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April 26, 1994

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

Subject: Docket No. 50-362
Voluntary Report
Licensee Event Report No. 93-007
San Onofre Nuclear Generating Station, Unit 3

Pursuant to 10 CFR 73(d), this submittal provides a voluntary written Licensee Event Report (LER) for an occurrence involving a Roto test switch terminal bolt failure. Neither the health nor the safety of plant personnel or the public was affected by this occurrence or condition.

If you require any additional information, please so advise.

Sincerely,

R. W. Krieger for
R. W. Krieger

Enclosure: LER No. 93-007

cc: L. J. Callan, Regional Administrator, NRC Region IV
K. E. Perkins, Jr., Director, Walnut Creek Field Office,
NRC Region V
J. A. Sloan, NRC Senior Resident Inspector,
San Onofre Units 2 and 3
M. B. Fields, NRC Project Manager, San Onofre Units 2 & 3
Institute of Nuclear Power Operations (INPO)

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LICENSEE EVENT REPORT (LER)

Facility Name (1) SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3	Docket Number (2) 0 5 0 0 0 3 6 2	Page (3) 1 of 0 3
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Title (4)
ROTO TEST SWITCH BOLT FAILURE, VOLUNTARY REPORT

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	1	2	8	9	3	9	3	0	4	2	UNIT 2	0 5 0 0 0 3 6 1	
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)			<input checked="" type="checkbox"/> Other (Specify in	
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)			Abstract below and	
			20.405(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(viii)(B)			in text)	
20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)			VOLUNTARY REPORT				

LICENSEE CONTACT FOR THIS LER (12)

Name R. W. Krieger, Vice President, Nuclear Generation	TELEPHONE NUMBER AREA CODE 7 1 4 3 6 8 - 6 2 5 5
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-	REPORTABLE	CAUSE	SYSTEM	COMPONENT	MANUFAC-	REPORTABLE
			TURER	TO NPRDS				TURER	TO NPRDS
B	E	A	H	S	M	2	8	2	Y

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> Yes (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	Expected Submission Date (15) Month Day Year
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On November 28, 1993, with Unit 3 in Mode 5 in a refueling outage, during Engineered Safety Features [JE] testing, Unit 3 Emergency Diesel Generator (EDG) [EK] 3G002 output breaker tripped. Emergency Diesel Generator 3G002 tripped because the output breaker had closed but immediately reopened on high differential current signal. Edison investigated and determined that a Roto test switch (RTS-2) [EA] terminal bolt had failed which had caused the EDG 3G002 output breaker to reopen. An Edison root cause evaluation of this failure concluded that the terminal bolt failed due to a manufacturing defect.

While this event is not reportable in accordance with 10CFR50.73, Edison is submitting a voluntary report due to potential industry interest.

On November 29, 1993, Edison replaced RTS-2 for Unit 3 EDG 3G002. Emergency Diesel Generator 3G002 was tested satisfactorily and declared operable on December 1, 1993.

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DESCRIPTION OF THE EVENT:

Plant: San Onofre Nuclear Generation Station, Unit 3
 Reactor Vendor: Combustion Engineering
 Event Date: November 28, 1993
 Mode: 5, Cold Shutdown

On November 28, 1993, with Unit 3 in Mode 5 in a refueling outage, during Engineered Safety Features [JE] testing, Unit 3 Emergency Diesel Generator (EDG) [EK] 3G002 output breaker tripped. Emergency Diesel Generator 3G002 tripped because the output breaker had closed but immediately reopened on high differential current signal.

Following the EDG 3G002 output breaker trip, Edison investigated and determined that a Roto test switch (RTS-2) [EA] terminal bolt had failed which had caused the EDG 3G002 output breaker to reopen. An Edison root cause evaluation of this failure concluded that the terminal bolt failed due to a manufacturing defect.

San Onofre Units 2 and 3 each have two Emergency Diesel Generators, each of which is sufficient to provide adequate electric power to allow safe shutdown of the plant in the event of a loss of offsite power coincident with worst case post accident conditions. To allow the Emergency Diesel Generators to be isolated during testing, each Emergency Diesel Generator train is equipped with 14 Roto test switches. Twelve of the 14 Roto test switches are on circuits which are for indication only or are automatically bypassed in the event a Safety Injection Actuation Signal is received. The remaining two Roto test switches (RTS-1 and RTS-2) are not bypassed following receipt of a Safety Injection Actuation Signal. Thus, failure of RTS-1 or RTS-2 may trip the Emergency Diesel Generator output breaker, and prevent reclosure.

Subsequent inspections were performed of all Roto test switches in the Emergency Diesel Generator trains for Units 2 and 3. One additional bolt (RTS-9) used in an automatically bypassed Roto test switch for Unit 2 EDG 2G003 was found broken. Other Roto test switches used in the Unit Auxiliary Transformers [EA], the Reserve Auxiliary Transformers [EA], and the Emergency Chillers [KM] control modules were visually inspected on December 21, 1993, and no broken bolts were detected.

While this event is not reportable in accordance with 10CFR50.73, Edison is submitting a voluntary report due to industry interest.

CAUSE OF THE EVENT:

Laboratory analysis of the two failed bolts identified the root cause as a lot-specific manufacturing defect in the bolt material. The defect caused them to fracture under mechanical loading. Specifically, the bolts were made of a highly brittle brass with extreme cold working around the base of the head. Cracks around the base of the head and in the threads were introduced during manufacturing which ultimately caused the bolts to fracture under normal mechanical loading.

CORRECTIVE ACTIONS:

On November 29, 1993, Edison replaced RTS-2 for Unit 3 EDG 3G002. Emergency Diesel Generator 3G002 was tested satisfactorily and declared operable on December 1, 1993. On December 21, 1993, Edison replaced the failed bolt in RTS-9 for Unit 2 EDG 2G002. Emergency Diesel Generator 2G002 was tested satisfactorily and declared operable on December 22, 1993.

After determining the Roto test switch terminal disengagement force to be approximately 5 pounds, Edison pull tested each Roto test switch terminal bolt to approximately 10 pounds. The pull tests confirmed that the remaining bolts in the 14 Roto test switches for each Emergency Diesel Generator at Units 2 and 3 were acceptable. The Roto test switches for the Unit Auxiliary Transformers, the Reserve Auxiliary Transformers and the Emergency Chillers were visually inspected on December 21, 1993, with no indication of fractured bolts.

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As a conservative measure, Edison will replace RTS-1 and RTS-2 for each Emergency Diesel Generator and the Roto test switches for the Emergency Chillers prior to the end of the Cycle 8 refueling outage for each Unit (currently scheduled for early 1995 and mid 1995 for Units 2 and 3 respectively). Similar upgrades for the remaining EDG Roto test switches and the Roto test switches for the Unit Auxiliary Transformers and the Reserve Auxiliary Transformers will be completed prior to the end of the Cycle 9 outage for each Unit.

Edison has notified the vendor about this bolt failure. Additionally, prior to replacing the Roto test switches as described above, Edison will verify that the replacement Roto test switches are not similarly affected.

SAFETY SIGNIFICANCE:

The failed RTS-2 terminal bolt failed during the performance of a ESF surveillance test. Emergency Diesel Generator 3G002 had been satisfactorily tested and successfully operated the previous hour and, therefore, the terminal bolt in RTS-2 was operable at that time. During subsequent investigation, Edison determined: (1) manual operation of the switch places approximately five pounds of force on the bolt; and (2) the forces to which the terminal bolt in RTS-2 could have been subject during a design basis earthquake (DBE) (based on the weight of the bolt assembly and the DBE acceleration) would have been less than two pounds. In accordance with the guidance in NUREG-1022, the bolt is assumed to have failed at the time the output breaker for EDG 3G002 opened, and there was no safety significance to the bolt failure.

Due to the nature and cause of the Roto test switch bolt failures, Edison contacted the Roto test switch supplier, ABB Switchgear Division, and provided ABB with the root cause evaluation of the failure. ABB replied, in a letter dated February 11, 1994, stating that they believe Edison was the only utility to procure class 1E qualified Roto test switches. However, other nuclear utilities could have this problem if they upgraded commercial grade switches. The failure of switches from a specific manufacturing lot minimizes the potential that bad parts were supplied to other nuclear utilities.

ADDITIONAL INFORMATION:

A review of previous LERs did not reveal any previous similar occurrences.