

September 17, 2008

U.S. Nuclear Regulatory Commission
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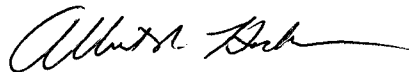
Subject: **Docket No. 50-361**
Licensee Event Report No. 2008-006
San Onofre Nuclear Generating Station, Unit 2

Dear Sir or Madam:

In compliance with 10CFR50.73(a)(2)(i)(B), this submittal provides Licensee Event Report (LER) 2008-006 to report the inoperability of a station battery for longer than allowed by Technical Specifications. Neither the health nor the safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please contact me.

Sincerely,



Albert R. Hochevar
Station Manager

Unit 2 LER No. 2008-006

cc: E. E. Collins, NRC Regional Administrator, Region IV
G. G. Warnick, NRC Senior Resident Inspector, San Onofre Units 2 & 3

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NRR

NRC FORM 366 (9-2007)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB: NO. 3150-0104 <small>Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs@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 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.</small>		EXPIRES: 08/31/2010		
<h2 style="margin: 0;">LICENSEE EVENT REPORT (LER)</h2> <p style="margin: 0; font-size: small;">(See reverse for required number of digits/characters for each block)</p>								
1. FACILITY NAME				2. DOCKET NUMBER		3. PAGE		
San Onofre Nuclear Generating Station Unit 2				05000-361		1 OF 5		
4. TITLE								
Loose connection bolting results in Inoperable Battery and TS violation								
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE		
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR
03	25	2008	2008-006-00			9	17	2008
			8. OTHER FACILITIES INVOLVED					
			FACILITY NAME			DOCKET NUMBER		
			FACILITY NAME			DOCKET NUMBER		
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)					
1			20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)	
10. POWER LEVEL			20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)	
100			20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)	
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)	
			20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)	
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)	
			20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v) X		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)	
OTHER Specify in Abstract below or in NRC Form 366A								
12. LICENSEE CONTACT FOR THIS LER								
NAME						TELEPHONE NUMBER (Include Area Code)		
Albert R. Hochevar, Station Manager						949-368-9275		
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT								
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	REPORTABLE TO EPIX
				N				
14. SUPPLEMENTAL REPORT EXPECTED						15. EXPECTED SUBMISSION DATE		
YES (If yes, complete EXPECTED SUBMISSION DATE)						MONTH DAY YEAR		
X NO								
16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)								
<p>On 3/25/08, with Unit 2 at about 100 percent power, plant personnel were performing surveillance (SR 3.8.4.1) of a 1E battery and discovered its voltage below the required value. Subsequently, signs of a loose connection were observed on the breaker connecting the battery to its DC bus, which provides charging current in its normal configuration. Reactor Operators (RO)s declared the battery inoperable, entering TS 3.8.4 Action A, while actions to find and fix the cause of the low reading continued. At about 0840 PDT, ROs initiated actions to shutdown upon entering TS 3.8.4 Action B.</p> <p>SCE determined the low voltage was caused by loose bolts on the DC breaker. By 0850 PDT on 3/25/08, SCE had torqued the loose connection bolts and completed the required TS SRs with satisfactory results. ROs declared the battery operable, terminated the plant shutdown, and returned the unit to full power.</p> <p>SCE determined that the degraded electrical connection on the DC breaker was due to an incomplete work plan and lack of checks during installation. SCE believes that the degradation most likely caused the battery to be inoperable for about 4 days prior to discovery (see Safety Significance section). This exceeds the TS allowed outage time of 2 hours, SCE is reporting this occurrence in accordance with 10CFR50.73(a)(2)(i)(B). SCE has initiated action to improve SONGS electrical work plans.</p>								

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Plant: San Onofre Nuclear Generating Station (SONGS) Unit 2
 Event Date: March 25, 2008
 Reactor Vendor: Combustion Engineering
 Mode: Mode 1- Power
 Power: 100 percent

Background:

The station class 1E DC electrical power system [EJ] provides the AC emergency power system with control and instrumentation power. It also provides both motive and control power to selected safety related and preferred AC vital bus power (through inverters).

The 125 VDC electrical power system consists of four independent and redundant safety related class 1E DC electrical power subsystems. (Trains A, B, C, and D). Each subsystem consists of one 125 VDC battery, a battery charger, and all associated control equipment and interconnecting cabling. Under normal operation, the charger is connected to the DC bus and supplies the connected DC loads and provides charging current for the battery.

Technical Specification 3.8.4 requires Trains A, B, C and D electrical power subsystems to be operable in Modes 1 through 4. If one electrical subsystem is inoperable, Action A.1 requires restoration of the DC electrical power subsystem to operable status within 2 hours. If not completed within 2 hours, Action B requires Operators to place the plant in Mode 3 within 6 hours and Mode 5 within 36 hours. TS Surveillance Requirement 3.8.4.1 requires SCE to verify battery voltage is greater than or equal to 129 VDC once every 7 days. Technical Specification (TS) Surveillance Requirement (SR) 3.8.4.6 requires verification of each battery charger capability every 24 months. During this surveillance a swing charger is connected at the battery and supplies the DC bus through the same DC breaker. This allows isolation of the normal charger for testing (See attached figure).

Description of Event:

On March 25, 2008 (Discovery Date), with Unit 2 at approximately 100 percent power, plant personnel began performance of the weekly surveillance (SR 3.8.4.1) of the Train B battery (2B008). The SR requires battery voltage to be greater than or equal to 129 VDC at the battery terminals. At about 0415 PDT, plant personnel discovered the battery voltage below the required value. Subsequently, while attempting to verify the low battery voltage reading, indications of a loose connection were observed on the bolt on the battery side of the breaker (2D201) that connects the battery to its DC bus (2D2) (See attached figure).

The Control Room Supervisor [Licensed, Utility] was informed of the low voltage reading, the suspected cause, and that the battery currently was reading above TS required levels. The information provided to the CRS was, however, non-specific and vague. After discussing this issue with the Shift Manager and Maintenance Management, at about 0640 PDT, Operations personnel [Utility, Licensed] declared battery 2B008 inoperable. Control Room Operators entered TS 3.8.4, Action "A", while actions to determine the cause of the earlier low reading and to perform any necessary maintenance continued.

At 0840, Plant Operators began preparation for a TS required plant shutdown and initiated cooldown of the Moisture Separator Reheaters (MSRs). This action caused reactor power to decrease slightly. In

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accordance with 10CFR50.72(b)(2)(i), SCE reported the initiation of a TS-required plant shutdown (NRC Log Number 44092).

By about 0850 PDT on March 25, 2008, SCE had torqued the loose connection bolts and completed the required TS SRs with satisfactory results. Plant operators [Licensed, Utility] declared the battery operable and terminated the plant shutdown and returned the unit to full power.

SCE subsequently determined that the loose electrical connection on breaker 2D201 most likely caused battery 2B008 to be inoperable for about 4 days prior to discovery (see the Safety Significance section below). Because this exceeds the Technical Specification allowed outage time (2 hours), SCE is reporting this occurrence in accordance with 10CFR50.73(a)(2)(i)(B).

Cause of the Event:

SCE completed a root cause evaluation which concluded the 2D201 connection bolts were most likely not fully torqued on March 17, 2004 when Breaker 2D201 was last replaced. The bolts were not fully torqued due to an incomplete work plan and lack of effective second check of critical steps.

Corrective Actions:

SCE has completed the following corrective actions:

1. SCE torqued the connections identified as loose on March 25, 2008.
2. On July 15, 2008, SCE performed a ductor test on the connections which demonstrated an acceptable contact resistance of less than 10 micro-ohms.
3. SCE inspected the other three DC electrical trains for Unit 2 and all four trains for Unit 3 confirming the associated DC breakers did not have loose connection bolting.
4. SCE has added this event to Maintenance Training as Operating Experience.
5. SCE has coached the electricians responsible for installing breaker 2D201 in 2004 regarding expectations for job completion and documentation.

SCE has initiated action to improve SONGS electrical work plans.

SCE is continuing to investigate the plant personnel response on March 25, 2008. Additional corrective actions may be identified to improve performance.

Safety Significance:

Based on a detailed review of plant records, SCE determined that battery 2B008 was most likely Operable between March 17, 2004 and March 21, 2008. During this period, four separate plant evolutions resulted in significant current (greater than 100 amperes) passing through the loose electrical connection. Between March 17, 2008 and March 21, 2008, SCE completed a TS required performance test of the normal charger for battery 2B008 (TS SR 3.8.4.6), during which, the swing charger supplied the DC bus approximately 115 amperes DC through the loose electrical connection while the normal charger was isolated for testing. SCE concluded that the higher current (normal battery float charge current through the connection is approximately 0.1A – 0.3A) resulted in increased heating of the connections for about 4 days. SCE considers that effects of the thermal cycling following use of the

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swing charger caused the loose connection to degrade to inoperability, which would have occurred sometime after March 21, 2008 and before its discovery on March 25, 2008.

Based on the above assessment of past operability, SCE has completed a Probability Risk Assessment of the degraded connection between breaker 2D201 and battery 2B008 which concludes the risk significance was very low. The calculated incremental core damage probability (ICDP) and incremental large early release probability (ILERP) are estimated to be $6.9E-7$ and $7.1E-8$, respectively for the period of 3/21/08 (at 1004) to 3/25/08 (at 0850) when the DC breaker is assumed to be inoperable. The risk estimates are based on actual plant configurations that occurred during the assumed breaker inoperability period and the operability of the other 3 DC trains. The very low risk significance of this degraded condition is primarily due to its short duration and the availability of other mitigating system components.

Additional Information:

LER 3-2005-001, submitted on August 23, 2005, voluntarily reported that a loose electrical connection on a thermal overload caused an emergency supply fan for an Emergency Diesel Generator (EDG) to be inoperable (the EDG remained operable). Corrective actions for that occurrence focused on other similar thermal overload electrical connections. The loose connection on breaker 2D201 reported in this submittal was not associated with a thermal overload.

Late LER Submittal:

Because the battery had been passing its weekly surveillance tests, SCE initially considered this connection to be "failed when found" and that a follow-up LER was not required. At that time (March 2008), a past operability evaluation was not performed. In June, in reviewing past SCE evaluations, the NRC Senior Resident Inspector questioned the operability of the connection in the as-found condition. In response to the Inspector's questions, SCE evaluated past operability of this connection and concluded Battery 2B008 was most likely inoperable for four days prior to discovery.

Because the event was discovered on March 25, 2008, SCE should have submitted an LER by May 27, 2008 but did not. To correct this occurrence, SCE performed a cause evaluation for this late submittal and will implement enhancements to the reportability process. Corrective actions are being tracked through SCE's corrective action program.

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Figure: DC System Configuration

