

*Southern California Edison Company*

SAN ONOFRE NUCLEAR GENERATING STATION

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December 15, 1989

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STATION MANAGER

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

Subject: Docket No. 50-206  
Supplemental Report  
Licensee Event Report No. 88-017, Revision 1  
San Onofre Nuclear Generating Station, Unit 1

Reference: Letter, H. E. Morgan (SCE) to USNRC Document Control Desk, dated  
January 5, 1989.

The referenced letter provided voluntary Licensee Event Report (LER) No. 88-17 involving the Technical Specification limit for the Auxiliary Feedwater Storage Tank. The enclosed supplemental LER provides additional information concerning the event, cause and corrective action. Neither the health and safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

*H E Morgan*

Enclosure: LER No. 88-017, Revision 1

cc: C. W. Caldwell (USNRC Senior Resident Inspector, Units 1, 2 and 3)  
J. B. Martin (Regional Administrator, USNRC Region V)  
Institute of Nuclear Power Operations (INPO)

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LICENSEE EVENT REPORT (LER)																	
Facility Name (1)								Docket Number (2)				Page (3)					
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1								0   5   0   0   0   2   0   6				1   of   0   6					
Title (4) POTENTIAL NON-CONSERVATISM WITH TECHNICAL SPECIFICATION REQUIREMENT FOR AUXILIARY FEEDWATER STORAGE TANK VOLUME DUE TO CALCULATION OVERSIGHT																	
EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)							
Month	Day	Year	Year	/// Sequential Number	/// Revision Number	Month	Day	Year	Facility Names		Docket Number(s)						
1	2	0	2	8	8	8	8	0	1	1	2	1	5	8	9	NONE	0   5   0   0   0
OPERATING MODE (9)		5		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)													
POWER LEVEL (10)		0   0   0		<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)								<input type="checkbox"/> 73.71(c)		
				<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input checked="" type="checkbox"/> Other (Specify in								Abstract below and		
				<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)								in text)			
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				<input type="checkbox"/> 20.405(a)(1)(v)										VOLUNTARY			
LICENSEE CONTACT FOR THIS LER (12)																	
Name								TELEPHONE NUMBER									
H. E. Morgan, Station Manager								AREA CODE		7   1   4				3   6   8   -   6   2   4   1			
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																	
CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS								
SUPPLEMENTAL REPORT EXPECTED (14)										Expected Submission Date (15)	Month	Day	Year				
<input type="checkbox"/> Yes (If yes, complete EXPECTED SUBMISSION DATE)										<input checked="" type="checkbox"/> NO							
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)																	

On 12/2/88, with Unit 1 in cold shutdown for the Cycle 10 refueling, during a review of a calculation used for determining minimum Auxiliary Feedwater Storage Tank (AFWST) volume requirements associated with upcoming changes to the AFW design, it was discovered that the calculation which provided the basis for the minimum Technical Specification (TS) volume of 150,000 gallons did not account for pump G10S bearing cooling water flow that is unavailable for delivery to the Steam Generators. On 1/27/89, the bearing cooling flow rate was measured to be 10.44 gallons per minute (gpm). With this flow diversion, the minimum AFWST volume required should have been 163,045 gallons during the period (11/7/84 to 4/25/89) in which a minimum of 150,000 gallons was specified in the TS. A review of operational records revealed that during this period the actual minimum tank volume was maintained well above 163,045 gallons. As a result, SCE has concluded that there was no safety significance to this event.

The engineer responsible for performing the calculation upon which the 150,000 gallon TS requirement was based erred in applying a general value of margin to the calculation, rather than identifying and quantifying all significant unavailable flows. In addition, the review and approval process for the calculation was not rigorous enough to detect the error. The root causes of this occurrence are related to deficiencies with programs for establishing and controlling design basis documentation. Corrective actions being taken for these concerns are addressed in a 10/3/88 submittal to the NRC regarding SCE's assessment of engineering and technical support for San Onofre. The TS has been revised to specify a minimum AFWST volume of 190,000 gallons.

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Plant: San Onofre Nuclear Generating Station  
 Unit: One  
 Reactor Vendor: Westinghouse  
 Event Date: 12-02-88

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 5, Cold Shutdown

B. BACKGROUND INFORMATION:

The Auxiliary Feedwater Storage Tank (AFWST) (EIIS Component Code TK) is the primary water source for the Auxiliary Feedwater System (AFW) (EIIS System Code BA), which is designed to deliver feedwater to the Steam Generators (SG)(EIIS System Code SG) following loss of normal feedwater, and during plant startup and shutdown operations. The AFWST has a 240,000 gallon capacity, 150,000 gallons of which was required by Technical Specification (TS) 3.4.4 in Modes 1, 2, and 3 by Amendment 82, which was in effect from 11/7/84 to 4/25/89. The 150,000 gallon TS requirement was based on a calculated requirement to deliver 143,000 gallons to the SGs for a reactor coolant system cooldown over a period of 32 hours and to provide an additional margin of 7,000 gallons.

One of the three pumps in the AFW system is a 10-stage, motor-driven AFW pump (G10S). When the pump is running, the bearings are cooled by AFW flow which is taken from the pump's first stage impeller discharge and routed to the pump bearings. Leak-off from the bearings is discharged to a floor drain. This water is therefore unavailable for delivery to the SGs. The actual cooling flow rate was not specified in vendor information, nor was it measured and taken into consideration for TS Amendment 82 calculation.

C. DESCRIPTION OF THE EVENT:

1. Event:

On 12/2/88, with Unit 1 in cold shutdown for the Cycle 10 refueling, during a review of a calculation used for determining minimum AFWST volume requirements associated with upcoming changes to the AFW design, it was discovered that the calculation which provided the basis for the minimum TS volume of 150,000 gallons for TS 3.4.4, Amendment 82, did not account for pump G10S bearing cooling water flow that is unavailable for delivery to the SGs. The actual cooling flow rate was not specified in vendor information, nor was it measured and taken into account as part of the calculation for Amendment 82.

On 1/27/89, the bearing cooling flow rate was determined to be 10.44 gallons per minute (gpm). With this flow rate, the minimum AFWST volume required should have been specified to be 163,045 gallons instead of the 150,000 gallons stipulated by TS 3.4.4 (Amendment

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82. Based on single failure considerations and a conservative estimate of 15 gpm for cooling flow to the pump bearings, the AFWST volume was recalculated to be 190,000 gallons and submitted to the NRC as a TS amendment application. This TS amendment application was approved by the NRC as Amendment 125 on 4/25/89.

2. Inoperable Structures, Systems or Components that Contributed to the Event:

None.

3. Sequence of Events:

Not applicable.

4. Method of Discovery:

On 12/2/88, during a review of the calculation for determining minimum AFWST volume requirements associated with upcoming changes to the AFW design, it was discovered that the calculation which provided the basis for the minimum TS volume of 150,000 gallons did not account for the bearing cooling water flow to pump G10S that is unavailable for delivery to the SGs.

5. Personnel Actions and Analysis of Actions:

Not Applicable.

6. Safety System Responses:

Not Applicable.

D. CAUSE OF THE EVENT:

1. Immediate cause:

The engineer responsible for performing the calculation which determined the minimum required AFWST volume under TS Amendment 82 erred in not adequately accounting for all of the significant flow paths associated with the system. In addition, the review and approval process for the calculation, which included reviews by an independent engineer and appropriate supervision, was not rigorous enough to detect the error.

2. Intermediate cause:

a. The responsible engineer applied a general value of margin to the calculation, rather than identifying and quantifying all significant unavailable flows. In this case, the bearing cooling flow path was indicated on the piping and instrumentation drawing, and described in the pump vendor's

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manual. Since the flow rate was not specified in the pump vendor's manual, the flow should have been measured in-place.

- b. The responsible engineer erred in deciding that an interdisciplinary review was neither required nor necessary. Such a review would have involved station personnel more familiar with the in-place details of the AFW pump, and may have resulted in identification of the bearing cooling water flow.
- c. The review process for engineering calculations utilized by the independent review engineer, engineering discipline group leader and engineering supervisor did not result in detection of this error.

3. Root cause:

SCE has completed a study to evaluate general deficiencies in the area of design, engineering and technical work which, in part, caused the conditions being reported in this LER. Results of this study are identified in SCE's October 3, 1988 letter to the NRC regarding this matter. The applicable conclusions reached in this study are as follows:

- a. There are no programmatic requirements for the development, update, or compilation of design basis documents.
- b. The engineering resources and supervision were inadequate to properly perform the above described engineering efforts.
- c. Technical training for engineering personnel is too narrowly defined and fails to properly consider the engineer's function and needs. Technical training generally fails to provide an integrated system knowledge of plant design and operation. Without this or a detailed design basis, the ability of the individual is largely a function of his own capabilities and experience.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

- a. Using a conservative AFW pump bearing cooling flow rate of 15 gpm, the AFWST volume required in TS 3.4.4 was recalculated for and included in a TS amendment application. This TS amendment application was approved by the NRC on 4/25/89 (Amendment 125) and established the minimum AFWST volume as 190,000 gallons.
- b. A training program for supervisory personnel, performing review of technical and engineering work, has been initiated.

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This program addresses, in part, the responsibilities of technical reviewers and emphasizes the need to foster a questioning attitude to ensure poor quality work is identified during the design process.

- c. Nuclear-related design engineering functions have been consolidated into one organization. This consolidation will enhance the quality and efficiency of the engineering activities by reducing duplication of effort and further clarifying accountability. This will also ensure that management attention will be dedicated to and focused on nuclear matters.
- d. The engineer who performed the original calculation has been trained in the correct methods and procedures applicable to these tasks.

2. Planned Corrective Actions:

- a. Members of the nuclear engineering design organization (NEDO) will review the erroneous AFWST volume calculation and will be trained in proper application of design related procedural requirements.
- b. Members of the NEDO will be trained in the proper responsibilities of an independent review engineer.
- c. All previous calculations performed by the responsible engineer and/or reviewed by the independent reviewer will be subjected to an additional review (including an interdisciplinary review as required).
- d. Applicable engineering procedures will be revised, as required, to address interdisciplinary review requirements for calculations and to clarify the responsibilities of the independent review engineer.

F. SAFETY SIGNIFICANCE OF THE EVENT:

A review of the operational records of the AFWST levels during the period in which TS 3.4.4, Amendment 82, was effective (11/7/84 to 4/25/89) was performed to determine the minimum AFWST level while the Unit was in Modes 1 through 3. This review determined that the minimum AFWST volume was maintained well above the 163,045 gallon minimum required for delivery to the SGs and to provide bearing cooling water. As a result, SCE has concluded that there was no safety significance to this event.

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G. ADDITIONAL INFORMATION:

1. Component Failure Information:

Not Applicable.

2. Previous LERs on Similar Events:

Recent LERs reporting similar design and design control related conditions:

Unit 1 (Docket No. 50-206)

LER 1-87-015 reported that certain systems were susceptible to single failure.

LER 1-88-009 reported a condition in which the emergency diesel generators could have exceeded an intended electrical load limit.

LER 1-88-006 reported a condition where the Unit 1 Backup Nitrogen Systems (as designed, installed and operated) did not satisfy the licensing and design basis for the systems.

LER 1-88-001 reported that several components requiring environmental qualification were not included in the administrative controls for the environmentally qualified equipment. Additionally, other components were found to be in an unqualified configuration.

Unit 2 (Docket No. 50-361)

LER 2-88-017 reported that a spent fuel pool siphon event occurred as a result of the failure to identify and implement the design intent to utilize administrative controls on certain locked valves.

LER 2-88-010 reported a condition in which both emergency chillers were rendered inoperable as a result of not addressing freon level as a critical design parameter.

LER 2-88-008 reported various conditions resulting in the Component Cooling Water System being outside its design basis due to design control program deficiencies.

3. Results of NPRDS Search:

Not Applicable.