

LICENSEE EVENT REPORT (LER)													
Facility Name (1)							Docket Number (2)				Page (3)		
San Onofre Nuclear Generating Station Unit 3							0 5 0 0 0 3 6 2				1 of 0 3		
Title (4) Reactor Coolant System Leakage - Instrument Thermowell Nozzles													
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)		
0	7	0	3	9	7	9	7	0	0	2	None		
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			
				20.405(a)(1)(iii)		X 50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		abstract below			
				20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		and in text)			
				20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)					
LICENSEE CONTACT FOR THIS LER (12)													
NAME							TELEPHONE NUMBER						
R. W. Krieger, Vice President, Nuclear Generation							AREA CODE						
							7	1	4	3	6	8	-
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)													
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS				
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 space typewritten lines.) (16)

On July 3, 1997, plant personnel inspected the Unit 3 RCS nozzles at 350 psia. One nozzle had an increased amount of white residue, and an isotopic analysis determined the residue was boric acid from the RCS. Three other "suspect" nozzles were re-inspected; two had a slight residue increase, the third did not. Edison assumed the residue from these other nozzles was also boric acid from the RCS.

Technical Specification (TS) 3.4.13.a allows no pressure boundary leakage in Modes 1 through 4. If this LCO is not met, this TS requires the unit to be in Mode 5 within 36 hours. Based on the existence of boric acid crystals around some of the leak locations, Edison believes it likely that one or more of the leaks existed during Mode 3 and 4 operations. Consequently, Edison is reporting these occurrences in accordance with 10CFR50.73(a)(2)(i).

Edison has previously determined that similar cracks were caused by Primary Water Stress Corrosion Cracking (PWSCC) of alloy 600 type materials. Cracking of Inconel 600 material is well known, and is believed to be the root cause of the leaks reported herein.

Based on evaluation of the leak size, leak location, deposition of boric acid crystals, and previous experience with Inconel 600 nozzle leakage, Edison suspects the leakage is from a crack through the nozzle in the heat affected zone (HAZ) of the partial penetration weld on each of the instrument nozzles.

These nozzles were originally designed and installed as a one piece nozzle made of Inconel 600 welded with a J-Groove weld on the inside of the RCS piping.

Edison replaced the outer half of the nozzles (Inconel 600 material) with Inconel 690 material. Required welding was completed in accordance with the ASME III, Class 1 welding guidelines.

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Description of Event:

Plant: San Onofre Nuclear Generating Station Unit 3
Reactor Vendor: Combustion Engineering
Event Date: July 3, 1997
Event Time: 2145
Mode: 5, Cold Shutdown
Power: 0 percent
Temperature: 122 Degrees F
Pressure: 350 PSIA

On July 3, 1997 during preparations to return Unit 3 to service, plant personnel inspected the Unit 3 RCS [AB] nozzles [NZL] at 350 psia. One nozzle had a small amount of white residue; an isotopic analysis determined the residue was boric acid from the RCS. Three other nozzles were identified as "suspect" with two having a slight visible residue, and the third nozzle did not. Edison assumed the residue from these other nozzles was also boric acid from the RCS. The subject nozzles are:

- 3TW-138A, RCS Hot Leg Spare RTD Thermowell,
- 3PDT-978-1, SG 089 Channel A RCS Differential Pressure,
- 3PDT-979-1, SG 088 Channel A RCS Differential Pressure,
- 3PDT-979-2, SG 088 Channel B RCS Differential Pressure.

Technical Specification (TS) 3.4.13.a allows no pressure boundary leakage in Modes 1 through 4. If this Limiting Condition for Operation is not met, this TS requires the unit to be in Mode 5 within 36 hours. Based on the existence of boric acid crystals around some of the leak locations, Edison believes it likely that one or more of the leaks existed during Mode 3 and 4 operations. Consequently, Edison is reporting these occurrences in accordance with 10CFR50.73(a)(2)(i).

Cause of the Event:

Edison has previously determined that similar cracks were caused by Primary Water Stress Corrosion Cracking (PWSCC) of alloy 600 type materials (see additional information section below). Cracking of Inconel 600 material is well known, and is believed to be the root cause of the leaks reported herein.

Based on evaluation of the leak size, leak location, deposition of boric acid crystals, and previous experience with Inconel 600 nozzle leakage, Edison suspects the leakage is from a crack through the nozzle in the heat affected zone of the partial penetration weld on each of the instrument nozzles.

Corrective Actions:

These nozzles were originally designed and installed as a one piece nozzle made of Inconel 600 welded with a J-Groove weld on the inside of the RCS piping.

Edison replaced the outer half of the suspect nozzles (Inconel 600 material) with Inconel 690 material. Required welding was completed in accordance with the ASME III, Class 1 welding guidelines. [Note: This repair is similar to that reported in LER's 3-97-001 and 2-97-004; see additional information section below.]

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The inspection and replacement program currently in use discovered this instance of PWSCC at San Onofre at the end of the Cycle 9 refueling outage. This program was developed in 1995 to: 1) qualify a replacement process in house to minimize plant impact; 2) explore other alternate replacement processes; 3) continue the inspect and repair program through Cycle 9 (current outage); and 4) reevaluate our program plan following the Cycle 9 outages. Consistent with this plan, Edison is continuing to assess the Cycle 9 outage PWSCC inspection results.

Safety Significance of the Event:

Based on the suspected location of the cracks and previous plant experience, a complete circumferential failure of an RCS instrument nozzle is not believed to be a credible event. Nevertheless, Edison has verified that the consequences of such a failure would be bounded by the small break loss of coolant accident (SBLOCA) analyzed in the UFSAR (multiple simultaneous failures of instrument nozzles is not credible). The actual leak rate through these cracks was not measurable. Consequently, this event had minimal safety significance.

Additional Information:

In the past three years, Edison has submitted the following four LERs on RCS leakage events:

1. LER 3-97-001 reported leakage of five RCS instrument thermowell nozzles. Based on evaluation of the leak size, leak location, deposition of boric acid crystals, and previous experience with Inconel 600 nozzle leakage, Edison suspects the leakage was caused by Primary Water Stress Corrosion Cracking. The outer half of the nozzles were removed and replaced with Inconel 690.
2. LER 2-97-004 reported leakage from the pressurizer liquid temperature thermowell nozzle. Edison concluded the leak was caused by Primary Water Stress Corrosion Cracking (PWSCC) of alloy 600 type materials. The outer half of the nozzle was removed and replaced with Inconel 690.
3. LER 3-96-004 reported RCS leakage from a broken thermowell. That thermowell failure mechanism appeared to be fatigue, a cause not present in the occurrences reported herein.
4. LER 3-95-001 reported RCS nozzle leakage caused by PWSCC of alloy 600 type materials. As detailed in Report No. 90022, "Susceptibility of Reactor Coolant System Alloy 600 Nozzles To Primary Water Stress Corrosion Cracking and Replacement Program," Rev. 1, dated February 9, 1995, Edison developed a nozzle inspection program based on the nozzle's susceptibility to PWSCC. As a result, all Reactor Coolant System Inconel Alloy 600 nozzles are scheduled for routine inspection during every refueling outage, which resulted in identification of the leaks reported herein.