Train A LOVs Procedure Load Sequence for 2A0406, Component Cooling Pump 2P025," 5/2/2007

Modifications/Design Change Packages

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List of Abbreviations

AR	action request
ACE	apparent cause evaluation
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
CAP	corrective action program
CCW	component cooling water
CDBI	component design basis inspection
CDF	core damage frequency
CFR	Code of Federal Regulations
CRS	control room supervisor
CS	containment spray
DBD	design basis document
DCE	direct cause evaluation
ECCS	emergency core cooling system
EDG	emergency diesel generator
EOP	emergency operating procedure
FSAR	Final Safety Analysis Report
HPSI	high pressure safety injection
IEEE	Institute of Electrical and Electronic Engineers
IMC	Inspection Manual Chapter
IST	Inservice Tests
IP	Inspection Procedure
LOVS	Loss of Voltage Signal
LPSI	low pressure safety injection
LOOP	loss of offsite power
MO	maintenance orders
MOV	motor-operated valve
NPSH	net positive suction head
NRC	U.S. Nuclear Regulatory Commission
NN	Notification
NSPDP	nuclear safety professional development program
OD	operability determination
OE	operating experience
PC	performance criteria
PPM	permanent plant modifications
PI&R	problem identification and resolution
PM	preventative maintenance
SBO	station blackout
SGTR	steam generator tube rupture
SIAS	Safety Injection Actuation Signal
SSC	structures, systems, and components
SWC	Saltwater Cooling
USAR	Updated Safety Analysis Report
VAC	Volts Alternating Current
VDC	Volts Direct Current