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Douglas R. Bauder
Site Vice President & Station Manager
San Onofre Nuclear Generating Station

June 3, 2011

10 CFR 50.73(a)(2)(i)(B)

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Subject: **Docket Nos. 50-362**
LER 2011-002-00, As-Found Condition of LOVS Relays Not Within Technical Specification Limits
San Onofre Nuclear Generating Station (SONGS), Unit 3

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2011-002-00, which is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B).

This letter does not contain any commitments. If you have any questions regarding the attached report, please call Ryan Treadway at 949-368-9985.

Sincerely,

Attachment: LER 2011-002-00

cc: E.E. Collins, Regional Administrator, NRC Region IV
R. Hall, NRC Project Manager, SONGS Units 2 and 3
G.G. Warnick, NRC Senior Resident Inspector, SONGS Units 2 and 3

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NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
San Onofre Nuclear Generating Station (SONGS) Unit 3	05000362	1 of 4

4. TITLE

As-Found Condition of LOVS Relays Not Within Technical Specification Limits

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	N/A
04	07	2011	2011-002-00			06	03	2011	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Douglas R. Bauder, Site Vice President and Station Manager	949-368-9275

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
		N/A					N/A		

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On 04/07/11, it was determined that SONGS Loss of Voltage Signal (LOVS) relays had been previously calibrated incorrectly, which would result in detecting an undervoltage condition at a higher voltage than specified in Technical Specification (TS) Surveillance Requirement (SR) 3.3.7.3.b. Two of the four Unit 3 LOVS relays on the Train B 4.16kV bus 3A06 were found with setpoints outside the allowable TS voltage range, thus meeting the logic for two channels inoperable (TS Condition 3.3.7.B). The 3A0615-127F1 relay failed surveillance testing on 03/01/11; however, this failure was initially attributed to voltage drift based on information available at that time. The subsequent cause evaluation discovered evidence that this failure was due to improper calibration prior to relay installation in the plant. All LOVS relays in Unit 2 and 3 were then retested; Unit 2 relays were found acceptable, and one additional Unit 3 relay (3A0615-127F2) was found failed on 04/08/11. Based on the investigation, this relay was miscalibrated during surveillance testing on 02/01/11. There was minimal safety significance because an undervoltage condition would have been detected within the design margins ensuring the safety function was performed (i.e., automatic transfer to alternate power source and emergency diesel generator start).

A. REPORTABLE OCCURRENCE

On April 7, 2011, it was determined that SONGS Loss of Voltage Signal (LOVS) relays [27] had been previously calibrated incorrectly, which would result in the relays detecting an undervoltage condition at a higher voltage than specified in Technical Specification (TS) Surveillance Requirement (SR) 3.3.7.3.b. TS 3.3.7 requires four LOVS channels operable in Modes 1 through 4, and in Modes 5 and 6 when the associated Emergency Diesel Generator (EDG) [EK] is required to be operable. Two of the four Unit 3 LOVS relays for the Train B 4.16kV bus [BU] 3A06 were found with setpoints outside the allowable TS voltage range, thus meeting the logic for two channels inoperable (TS Condition 3.3.7.B). Relay 3A0615-127F1 failed surveillance testing on March 1, 2011, and was replaced. On April 8, 2011, relay 3A0615-127F2 was found incorrectly set, and the setpoint was readjusted. Based on the investigation, there was evidence that these two relays had been previously miscalibrated. As a result, SONGS Unit 3 was operated with two Train B 3A0615 LOVS channels inoperable for a period of time longer than allowed by TS. This is a condition prohibited by TS, reportable pursuant to 10 CFR 50.73(a)(2)(i)(B); however, the undervoltage protection scheme of LOVS relays would have operated within the assumed design margins.

B. INITIAL CONDITIONS

At the time of discovery on April 7, 2011, SONGS Unit 3 was in Mode 1 with reactor power at approximately 100 percent power.

The Unit 3 LOVS relays were replaced with a newer type of relay during the refueling outage. Calibration and testing of the relays was performed prior to installation. The new Train B LOVS relays were placed into service during Mode 5 on January 28, 2011.

For relay 3A0615-127F1, the deficiency existed from January 28, 2011 (Mode 5), to March 1, 2011 (Mode 1), when the relay failed surveillance testing. For relay 3A0615-127F2, the deficiency existed from the last surveillance test performed on February 1, 2011 (Mode 5), to April 8, 2011 (Mode 1), when the relay was found incorrectly set.

Upon inspection of relay 3A0615-127F1 on March 30, 2011, an internal capacitor was found not properly connected and the vendor was contacted for further investigation and testing. It is not known at this time if this condition contributed to voltage drift on relay 3A0615-127F1. Regardless of the outcome of the vendor's investigation, this event is still reportable as a condition prohibited by TS.

C. DESCRIPTION OF OCCURRENCE

Each Unit has 4 LOVS relays for each Train A and Train B 4.16kV bus. The relays are combined in a two-out-of-four logic to generate a loss of voltage signal, permitting automatic transfer to an alternate power source and EDG start. Two of the four Unit 3 Train B LOVS relays were found with setpoints outside the allowable TS voltage range. Because of the configuration of the two failed relays, the logic for two channels inoperable was met (TS Condition 3.3.7.B).

In 2008, plant design change packages were issued to replace the Westinghouse model CV-2 electromechanical relays with Basler Electric BE1-27 solid state relays in the LOVS circuitry. The new relays were subsequently installed in Units 2 and Unit 3 Cycle 16 refueling outages. Pre-installation calibration of the new Unit 3 relays was performed on October 5, 2010, and the new Train B LOVS relays were placed into service on January 28, 2011.

The 3A0615-127F1 relay failed surveillance testing on March 1, 2011; however, this failure was initially attributed to voltage drift based on information available at that time. The relay was replaced with a new qualified spare on March 3, 2011. Subsequent evaluation discovered this failure was likely a result of improper adjustment or calibration of relay settings performed prior to or during installation. As a result of an extent of condition review, all 16 LOVS relays in Unit 2 and 3 were retested from April 7 through April 9, 2011. The eight Unit 2 relays were found acceptable. On April 8, 2011, one additional Unit 3 relay (3A0615-127F2) was found incorrectly set, and was readjusted to within TS acceptance criteria on April 9, 2011. Based on the investigation, this relay was not properly calibrated during the last surveillance test performed on February 1, 2011. As a result of the incorrect relay settings, Unit 3 was operated with two Train B 3A0615 LOVS channels inoperable for a period of time prohibited by TS, which is reportable under 10 CFR 50.73(a)(2)(i)(B).

As described below, weaknesses in the design change and training qualification processes associated with design change impact reviews, and calibration, testing, and installation of the new relays led to the miscalibration of two Unit 3 LOVS relays.

D. APPARENT CAUSE

A Root Cause Evaluation identified two root causes:

1. Inadequate engineering design process - The design change packages for the new LOVS relays were implemented without adequate review for site maintenance training needs due to stakeholders not recognizing the significance of the difference between the two relay designs and testing methodology. A contributing cause was ambiguous/incorrect technical information contained in LOVS surveillance testing procedure. Specifically, the procedure contained a misleading note pertaining to a critical step in the testing process. This note had not been updated properly for the new relay design.

2. Inadequate training/qualification process - A less than adequate training needs analysis was performed for the LOVS relay design change due to stakeholders not recognizing the significance of the difference between the two relay designs and testing methodology. The training needs analysis process also did not obtain feedback from the line organization. As result, the test technician training qualification was inadequately updated for the new LOVS relays, generally relying on skill and knowledge of the craft.

E. CORRECTIVE ACTIONS

Immediate/Interim Corrective Actions - Upon failing surveillance testing, the two Unit 3 relays were replaced or readjusted to meet TS requirements. Retesting was performed on all Unit 2 and 3 LOVS relays to verify setpoints were within the allowable TS voltage range. The applicable test and calibration

procedures were revised to provide correction/clarification of test methodology, and test personnel were briefed on acceptable testing methodology.

Long Term Corrective Actions - A Root Cause Evaluation addressed corrective actions to prevent recurrence of similar events, including actions to ensure effectiveness of the training needs analysis process and engineering design change process. This event was due to process weaknesses that existed during the 2008-2010 timeframe in which the LOVS relay design change packages were initiated. Recently completed corrective actions for previously identified deficiencies (unrelated to this event) could have prevented occurrence of this event.

F. SAFETY ASSESSMENT

Although the LOVS relay setpoints were found outside the licensing basis limits specified in TS SR 3.3.7.3.b, the LOVS operation remained within the bounds of the design basis. Consequently, this event did not result in a loss of safety function and had minimal safety significance.

The LOVS relays actuate on a loss of offsite power to automatically start and transfer loads to the EDGs, or if available, repower the buses from the alternate source. The TS SR 3.3.7.3.b setpoints provide margin to ensure safeguards components are repowered as assumed in the Updated Final Safety Analysis Report (UFSAR) Chapter 15 Accident Analysis, while protecting against a spurious actuation caused by momentary voltage dips on the offsite power grid. The two-out-of-four relay logic prevents a single failure from causing a spurious actuation of the undervoltage protection scheme.

The as-found settings for both relays were slightly above the TS SR 3.3.7.3.b setpoint. One relay was found set slightly above the limit allowed under the design calculations, the other relay was found within the assumed design margins for the LOVS undervoltage protection scheme. Since both relays must actuate in a two-out-of-four logic, the response to a loss of voltage on the 3A06 bus would have started the EDG at a slightly higher voltage than the TS SR 3.3.7.3.b setpoint, but within the assumed design margins and well below the spurious low voltage limit for the offsite power grid.

G. ADDITIONAL INFORMATION

Previous Similar Events - There have been no similar reportable events in the past three years at SONGS with the same underlying cause.