

May 11, 2005

U.S. Nuclear Regulatory Commission  
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Washington, D.C. 20555-0001

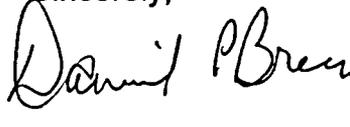
Subject: **Docket Nos. 50-361 and 50-362**  
**Licensee Event Report No. 2005-003**  
**San Onofre Nuclear Generating Station, Units 2 and 3**

Dear Sir or Madam:

This submittal provides Licensee Event Report (LER) 2005-003, in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(v)(D) and for failure to comply with the requirements of General Design Criterion 17.

If you require any additional information, please advise.

Sincerely,



LER No. 2-2005-003

cc: B. S. Mallett, NRC Regional Administrator, Region IV  
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

*JE22*

<b>NRC FORM 366</b> (7-2001)	<b>U.S. NUCLEAR REGULATORY COMMISSION</b>	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: 06/30/2007
<b>LICENSEE EVENT REPORT (LER)</b> <small>(See reverse for required number of digits/characters for each block)</small>			

<b>1. FACILITY NAME</b> San Onofre Nuclear Generating Station (SONGS) Unit 2	<b>2. DOCKET NUMBER</b> 05000-361	<b>3. PAGE</b> 1 OF 5
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**4. TITLE**  
 Relay Settings For The Degraded Grid Voltage Protection System Could Cause Early Separation From Offsite Power Sources During A Design Basis Event

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	14	2005	2005	003-00		05	11	2005	SONGS Unit 3	05000-362
									FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>	1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>								
<b>10. POWER LEVEL</b>	99	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
		20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)		50.73(a)(2)(x)
		20.2203(a)(1)			50.36(c)(1)(i)(A)			50.73(a)(2)(iv)(A)		73.71(a)(4)
		20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)		73.71(a)(5)
		20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)		<input checked="" type="checkbox"/> OTHER
		20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A  <b>GDC-17</b>
		20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)		
		20.2203(a)(2)(v)			<input checked="" type="checkbox"/> 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)				

<b>12. LICENSEE CONTACT FOR THIS LER</b>	
NAME D. P. Breig, Station Manager, Nuclear Generation	TELEPHONE NUMBER (Include Area Code) 949-368-9263

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						

14. SUPPLEMENTAL REPORT EXPECTED					15. EXPECTED SUBMISSION DATE			
YES (If yes, complete EXPECTED SUBMISSION DATE)				<input checked="" type="checkbox"/> NO	MONTH		DAY	YEAR

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

In 1995, Southern California Edison (SCE) installed degraded voltage protection systems to ensure San Onofre Nuclear Generating Station (SONGS) separates from offsite power if the voltage supplied by the offsite power system dips and remains below the voltage needed for plant safety equipment operability. SCE had calculated 218 kV to be the minimum switchyard voltage that would support plant safety equipment operability.

During an assessment of the SONGS switchyard the week of March 14, 2005, personnel questioned the validity of 218 kV as the minimum voltage required for offsite circuit operability with one unit shutdown and one unit operating. SCE performed evaluations after March 14, 2005 which indicate 222.2 kV is required for operability of the immediate access offsite power circuit. If post-trip switchyard voltage would have been between 218 kV and 222.2 kV, degraded voltage protection systems could have caused SONGS to separate from offsite power even though offsite power would have provided sufficient voltage to support plant safety equipment operability. SCE is reporting this occurrence in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(v)(D).

SCE is continuing to evaluate hardware and electrical setpoint changes to reduce the voltage required at the SONGS switchyard from 222.2 kV to a lower value.

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Plant: San Onofre Nuclear Generating Station (SONGS)  
 Event Date: March 14, 2005  
 Reactor Vendor: Combustion Engineering

Mode: Unit 2 Mode 1 – Power Operation      Unit 3 Mode 1 – Power Operation  
 Power: 99 percent      100 percent

**Description of the Event:**

In 1995, Southern California Edison (SCE) installed degraded voltage protection systems [JE] to ensure San Onofre Nuclear Generating Station (SONGS) separates from offsite power if the voltage supplied by the offsite power system degrades and remains below the voltage needed to support plant safety equipment operability. The degraded grid voltage protection scheme was installed as an enhancement to the original degraded voltage protection scheme to provide more robust protection against a degraded grid.

The SONGS switchyard minimum voltage that supports plant safety equipment operability is 218 kV. A written agreement is in effect which requires the California Independent System Operator (the Grid Operator) to manage grid operations to ensure the SONGS switchyard voltage will remain above this minimum voltage under the most limiting condition (one SONGS Unit is shutdown and the remaining SONGS Unit trips; i.e., post trip voltage above 218 kV). The Grid Operator is required to notify SCE if grid operating conditions cannot satisfy the above criterion. SCE would then declare offsite power inoperable, and would enter the appropriate Technical Specification (TS), normally TS 3.8.1 Action "C." (These steps are proceduralized by SCE and the Grid Operator in accordance with the Transmission Control Agreement).

During an assessment of the SONGS switchyard the week of March 14, 2005, Utility and non-Utility personnel (non licensed) questioned the validity of using 218 kV as the minimum voltage required for operability of the immediate access offsite power circuit. SCE performed evaluations after March 14, 2005 which indicate 222.2 kV is required for operability of the immediate access offsite power circuit. Below this voltage, the Class 1E AC bus [EB] voltages might not be able to recover above the upper reset limit of the degraded voltage protection systems [Sustained Degraded Voltage Signal (SDVS) and Degraded Grid Voltage with Safety Injection Actuation Signal (SIAS) (DGVSS)]. Consequently, if post trip voltage would have been between 218 kV and 222.2 kV, the SDVS / DGVSS relay setpoint uncertainties could have caused SONGS to separate from the immediate access offsite power even though offsite power would still be operable.

This condition is not in accordance with the requirements of General Design Criterion (GDC) 17, "Electric Power Systems." GDC 17 states (in part):

"Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits [...] One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained."

"Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the

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nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.”

Due to the condition described above, SONGS might not have had one offsite source available within a few seconds because of, or coincident with, the loss of power generated by the Operating SONGS unit. Therefore, this condition does not meet the requirements for the immediate access offsite power circuit to be operable in accordance with the Technical Specifications.

It is likely that at times in the past with one unit shutdown and one unit in operation, post-trip voltage would have been between 218 kV and 222.2 kV and availability of the immediate access offsite power circuit to the affected unit could not be assured. (With both units initially operating, post-single unit-trip voltage would have been sufficient to allow the immediate access offsite power circuit to remain connected to the Class 1E AC buses.) Consequently, SCE is reporting this occurrence in accordance with 10CFR50.73(a)(2)(i)(B), a condition prohibited by the Technical Specifications. SCE is also reporting this event in accordance with 10CFR50.73(a)(2)(v)(D) because section 3.2.7 of NUREG-1022, Revision 2 indicates offsite power unavailability is reportable regardless of whether other electrical power systems are available.

**Cause of the event:**

The direct cause of this condition is considered to be an incomplete scope of engineering analysis for the design change package that installed the DGVSS and SDVS systems. The individuals involved (Utility, non-licensed) failed to evaluate the effects of the DGVSS relay uncertainties [RLY, 27] on the availability of the immediate access offsite power circuit.

A more detailed review of this issue is being completed in a Root Cause Evaluation that is ongoing.

**Corrective Actions:**

As a short-term measure, applicable procedures have been revised to change the 218 kV value to 222.2 kV. That is, whenever one SONGS unit is shutdown, the Grid Operator will now inform SONGS whenever the offsite power source is predicted to be unable to remain above 222.2 kV if the remaining SONGS Unit trips. SONGS plant operators will enter the appropriate TS, normally TS 3.8.1 Action “C.”

SCE is continuing to evaluate ways to reduce the voltage required at the SONGS switchyard from 222.2 kV to a lower value (and desirably less than 218 kV). Potential solutions include:

- Removing excess margin used for determining operability of specific electrical components (pump motors, valve actuators, etc.)
- Reducing relay setting tolerances,
- Upgrading transformers for control power circuits,
- Splitting 480V power distribution, and
- Addition of Regulating Transformers.

The Root Cause Evaluation may determine additional factors that resulted in this design oversight. The RCE may thus require additional corrective actions that will be implemented.

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**Safety Significance:**

San Onofre Units 2 and 3 each have two emergency diesel generators (EDGs) [EK]. During the past three years, at least one diesel generator per Unit was always available and capable of supplying sufficient electrical power to operate required safety systems in the event of a postulated accident. Even though SONGS could have separated from the immediate access offsite power circuit between 218 kV and 222.2 kV, required safety systems would have been powered from the EDGs and would have been capable of performing their intended safety functions. This is consistent with the Updated Final Safety Analysis Report as the complete loss of offsite power is within the design basis of the plant. Also, offsite power would most likely become available a short time after the Unit trip. Grid voltage would dip as a result of the Unit trip but would recover as the grid responded to the loss of generation.

SCE completed a Probabilistic Risk Assessment (PRA) which evaluated the increased risk associated with this condition for at-power and shutdown operations. This evaluation was based on actual plant configurations (e.g., component unavailabilities, alignments, mode of operation, etc.) which existed during the time one unit was shutdown and the other unit was at power from April 2002 through March 2005. The SONGS Units 2 and 3 average annual incremental change in core damage probability (ICDP) and incremental large early release probability (ILERP) were determined to be 6.3E-7 and 6.2E-8 respectively.

**Additional Information:**

In the past three years, SCE has reported one other instance of offsite power being inoperable. LER 2-2004-003 reported that on June 14, 2004, a 230 kV transmission line fault in Arizona caused offsite power frequency at SONGS to momentarily drop below that required for operability.

**Applicable Technical Specifications:**

Technical Specification (TS) 3.8.1, AC Sources - Operating, requires the following AC electrical sources shall be operable in MODES 1 through 4:

- a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and
- b. Two diesel generators (DGs) each capable of supplying one train of the onsite Class 1E AC Electrical Power Distribution System.

With both required offsite circuits inoperable, Action "C" requires SCE to restore at least one offsite source to operable status within 24 hours. (Action "C" also requires SCE to declare required features inoperable when its redundant required feature is inoperable). If Action "C" is not met within 24 hours, Action "F" requires SCE to place the plant in Mode 3 within the following 6 hours and in Mode 5 in an additional 36 hours.

TS 3.8.2, AC Sources - Shutdown, requires the following AC electrical sources shall be operable in MODES 5 and 6 and during movement of irradiated fuel assemblies:

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- a. One qualified circuit between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems, Shutdown"; and
- b. One diesel generator (DG) capable of supplying one train of the onsite Class 1E AC Electrical Power Distribution subsystem(s) required by LCO 3.8.10.

If the one required offsite circuit is inoperable, Action "A" requires SCE to immediately:

- 1. Declare affected required features with no offsite power inoperable; or
- 2.1. Suspend CORE ALTERATIONS, and
- 2.2. Suspend movement of irradiated Fuel Assemblies, and
- 2.3. Suspend operations involving positive reactivity additions that could result in loss of required shutdown margin or boron concentration, and
- 2.4. Initiate action to restore the required offsite power circuit to operable status.