Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION

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May 19, 1992

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

Subject: Docket No. 50-361
Voluntary Report
Licensee Event Report No. 92-007
San Onofre Nuclear Generating Station, Unit 2

Pursuant to NUREG-1022, Supplement 1, "Licensee Event Report System," this submittal provides a voluntary Licensee Event Report (LER) for an occurrence involving an auxiliary feedwater pump turbine trip on overspeed due to condensate buildup in upstream piping. 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,

Rill Krieger

Enclosure: LER No. 92-007

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

LICENSEE EVENT REPORT (LER)

Facility Name (1)	Docket Number (2)	Page (3)
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2	0 5 0 0 0 3 6 1	1 of 0 7

Title (4)

AUXILIARY FEEDWATER PUMP TURBINE TRIP ON OVERSPEED DUE TO CONDENSATE BUILDUP IN UPSTREAM PIPING

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	2 2	9 2	9 2	- 0 0 7	- 0 0	0 5	1 9	9 2		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)			
POWER LEVEL (10)	1 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)	X 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)	___ 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)	VOLUNTARY

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)

At 0838 on 2/26/92, with Unit 2 in Mode 1 at 100% power, Turbine Driven Auxiliary Feedwater Pump (TDAFWP) P-140 tripped on overspeed during startup for an inservice test surveillance. As required by Technical Specifications (TS), P-140 was declared inoperable at 0838 on 2/26/92, troubleshooting/corrective actions were implemented, and P-140 was returned to operable status at 1607 on 2/28/92.

The turbine trip was caused by the introduction of accumulated condensed steam into the pump turbine. This condition is known to result in speed oscillations which may exceed the overspeed trip point. The water accumulation was attributed to the clogging of a strainer associated with a steam trap in the turbine steam supply line, thus degrading the effectiveness of condensate removal. The material clogging the strainer consisted mainly of magnetite.

Corrective actions included: 1) replacing the clogged steam trap strainer, 2) inspecting turbine steam supply components and piping, 3) implementing periodic steam trap strainer blowdown, 4) maintaining the affected Unit 2 and 3 TDAFWP steam supply line traps bypassed, and 5) continuing with plans to improve system performance in order to make the system more tolerant of water intrusion, and reduce the likelihood of condensate buildup.

Plant: San Onofre Nuclear Generating Station
Unit: Two
Reactor Vendor: Combustion Engineering
Event Date: 2/26/92
Time: 0838

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, Power Operations (100%)

B. BACKGROUND INFORMATION:

1. Auxiliary Feedwater (AFW) System (AFWS):

The AFWS [BA] provides a source of feedwater to steam generators (SGs) [SG] E-088 and E-089. The AFWS is manually controlled to provide SG makeup during normal plant startup and shutdown, and is automatically initiated in response to an emergency feedwater actuation signal (EFA. [JE], which in turn is initiated by low SG level. The AFWS is comprised of electrically-driven pump [P] P-141, which is normally aligned to supply SG E-089, electrically-driven pump P-504, which is normally aligned to supply SG E-088, steam turbine-driven pump (TDAFWP) P-140, which can supply either SG, and associated valves and piping. AFW pump turbine (AFWPT) K-007 [TRB] provides the motive power for AFW pump (AFWP) P-140.

AFWPT K-007 can be supplied steam from either SG E-088 via isolation valve HV-8201 [ISV] and check valve MU-003 [V] or from SG E-089 via isolation valve HV-8200 and check valve MU-005 (refer to Figure 1). The steam lines from these two sources are combined into a common line downstream of the check valves. Steam is then directed to the AFWPT via trip/throttle valve HV-4716 and governor valve SV-4700. HV-8201 was normally maintained closed when P-140 was in the standby mode of operation, and HV-8200 was left open to minimize wear damage from flow induced oscillations to check valves MU-003 and MU-005. However, based on additional corrective actions from a previous water intrusion event (refer to Section G and LER 2-91-014, Rev. 1, Docket No. 50-361), that resulted in damage to check valve MU-005, the normal alignments for HV-8200 and HV-8201 were reversed on 1/30/92 such that HV-8200 was maintained closed when P-140 is in the standby mode of operation, and HV-8201 was left open. This was intended to prevent the potential for check valve damage by minimizing the differential pressure that could accelerate accumulated water formed due to the potential malfunction or inadvertent isolation of trap F-209. During surveillance and normal starts, both HV-8200 and HV-8201 are opened.

The AFWPT steam supply lines are attached to the condensate drains from the bottom of the main steam header. As a consequence, these steam lines are provided with traps and orifices which are intended

to provide a means for continuously extracting condensed steam and to keep the piping hot (refer to Figure 1 for details).

2. Inservice Testing (IST):

TDAFWP P-140 is inservice tested once per month in accordance with the IST program. Blowdown of the AFWPT steam supply lines is not allowed prior to pump startup in order to better represent actual auto start conditions.

C. DESCRIPTION OF THE EVENT:

1. Event:

At 0838 on 2/26/92, with Unit 2 in Mode 1 at 100% power, TDAFWP P-140 tripped on overspeed during startup for an IST surveillance. As required by Technical Specifications (TS), P-140 was declared inoperable at 0838 on 2/26/92, troubleshooting/corrective actions were implemented, and P-140 was returned to operable status at 1607 on 2/28/92.

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

As indicated in Section D.3 below, degraded steam trap P-209 contributed to this event (refer to Figure 1).

3. Sequence of Events:

Date	Time	Description
2/26/92	0838	TDAFWP P-140 tripped on overspeed.
2/28/92	1607	P-140 was returned to service.

4. Method of Discovery:

Control room alarms and annunciation alerted the operators that the TDAFWP turbine had tripped. The trip was also observed locally by operating and engineering personnel.

5. Personnel Actions and Analysis of Actions:

Not applicable.

6. Safety System Responses:

Not applicable.

D. CAUSE OF THE EVENT:

1. Immediate Cause:

The immediate cause of the trip was the introduction of accumulated water into the turbine, which is known to result in speed oscillations which may exceed the overspeed trip point.

2. Root Cause:

The accumulation of water in the steam line was attributed to the clogging of an internal strainer for steam trap F-209. There had not been a requirement to periodically flush the strainer. As shown in Figure 1, clogging of F-209 can result in condensate accumulation in the TDAFWP steam supply header large vertical loops upstream of check valve MU-005. Upon turbine startup, the accumulated condensate was then accelerated down the steam supply line and discharged through the turbine to the atmosphere. The material clogging the strainer consisted mainly of magnetite.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. An evaluation was performed which concluded that this event had no adverse impact on the turbine assembly.

b. A formal valve alignment was conducted in accordance with surveillance procedures in order to verify proper alignment of the steam supply line condensate removal valves. All valves were found to be properly aligned.

c. The snubbers down-stream of HV-8200 and HV-8201 were hand stroked. The snubbers were found to be undamaged.

d. The AFWPT steam supply lines down stream of HV-8200 and HV-8201 were visually inspected for potential damage resulting from entrained water in the steam supply. No damage resulting from a water intrusion transient was detected. The three steam line scratch plates installed per a previous event involving water accumulation (refer to LER 2-91-014, Rev.1, Docket No. 50-361) were also inspected. Scratch plate indication showed some minor movement (less that an eighth of an inch) that may have been related to this event, and was considered not to be significant.

e. Based on their previous failure history (refer to LER 2-91-014, Rev.1), check valves MU-003 and MU-005 were disassembled for inspection. No internal damage was found. Both check valves stroked satisfactorily and there were no signs of hinge pin wear or deformation.

f. Thermographic inspections were performed on the continuous blowdown orifices downstream of check valves MU-003 and MU-005. All three of the orifices were verified to be functioning properly.

g. Thermographic inspections were performed on both steam header drain lines. Temperature measurements across the steam traps indicated degraded performance for steam trap F-209. The strainer associated with F-209 was found substantially clogged, such that its condensate removal capability was adversely affected, and was replaced. No problems with steam trap F-207 were noted.

h. The recently revised steam supply line valve lineup was returned to its previous normal configuration (i.e., HV-8200 normally open and HV-8201 closed).

i. Until design modifications have been implemented as indicated below in Section E.2, both traps F-207 and F-209 for Units 2 and 3 are to remain bypassed. This configuration is less likely to result in the accumulation of condensate.

j. Blowdown of the strainers associated with traps F-207 and F-209 for Units 2 and 3 has been implemented on a monthly basis, during times when TDAFWP operability is required, in order to minimize the possibility of steam trap strainer clogging.

2. Planned Corrective Actions:

a. The design modification efforts already underway, as a result of previous events involving moisture in the TDAFWP steam supply line, are continuing and will be implemented at the next outage of sufficient duration consistent with the completion of the design change package, but not later than during the Cycle 7 refueling outage for each Unit.

b. Periodic steam trap temperature monitoring will continue, and thermographic inspections performed as appropriate, until action 2.a above has been implemented.

F. SAFETY SIGNIFICANCE OF THE EVENT:

SCE has determined this event to be of no safety significance. Our analysis indicates that 1) TDAFWP P-140 was capable of being reset and functioning as required following the trip, and 2) on a realistic basis, as indicated in LER 90-012, Docket No. 50-361, sufficient time exists for the Operator to reach the pump, reset the turbine, and start AFW flow in time to avoid unacceptable consequences. In addition, the out-of-service time of P-140, commencing with the overspeed trip, was well within that allowed by the TS.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

None.

2. Previous LERs for Similar Events:

LER 85-017 (Docket 50-362):

This LER reported an event occurring on 4/16/85 at Unit 3 involving a failed snubber on the main steam line to the AFWPT. The failure was attributed to a hydraulic transient. It was postulated that condensation resulted in an accumulation of water which passed through the main steam inlet lines to the AFWPT during turbine startup. This condensation was due to incomplete draining during system heatups. Corrective actions included replacement of existing steam traps down stream of HV-8200 and HV-8201 with orifices to allow continuous removal of condensation and to maintain a more constant temperature in the system. Damage to other components was not observed.

LER 86-009 (Docket 50-361) & LER 86-009 (Docket 50-362):

These voluntary LERs reported events identified on 4/16/86 and 7/1/86, in which check valve MU-003 and MU-005 hinge pin damage occurred at both Units 2 and 3 respectively. The damage was attributed to condensation in the line and entrained in the steam flow, impacting the valve disc when the AFWPT started. Subsequent modifications were made to improve valve design. Also, containment isolation valve TS changes were implemented to allow the steam trap isolation valves to be open continuously, thereby permitting the traps to perform their intended functions.

LER 90-012 (Docket 50-361):

This LER reported an event identified on 10/21/90 at Unit 2 in which steam trap F-207 was discovered isolated in the main steam line to the AFWPT. This resulted in the accumulation of condensate and subsequent overspeed trip of the AFWPT during testing. Corrective actions included: 1) procedural changes in order to minimize water intrusion in the steam supply lines, and 2) an evaluation of system design enhancements to address water entrainment.

LER 91-014, Rev. 1 (Docket 50-361):

On 9/10/91, check valve MU-005 was found damaged during an inservice testing activity in which the valve was disassembled to demonstrate full stroke capability. The observed damage was indicative of the valve disc having been subjected to a large impact force. The root cause evaluation indicated that the impact force was caused by a

mass of water entrained in steam flowing through P-140 steam supply piping. Corrective actions included installing a replacement check valve and modifying appropriate Operations procedures to enhance moisture removal in the AFW steam supply lines prior to placing P-140 in service following a period of cold shutdown.

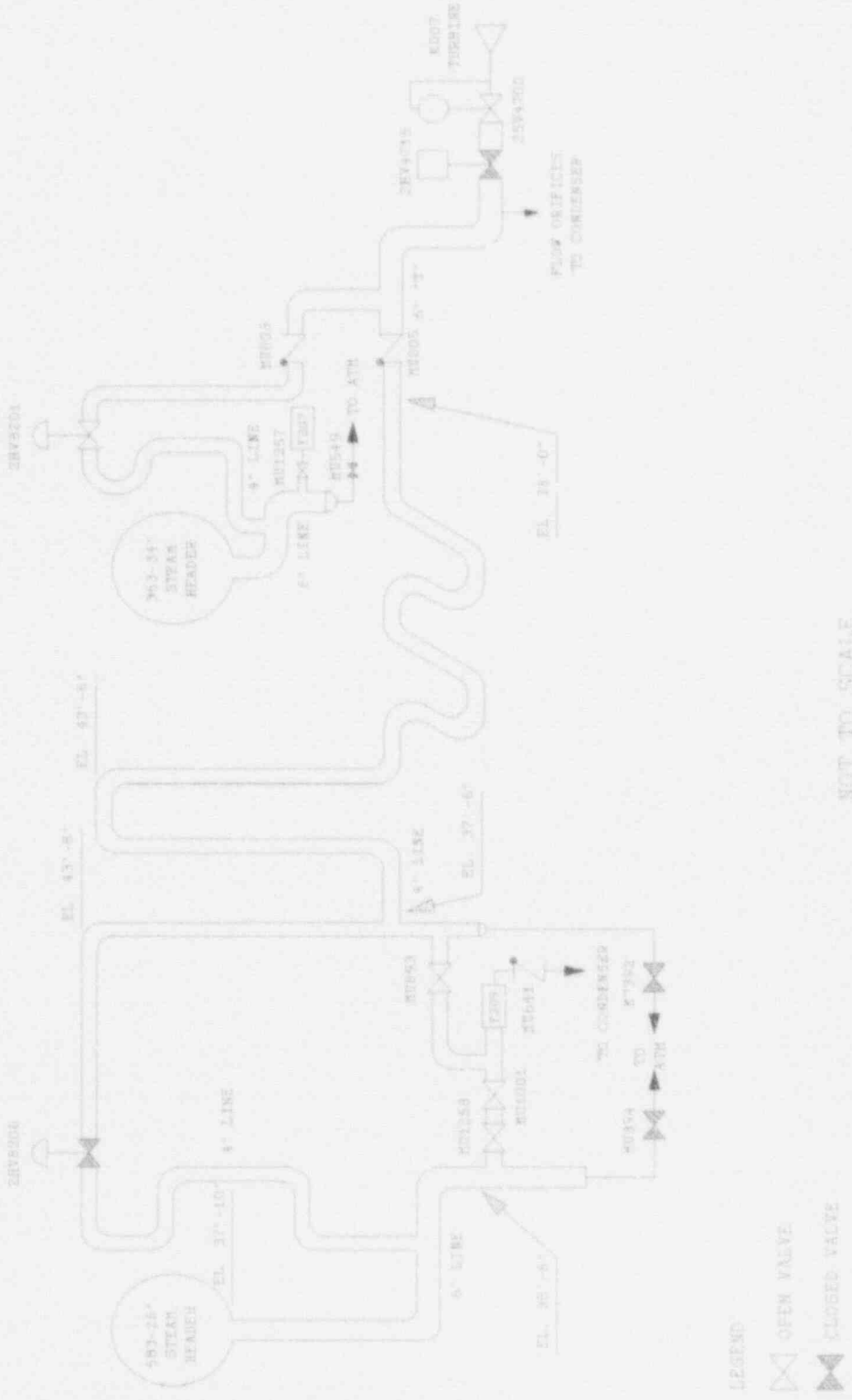

Figure 1