Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION

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March 7, 1991

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

Subject: Docket No. 50-206
30-Day Report
Licensee Event Report No. 91-002
San Onofre Nuclear Generating Station, Unit 1

Pursuant to 10 CFR 50.73(d), this submittal provides the required 30-day written Licensee Event Report (LER) for an occurrence involving Trisodium Phosphate. Neither the health nor the safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

R W Krieger

Enclosure: LER No. 91-002

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)

IE22
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LICENSEE EVENT REPORT (LER)

Facility Name (1)	Docket Number (2)	Page (3)
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Title (4)

CALCULATIONAL ERROR ASSOCIATED WITH THE MINIMUM QUANTITY OF TRISODIUM PHOSPHATE (TSP) USED FOR CONTROLLING pH OF CONTAINMENT SUMP WATER FOLLOWING A LOCA

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)
				---	---					NONE	0 5 0 0 0
0 2	0 5	9 1	9 1	0 0 2	--- 0 0		0 3	0 7	9 1		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	___ 20.402(b)	___ 20.405(c)	___ 50.73(a)(2)(iv)	___ 73.71(b)
//////////////////////		___ 20.405(a)(1)(i)	___ 50.36(c)(1)	___ 50.73(a)(2)(v)	___ 73.71(c)
//////////////////////		___ 20.405(a)(1)(ii)	___ 50.36(c)(2)	___ 50.73(a)(2)(vii)	___ Other (Specify in Abstract below and in text)
//////////////////////		___ 20.405(a)(1)(iii)	___ 50.73(a)(2)(i)	___ 50.73(a)(2)(viii)(A)	
//////////////////////		___ 20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	___ 50.73(a)(2)(viii)(B)	
//////////////////////		___ 20.405(a)(1)(v)	___ 50.73(a)(2)(iii)	___ 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER AREA CODE
R. W. Krieger, Station Manager	7 1 4 3 6 8 - 6 2 5 5

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	//////	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	//////
					//////						//////
					//////						//////

SUPPLEMENTAL REPORT EXPECTED (14)	Expected Submission Date (15)	Month	Day	Year
___ Yes (If yes, complete EXPECTED SUBMISSION DATE) XX NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On February 5, 1991, with Unit 1 in Mode 5, while revising the calculation which specifies the minimum quantity of Trisodium Phosphate (TSP) required for controlling containment sump water pH following a Loss Of Coolant Accident (LOCA), it was determined that the post LOCA pH could have ranged between 6.74 and 7.33. This range was determined based upon current Technical Specifications (TS) governing TSP and boric acid sources to the Reactor Coolant System (RCS). The basis for the TS governing TSP specifies a minimum pH of 7.0 within four hours following a design basis LOCA. Therefore, there has existed the potential for Unit 1 to be operated in a condition outside of its design basis with respect to post LOCA containment sump water pH.

The calculation revision had been initiated after it was identified that the original calculation had not included the Boric Acid Storage Tank (BAST) as a potential source of boric acid into the containment sump. Given the length of time since the original calculation was performed, SCE has been unable to definitively conclude the reason for the omission. However, it is our belief that the original calculation only considered sources of boron that were introduced into the containment sump in accordance with procedure or were credited in the LOCA analysis. Since this is not the case for the BAST, its contents were not incorporated in the calculation.

The amount of TSP located in racks in the lowest elevation of containment has been increased. Appropriate administrative controls have been implemented to limit boron in the Refueling Water Storage Tank (RWST) and BAST. A proposed TS change reflecting these limits and the increase in the minimum TSP required will be submitted within three months after restart from the current outage.

This condition would have had minimal safety significance.

Plant: San Onofre Nuclear Generating Station
Unit: One
Reactor Vendor: Westinghouse
Event Date: 02-05-91

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 5, Cold Shutdown

B. BACKGROUND INFORMATION:

Anhydrous Trisodium Phosphate (TSP) is provided at SONGS 1 to control the pH of the containment sump water following a Loss Of Coolant Accident (LOCA). The TSP serves to minimize the possibility of chloride stress corrosion cracking of metal components during operation of the Emergency Core Cooling System (ECCS) following a LOCA. The TSP is located in racks in the lowest elevation of the containment.

Technical Specification (TS) 3.3, "Safety Injection and Containment Spray Systems" specifies a minimum of 5400 pounds of anhydrous TSP to be stored in the containment racks. This minimum value is based on ensuring that the pH of the water in the sump [WK] will be greater than 7.0 within four hours following the design basis LOCA.

The post LOCA boron sources to the containment sump water sources consist of the contents of the Reactor Coolant System (RCS) [AB], the Refueling Water Storage Tank (RWST) [TK], and potentially the Boric Acid Storage Tank (BAST) [CB].

TS 3.3.3, "Minimum Boron Concentration In The Refueling Water Storage Tank (RWST) And Safety Injection (SI) Lines And Minimum RWST Water Volume" specifies a maximum boron concentration of 4300 ppm in the RWST to ensure that the post-accident containment sump water is maintained at a pH between 7.0 and 7.5. TS 3.2, "Chemical And Volume Control System" specifies that the BAST contains a solution of at least 3450 pounds of boric acid in not less than 3500 gallons of water. TS 4.2, "Safety Injection and Containment Spray System" specifies testing requirements of the TSP.

C. DESCRIPTION OF THE EVENT:

1. Event:

As part of SCE's Design Basis Documentation (DBD) program, the calculation (performed in 1975) which determined the minimum quantity of TSP required for post LOCA conditions was reviewed. This review identified that the calculation did not include the contents of the BAST as a potential source of boric acid into the containment sump. The calculation did consider other sources of boron including the RWST and the RCS.

Although no procedural requirements exist in which the contents of the BAST are to be used during post LOCA scenarios, it would be possible for operators to use the BAST in such circumstances. In addition, the design of the BAST system is such that during certain accident scenarios the contents of the BAST could be a containment sump water source. Specifically, if instrument air (which for SONGS 1 is not safety related) were to be lost during the LOCA, the BAST outlet valves would fail open thereby creating an open path from the BAST to the charging pumps suction. Since charging is operated during post LOCA conditions (for hot/cold leg recirculation), a portion of the contents of the BAST could be supplied to the RCS and eventually become a containment sump water source. Therefore, the boron in the BAST should have been considered in the calculation.

Based upon this discovery, a revision to the calculation was initiated which considered the contents of the BAST. On February 5, 1991, the calculation revision identified that the post LOCA pH could have ranged between 6.74 and 7.33, which deviates from the range stipulated in the bases for the TS's as described above in Section B.

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

None.

3. Sequence of Events:

Not applicable.

4. Method of Discovery:

See Section C.1 above.

5. Personnel Actions and Analysis of Actions:

Not applicable.

6. Safety System Responses:

Not applicable.

D. CAUSE OF THE EVENT:

The TS minimum TSP quantity of 5400 pounds was established based upon a calculation performed by a contractor in 1975. The calculation erroneously assumed that the contents of the BAST would not be introduced into the RCS post LOCA, and therefore would not contribute to the boron concentration in the containment sump.

Given the length of time since the original calculation was performed, SCE has been unable to definitively conclude why the contents of the BAST were not incorporated in the calculation. However, it is our belief that the original calculation did not address the BAST because its scope was limited to sources of boron that were introduced into the containment sump in accordance with procedure or were credited in the LOCA analysis. Since this is not the case for the BAST, its contents were not incorporated in the calculation.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. The calculation for the minimum quantity of TSP required to ensure a post LOCA pH of 7.0 to 7.5 has been revised.

b. The amount of anhydrous TSP located in racks in the lowest elevation of containment has been increased to 6,232 +/- 125 pounds. A fourth TSP storage rack has been installed in containment to accommodate the additional TSP.

c. Administrative controls have been implemented to assure that the total boron inventory available for ECCS injection is limited such that containment sump pH will be within the range of 7.0 to 7.5. Specifically, the RWST boron will be limited to between 3750 - 3950 ppm and the BAST boric acid concentration will be limited to less 13%. This quantity of boron is based on the sump pH requirements and results from an analysis of the design basis LOCA at full power operation.

d. Appropriate administrative controls have also been implemented such that if the TSP or boron inventories are found to deviate from the requirements, restoration will be required within 72 hours, or the plant will be taken to HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

e. Additional administrative controls have been implemented to require surveillance of the fourth TSP storage rack and a revised testing method of TSP samples.

2. Planned Corrective Actions:

a. A calculation will be performed which once completed will allow the RWST boron inventory and BAST boric acid concentration to be increased provided that the total boron inventory in the RWST, BAST, and RCS is less than 9,346 pounds at full power conditions.

b. Appropriate procedures will be revised to reflect the results of the above calculation results/limits.

c. A proposed Technical Specification change for TS 3.2, 3.3.1, 3.3.3, and 4.2, will be submitted within three months after restart to revise the current TS limits on the quantities of boron and TSP required.

d. The current requirement for TSP surveillances will also be revised to reflect the addition of the fourth TSP storage rack and a revised testing method of TSP samples.

F. SAFETY SIGNIFICANCE OF THE EVENT:

Calculations performed indicate that with the maximum TS allowable quantities of boron in the RWST and BAST, the post LOCA pH of the containment sump water would have been below 7.0. Specifically, the pH would have been 6.74. However, with the boron concentration of these sources at nominal values, the estimated resultant pH would have been approximately 7.0.

In addition, the calculations upon which the above pH values are based do not account for factors which are expected to increase containment sump water alkalinity (pH) thereby reducing the probability of chloride stress corrosion cracking. These factors are: 1) lithium hydroxide (which is used during normal plant operations to adjust RCS pH), 2) the post LOCA containment temperature, 3) hydrazine (which is used as a spray water additive during the spray injection period) and, 4) leaching of alkalies from the surfaces of uncoated concrete by the containment spray water and steam condensate.

Since the above factors are expected to increase the containment sump water alkalinity (pH) thereby reducing the probability of chloride stress corrosion cracking, this condition would have had minimal safety significance.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

Not applicable.

2. Previous LERs for Similar Events:

None.

3. IE Bulletin 77-04:

IE Bulletin 77-04, "Calculational Error Affecting The Design Performance Of A System For Controlling pH Of Containment Sump Water Following A LOCA", dated November 4, 1977, was included in the review of this issue by SCE's Design Basis Documentation program. This document described an incident in which it was determined that the amount of TSP specified in the TS was inadequate to maintain proper pH control during all potential post LOCA conditions. Specifically, the assumptions upon which the calculations were based were not the maximum boron concentrations and water volumes permitted by TS for the containment sump water sources including the BAST.

Our response to the IE Bulletin did not identify the aforementioned calculation deficiency. SCE believes that our response was based upon the presumption that the IE Bulletin described a plant for which the contents of the BAST is required to be injected into the RCS at some point in the accident. Since such a requirement does not exist at SONGS 1, we did not address the contents of the BAST in our IE Bulletin response or revise our calculation to include it.