UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AEOD/E123

SEP 15 1981

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Victor Stello, Jr., Director
Office of Inspection and Enforcement

FROM: Carlyle Michelson, Director
Office for Analysis and Evaluation of
Operational Data

SUBJECT: IMMEDIATE ACTION MEMO: COMMON CAUSE FAILURE POTENTIAL AT RANCHO SECO - DESICCANT CONTAMINATION OF AIR LINES

I wish to bring to your attention a potentially serious problem which has been identified at Rancho Seco. Based upon the enclosed LER (Enclosure 1), it is likely that desiccant has entered the instrument and control air system at the Rancho Seco Nuclear Plant.

The desiccant presents a potential common cause failure hazard to pneumatically operated equipment. From the plant air system P&ID (drawing #M-590, Rev. 17, March 14, 1979), it is not clear which of the plant's safety-related equipment could be affected by the desiccant contamination. A similar problem existed at San Onofre in 1980. For that plant, it was found that operation of about 130 safety-related items was threatened by desiccant contamination. The common cause failure of such safety-related equipment appears to be unreviewed.

AEOD views the desiccant contamination at Rancho Seco, as described in the enclosed LER, as an apparent precursor having great similarity to the contamination of San Onofre's instrument and control air system which was instrumental in an abnormal occurrence involving a total loss of the saltwater cooling system in March 1980.

Certain details of the magnitude, history, and corrective actions associated with the desiccant contamination of San Onofre 1's instrument and control air system appear in Enclosure 2 (which consists of excerpts from AEOD's draft case study of the San Onofre event to be issued shortly).

I understand (from a September 9, 1981 telecon, AEOD, Ornstein to the NRR PM, Padovan; and Ornstein to the IE senior site representative, Canter) that prior to discussion with AEOD, the Rancho Seco staff had not taken any corrective actions other than cleaning out desiccant from the affected valve which is described in the enclosed LER.

AEOD recommends that NRR/IE take immediate action to assure that the Rancho Seco staff:

1. Examine the instrument and control air system, determine the source of contamination (defective equipment, inadequate maintenance or operation procedures, etc.), and take appropriate corrective action.

2. Evaluate the common cause failure potential of desiccant in the air lines.

3. Examine the instrument and control air system to determine the extent of desiccant contamination. If the desiccant contamination is determined to be widespread, and if it appears that a valid safety concern exists, the licensee should be required to blowdown, cleanup, and test the entire air system and the safety-related equipment which could be affected by the desiccant prior to bringing the plant up to power from its present outage.

Regarding other plants, AEOD recommends that an appropriate bulletin be issued requiring all licensees to furnish a listing of their experience with air system contamination (contamination by dirt, desiccant, water, etc.), provide an assessment of the safety implications of these events, and evaluate their plant's susceptibility to contamination induced common cause failures of their air system. NRR/IE should review each plant's operating experience and susceptibility to such common cause failures and, if required, determine the course of corrective action on a case-by-case basis. AEOD is presently drafting a list of specific information to be requested from the licensees, along with a writeup of how such information could be evaluated. Harold Ornstein of my staff will be available to assist in preparation of the bulletin.

Carlyle Michelson

Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

Enclosures:
1. Rancho Seco LER 81-37
2. Sections of AEOD Draft Case Study on San Onofre Loss of Saltwater Cooling Event

cc w/enclosures:
M. Padovan, NRR
S. Nowicki, NRR
R. Kiessel, IE
H. Canter, IE
L. Miller, IE

Enclosure 1

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, Box 15830, Sacramento, California 95813; (916) 452-3211

August 7, 1981

R H ENGELKEN, DIRECTOR
REGION V OFFICE OF INSPECTION & ENFORCEMENT
U S NUCLEAR REGULATORY COMMISSION
1990 N CALIFORNIA BLVD
WALNUT CREEK PLAZA, SUITE 202
WALNUT CREEK CA 94596

DOCKET NO. 50-312
LICENSE NO. DPR-54
REPORTABLE OCCURRENCE 81-37

In accordance with Technical Specification Section 6.9.4.2.b, the Sacramento Municipal Utility District hereby submits a thirty-day report of Reportable Occurrence 81-37.

On July 7, 1981, during performance of SP 205.07A, Isolation Valve Surveillance Test, HV-20593, the OTSG-A Sample Line Isolation Valve closed in 12.9 seconds, exceeding the allowable limit of 12 seconds. In accordance with Technical Specification Section 3.6.6, HV-20593 was closed until repairs could be made.

The valve is a pneumatically operated globe valve, Fisher Governor model 667-ES, with an Asco controller. Foreign material, which appeared to be desiccant from the air driers, was found in the air discharge port. When it was removed, the valve was retested and closed in 10.5 seconds. This and all other safety related, pneumatically operated valves will continue to be monitored and tested to assure proper operation.

The reactor operated at full power, with no transients or power reductions associated with this event.

John J. Mattimoe

John J. Mattimoe
Assistant General Manager
and Chief Engineer

IE22
S/1

cc: I&E Washington (30)
MIPC (3)
EPRI-NSAC

NRC FORM 366 (7-77)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

EXHIBIT A

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 | C A R S S 1 (2) | 0 0 - 0 0 0 0 0 - 0 0 (3) | 4 1 1 1 1 (4) | | (5)

LICENSEE CODE · LICENSE NUMBER · LICENSE TYPE · CAT

CON'T 0 1 REPORT SOURCE | L (6) | 0 5 0 0 0 3 1 2 (7) | 0 7 0 7 8 1 (8) | 0 8 0 7 8 1 (9)

DOCKET NUMBER · EVENT DATE · REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 With the reactor at full power, performance of SP 205.07A, Isolation Valve

0 3 Surveillance Test, revealed a closing time of 12.9 seconds, exceeding the

0 4 Technical Specification limit of 12 seconds, for HV-20593, the OTSG-A

0 5 Sample Line Isolation Valve. It was left closed, per Technical Specification

0 6 3.6.6, pending repair.

0 7

0 8

	SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
0 9	S D (11)	E (12)	B (13)	V A L V O P (14)	D (15)	Z (16)

(17) LER/RO REPORT NUMBER	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 1	—	0 3 7	/	0 3	L	—	0

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
B (18)	Z (19)	Z (20)	Z (21)	0 0 0 0	Y (23)	N (24)	A (25)	A 4 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 HV-20593 is a pneumatically operated globe valve, Fisher Governor model

1 1 667-ES, with an Asco controller. The air discharge port was cleaned, and

1 2 the valve operated properly. The foreign material was apparently desiccant

1 3 from the air driers. Surveillance is continuing to assure that the problem

1 4 doen not recur.

	FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
1 5	E (28)	1 0 0 (29)	N/A	B (31)	Surveillance Test

	ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
1 6	Z (33)	Z (34)	N/A	N/A

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION (39)
1 7	0 0 0 (37)	Z (38)	N/A

PERSONNEL INJURIES

	NUMBER	DESCRIPTION (41)
1 8	0 0 0 (40)	N/A

LOSS OF OR DAMAGE TO FACILITY (43)

	TYPE	DESCRIPTION
1 9	Z (42)	N/A

PUBLICITY

	ISSUED	DESCRIPTION (45)	NRC USE ONLY
2 0	Y (44)	Local newspapers and wire services	

NAME OF PREPARER R. W. Colombo PHONE (916) 452-3211

Enclosure 2

EXCERPTS FROM DRAFT CASE STUDY REPORT ON SAN ONOFRE'S

LOSS OF SALTWATER COOLING EVENT OF MARCH 10, 1980

The air dryers through which instrument and control air is routed are vertical tanks containing silica gel desiccant material in bulk form. Due to their long use between replacement at San Onofre, this desiccant broke down into small fragments. Some of the fragments migrated from the tanks to the filters downstream. These filters, which also contained desiccant in bags, were initially effective in removing the small desiccant fragments from the air system. The desiccant fragments gradually coated the filters, thereby increasing the pressure drop across the filters. This increased pressure caused increased bypass flow around the air filters, and the small desiccant fragments eventually bypassed the filters. Desiccant fragments then migrated throughout the instrument and control air system to areas inside containment, the auxiliary building, and the intake structure.

As noted in section _____, the pneumatically operated valve (POV-5) on the discharge of the north saltwater cooling pump failed to open on demand subsequent to the failure of the south saltwater cooling pump's shaft. This valve failure blocked the flow of saltwater from the redundant (north) saltwater cooling pump to the bottom component cooling heat exchanger. The failure of the pneumatically operated discharge valve was attributed to desiccant in the instrument and control air lines.

The licensee has noted (refs. 1, 2) that there are two predominant mechanisms in which the presence of desiccant can lead to solenoid valve failures.* The first failure mechanism is one in which the desiccant enters a solenoid core and prevents proper operation. The second involves wear of solenoid components due to the abrasive action of the desiccant on moving parts.

Failure of the saltwater cooling system discharge valve (POV-5) was suspected to have been caused by the desiccant's abrasive action on the solenoid's O-ring (ref. 1). As noted in section____, sluggish operation or malfunctions of POV-5 and -6 and other pneumatically actuated equipment had been caused by desiccant in the instrument and control air prior to March 10, 1980. The licensee had taken action to correct a desiccant carryover problem which was discovered earlier (containment isolation valve CV-537, which led to installation of temporary filter pads in the instrument and control air system in February 1980). At that time, the licensee apparently was not aware of how widespread the desiccant problem was.

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*It should be noted that maintenance information from the solenoid valve vendor (ref. 3) recommends, "keep the medium flowing through the valve as free from dirt as possible." It also notes that, "In general, if the voltage to the coil is correct, sluggish valve operation, excessive heating or noise will indicate that cleaning is required."

Subsequent to the loss of saltwater cooling event (during the April 1980 refueling outage), the licensee became aware of the fact that large amounts of desiccant had spread throughout the instrument and control air system.

The licensee's cleanup of the instrument and control air system involved a sequential blowdown and venting of all the instrument and control lines, and the testing of all safety-related equipment and instruments which could have been contaminated by the desiccant (approximately 130 safety-related items, including the power operated relief valves and the associated block valves). The licensee has estimated (ref. 4) that between 400 and 800 man hours were spent in the plant cleaning out desiccant from the instrumentation and control air system and related equipment. The cleanup consisted of starting at the main air header and sequentially blowing down all of the lines. AEOD reviewed the documentation associated with the blowdown process and discussed it with licensee representatives during a meeting on October 30, 1980 (ref. 5). The technique for removing the desiccant and the scope of the equipment to be cleaned had not been reviewed by the onsite review committee nor had an approved, written procedure been used during the process. The licensee has informed AEOD (ref. 6) that the onsite review committee and the IE resident inspectors did review the procedures for determining that the air lines (to safety-related equipment and instruments) are free of desiccant and other particulate matter.

In reference 2, the licensee acknowledged the presence of iron oxides along with desiccant which was removed from the instrument and control air lines. The red oxides found are believed to emanate from oxidation of carbon steel piping in the system, whereas the black iron oxides which were found in the system are believed to have emanated from the original mill scale. Apparently, moisture, which was not removed by the desiccant, contributed to the corrosion of the carbon steel in the instrument and control air system.*

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*In reference 4, the licensee indicated that there are no instrument and control air system cleanliness or moisture specifications and that there is no periodic air sampling or monitoring of the instrument and control air system. However, the licensee also indicated that the desiccant air dryers were sized so that when they operated correctly the instrument and control air system would have a -20°F dew point.

REFERENCES

1. Letter, SCE (Baskin) to NRC (Crutchfield), "Failure of the Saltwater Cooling System, San Onofre Nuclear Generating Station, Unit 1, October 8, 1980."

2. Letter, SCE (Haynes) to NRC, Region V (Engelken), "Instrument Air System Malfunction, San Onofre Unit 1, February 23, 1981."

3. ASCO Valve Company, "Installation and Maintenance Instructions, Form V-5380R3-1978."

4. Telephone discussion, SCE (Ornealas, Scholl) to NRC (Ornstein), August 6, 1981.

5. Meeting, SCE (Krieger, Haynes, et al) and NRC (Nowicki, et al), October 30, 1980. NRC Meeting Summary, Docket No. 50-206, dated January 6, 1981.

6. Meeting, SCE (Krieger, Ornealas, et al) and NRC (Nowicki, Ornstein), July 7-8, 1981 at San Onofre Nuclear Generating Station.