NRC FORM 366 (MMM-YYYY) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	Docket Number (2)	Page (3)
San Onofre Nuclear Generating Station (SONGS) Unit 2	05000-361	1 of 5

TITLE (4): Emergency Feedwater Actuation Signal (EFAS) Outside Design Basis

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 NAME	DOCKET NUMBER
08	18	1998	1998	-- 014 --	00	09	17	1998	SONGS Unit 3	05000-362
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9): 1

POWER LEVEL (10): 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check One or More) (11)

20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)
20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R.W. Krieger, Vice President, Nuclear Generation	949-368-6255

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
Yes (If yes, complete EXPECTED SUBMISSION DATE)	X	No				

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

On 8/12/1998, operators in simulator training noticed that the failure of Vital Bus No. 2 unexpectedly resulted in the steam driven Auxiliary Feedwater (AWF) pump starting and discharging to steam generator E-088. This could happen during either normal operations or during a Main Feedwater Line Break (MFLB) or Main Steam Line Break (MSLB). Because feedwater flow to a faulted E-088 would not isolate, a MFLB also represents a more limiting case than previously evaluated for the Condensate Storage Tank capacity.

On 8/18/1998 (discovery date), Southern California Edison (SCE) made a 1-hour non-emergency telephone notification to the NRC Operations Center (Log 34649) as required by 10CFR50.72(b)(1)(ii) for Emergency Feedwater Actuation Signal being outside its design basis. This LER provides the 30-day written report required by 10CFR50.73(a)(2)(ii).

This condition has existed since plant startup (circa 1982). Due to the passage of time, SCE did not determine the cause.

Other vital bus failures are being reviewed for similar and other scenarios. Solution(s) will be determined after completion of on going engineering review of other vital bus failure scenarios.

This condition has no actual safety significance because additional condensate is available for shutdown, and postulated transients and accidents are bounded by UFSAR analyses.

Two previously reported conditions of the condensate storage being outside its design basis were unrelated.

Plant: San Onofre Nuclear Generating Station Units 2 & 3
Reactor Vendor: Combustion Engineering
Event Date: August 18, 1998
Event Time: 1201 PDT

	Unit 2	Unit 3
Mode:	1, Power operation	1, Power operation
Power:	99.8 percent	99.9 percent
Temperature:	548 degrees F	547 degrees F
Pressure:	2250 psia	2250 psia

Background:

The AFW System (BA) consists of two motor driven AFW pumps and one steam turbine driven pump configured into three trains. See Figure 1. Each 100% flow capacity pump is sufficient to remove decay heat and cool the unit to Shutdown Cooling (SDC) System entry conditions.

The AFW System automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System (RCS) upon the loss of normal feedwater supply. The AFW pumps take suction from the CST T-121 and pump to the steam generator secondary side via separate and independent connections to the main feedwater (MFW) piping inside containment. The steam generators function as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere via the main steam safety valves or atmospheric dump valves. If the main condenser is available, steam may be released via the steam bypass valves and recirculated to the CST.

The steam turbine driven AFW pump receives steam from either main steam header upstream of the main steam isolation valve. Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The turbine driven AFW pump supplies a common header capable of feeding both steam generators, with DC powered control valves actuated to the appropriate steam generator by the Emergency Feedwater Actuation System (EFAS).

The AFW System actuates automatically on low steam generator level by the EFAS. The EFAS logic is designed to feed either or both steam generators with low levels, but will isolate the AFW System from a steam generator having a significantly lower steam pressure than the other steam generator. The EFAS automatically actuates the AFW turbine driven pump and associated DC operated valves and controls when required, to ensure an adequate feedwater supply to the steam generators. DC operated valves are provided for each AFW line to control the AFW flow to each steam generator.

The Condensate Storage and Transfer System (KA) provides water to the suction of the AFW pumps during normal startup and shutdown and during loss of offsite power conditions, as well as during loss of feedwater and steam line rupture. CST T-121 has sufficient storage capacity (at least 144,000 gallons) to maintain a hot standby condition for 2 hours, and to provide enough water to remove decay heat and to cooldown the reactor to 400 degrees F, the temperature at which the SDC can be used to remove decay heat. This storage capacity is based on the most limiting single failure being that of a diesel generator, with both atmospheric steam dump valves operable.

CST T-120 is a 500,000 gallon tank, and provides makeup to CST T-121 via the condensate transfer pump, or gravity feed through a crosstie line. CST T-120 ensures a minimum additional 200,000 gallons of additional water from a seismic source as a backup to T-121. The Technical Specification low level limit of 280,000 gallons would be available for non-seismic events. See the Additional Information section.

Description of the Event:

On August 12, 1998, station operators (utility, licensed) participating in simulator training noticed that the failure of Vital Bus No. 2 (Y-002) (ED) resulted in the steam driven AWF pump P-140 starting (turbine steam admission valve HV-4716 opening), and AFW valves HV-4705 and HV-4714 opening (pump discharge valves), and feedwater being delivered to steam generator E-088. The failure of Y-002 should not cause any (motor or steam driven) auxiliary feedwater pump to start, nor cause any AFW discharge valves to operate.

A subsequent evaluation of the circuit revealed a design flaw that explained the phenomena noted during the simulator exercise. This event could happen during either normal operations or under postulated accident conditions. During a MFLB scenario for steam generator E-088, AFW would not be isolated to E-088 on low steam generator pressure. This scenario, because of the feedwater flow lost to containment through the unisolated break, also represents a more limiting condition than previously evaluated for CST T-121 capacity.

On August 18, 1998 (discovery date), SCE made a 1-hour non-emergency telephone notification to the NRC Operations Center (Log 34649) as required by 10CFR50.72(b)(1)(ii) for EFAS being outside its design basis. This LER provides the 30-day written report required by 10CFR50.73(a)(2)(ii).

SCE is continuing to evaluate the potential consequences of a single failure of the other three vital buses, but it appears that only the failure of Y-002 would result in an inadvertent start of the steam driven AFW Pump P-140, and provide an injection flow path to Steam Generator E-088. As expected, the motor driven AFW pumps do not start as a result of the failure of Y-002 only.

Cause of the Event:

This condition has existed since plant startup (circa 1982). Due to the passage of time, SCE did not determine the cause.

Corrective Actions:

1. SCE reviewed control drawings and confirmed that:

   a. P-140 starts and valves HV-4705 and HV-4714 open on failure of the Y-002 inverter, allowing AFW injection into the steam generator E-088.

   b. If the failure of Y-002 is postulated as a single failure concurrent with a design basis event, valves HV-4705, HV-4714 and HV-4716 will open. Operator intervention to manually stop the turbine driven pump or restore power to Y-002 would be required to correct the situation. Assuming 30 minutes to identify and isolate the diverted AFW flow in the event of a large feedwater line break associated with Steam Generator E-088, an estimated maximum of 30,000 gallons of condensate could be inadvertently pumped to the affected steam generator.

2. Failure of other three vital buses (Y-001, Y-003, and Y-004) are being reviewed for similar and other failure scenarios.

3. Solution(s) will be determined after completion of on going engineering review of other vital bus failure scenarios.

Safety Significance:

This condition has no actual safety significance because:

1. As discussed in the Background, CST T-120 can supplement CST T-121 with a minimum of 280,000 gallons of additional condensate, sufficient to bring the plant to cold shutdown.

2. The analyses of record for peak containment pressure following a MSLB assu[illegible] single failure of one emergency diesel generator. The above described single failure will not i[illegible] that event since a Main Steam Isolation Signal (MSIS) will override the inadvertent EFAS tha[illegible]ults from a single failure of Y-002. A less limiting scenario is an MFLB. In either case, a consequential failure of losing one emergency diesel generator would be the loss of one train of containment cooling. For the scenario reported herein, the assumed single failure is Y-002. For this scenario, both trains of containment cooling are available to mitigate the pressure and temperature effects of a prolonged energy release to the containment due to the unintentional AFW injection to the faulted steam generator, resulting in a lower peak containment temperature and pressure.

3. The failure of Y-002 during normal operation (non-accident condition) would place the plant in a two hour Technical Specification action statement to restore power to Y-002. This event could also result in AFW flow to the steam generators, and a decrease in feedwater temperature. The level transient would be compensated for by the Steam Generator Level Control System. The temperature transient would be bounded by the decrease in feedwater temperature caused by the loss of a feedwater heater evaluated in the UFSAR.

Additional Information:

- LER 2-96-012-01 reported CST T-120 was outside its design bases because during the initial licensing process (circa 1980), SCE did not consider all potential effects on T-120 caused by interactions with the piping and electrical components downstream of the isolation valves following a Design Basis Earthquake (DBE). These postulated interactions could have resulted in a loss of condensate such that T-120 would not have provided the required 200,000 gallons of makeup to T-121. That condition would not have affected the postulated scenario reported herein because a DBE with concurrent MFLB is not a design basis event. The TS low limit of 280,000 gallons of condensate T-120 would be available for non-seismic events.

  Also discussed in this LER was the seismic qualification of the downcomer piping inside T-120. This provided an additional 45,000 gallons of condensate below the level instrument zero datum which is available to replenish T-121.

- LER 2-1998-009-01 reported CST T-120 was outside its design bases when the operator actions in the Abnormal Operating Instructions (AOI) to isolate T-120 following an OBE were inadvertently deleted while revising the AOI. That condition would not have affected the postulated scenario reported herein because an Operating Basis Earthquake (OBE) or greater seismic event with concurrent MFLB is not a design basis event. The TS low limit of 280,000 gallons of condensate T-120 would be available for non-seismic events.

FIGURE 1 - Auxiliary Feedwater System