

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9005310192 DOC.DATE: 90/05/25 NOTARIZED: NO DOCKET #  
 FACIL:STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528  
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 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 90-005-00:on 900521,spray pond cross connection valve  
 failure due to matl misapplication by Henry Pratt Co.  
 W/9 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

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	AEOD/ROAB/DSP	2 2		DEDRO	1 1
	NRR/DET/ECMB 9H	1 1		NRR/DET/EMEB9H3	1 1
	NRR/DLPQ/LHFB11	1 1		NRR/DLPQ/LPEB10	1 1
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	RGN5 FILE 01	1 1			
EXTERNAL:	EG&G STUART,V.A	4 4		L ST LOBBY WARD	1 1
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Arizona Public Service Company  
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P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE  
VICE PRESIDENT  
NUCLEAR PRODUCTION

192-00667-JML/TRB/SBJ  
May 25, 1990

U. S. Nuclear Regulatory Commission  
Document Control Desk  
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Dear Sirs:

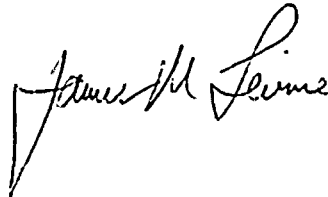
Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 1  
Docket No. STN 50-528 (License No. NPF-41)  
Licensee Event Report 90-005-00  
File: 90-020-404

Attached please find Licensee Event Report (LER) No. 90-005-00 prepared and submitted pursuant to 10CFR50.73. In accordance with 10CFR50.73(d), we are herewith forwarding a copy of the LER to the Regional Administrator of the Region V office.

This report is also being submitted pursuant to 10CFR21 and includes the information requested in 10CFR21.21(b)(3). In accordance with 10CFR21.21(b)(2), three copies of this report are being provided to the Director, Office of Nuclear Reactor Regulation.

If you have any questions, please contact T. R. Bradish, Compliance Manager at (602) 393-2521.

Very truly yours,



JML/TRB/SBJ/tlg

Attachment

cc: W. F. Conway (all with attachment)  
J. B. Martin  
D. H. Coe  
T. L. Chan  
A. C. Gehr  
A. L. Gutterman  
INPO Records Center

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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Palo Verde Unit 1

DOCKET NUMBER (2)

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PAGE (3)

TITLE (4)

Spray Pond Cross Connection Valve Failure Due to Material Misapplication by Henry Pratt Co.

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	5	2	1	9	0	9	0	0	0	5	2	8	1
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)													
OPERATING MODE (9)			20.402(b)			20.405(c)			50.73(a)(2)(iv)			73.71(b)	
POWER LEVEL (10)			20.406(a)(1)(i)			50.38(c)(1)			50.73(a)(2)(v)			73.71(c)	
			20.405(a)(1)(ii)			50.38(c)(2)			50.73(a)(2)(vii)			OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
			20.406(a)(1)(iii)			50.73(a)(2)(ii)			50.73(a)(2)(viii)(A)			10CFR21	
			20.406(a)(1)(iv)			50.73(a)(2)(iii)			50.73(a)(2)(viii)(B)				
			20.406(a)(1)(v)			50.73(a)(2)(ix)			50.73(a)(2)(x)				

LICENSEE CONTACT FOR THIS LER (12)

NAME

T. R. Bradish, Compliance Manager

TELEPHONE NUMBER

AREA CODE

6 0 2 3 9 3 1 - 1 2 5 2 1

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

On May 21, 1990, Palo Verde Unit 1 was in Mode 5 (COLD SHUTDOWN), Unit 2 was in Mode 6 (REFUELING) and Unit 3 was in Mode 1 (POWER OPERATION) at 100 percent power when APS determined that material misapplication in six essential spray pond cross connect valves was reportable pursuant to 10CFR21 and consequently 10CFR50.72 and 10CFR50.73.

In March 1990, during investigation into the cause of a Unit 1 essential spray pond cross connect valve failure to operate, it was discovered that the key that connects the valve stem to the operator torque tube was missing. During subsequent inspection of the other spray pond cross connect valves (two per unit), the key in a Unit 2 valve was also found to be missing and the other keys were found to be significantly corroded.

A root cause investigation into the condition determined that the keys were manufactured from carbon steel and were not suitable for the spray pond environment. As corrective action, all PVNGS spray pond cross connect valves carbon steel keys were replaced with stainless steel keys.

A previous similar event was reported under Unit 1 LER 88-018.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  Palo Verde Unit 1	DOCKET NUMBER (2)  0   5   0   0   0   5   2   8	LER NUMBER (6)			PAGE (3)		
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

This report is also being provided pursuant to the provisions of 10CFR21. The narrative below includes the information requested by 10CFR21.21(b)(3); however, it is being formatted to report this event in accordance with the requirements of 10CFR50.73.

## I. DESCRIPTION OF WHAT OCCURRED

## A. Initial Conditions:

The following plant conditions existed on May 21, 1990, when it was determined that the failures described herein were reportable pursuant to 10CFR21 and consequently 10CFR50.72 and 10CFR50.73.

Palo Verde Unit 1 was in Mode 5 (COLD SHUTDOWN). The Reactor Coolant System (RCS)(AB) was at approximately 95 degrees Fahrenheit (F) and atmospheric pressure.

Palo Verde Unit 2 was in Mode 6 (REFUELING). The RCS was at approximately 95 degrees Fahrenheit and atmospheric pressure.

Palo Verde Unit 3 was in Mode 1 (OPERATION) at approximately 100 percent power.

## B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event or condition that alone could have prevented the fulfillment of a safety function. 10CFR21

On May 21, 1990, APS determined that a material misapplication in the essential spray pond (BS) manual cross connect valves was reportable pursuant to 10CFR21. The carbon steel key connecting the valve stem to the operator torque shaft was susceptible to corrosion as it is submerged in the spray pond. The corrosion of the carbon steel key could prevent the opening of the cross connect valves.

On September 20, 1989, during the Unit 1 refueling outage, Unit 1 operations personnel (utility, non-licensed) discovered that the essential spray pond cross connect valves (1-HCV-207, 1-HCV-208) could not be operated. Work requests to troubleshoot the cross connect valves and a root cause engineering evaluation request (EER) were initiated on September 20, 1989.





LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

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PAGE (3)

Palo Verde Unit 1

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Each generating unit is provided with two independent Seismic Category I essential spray ponds (the ultimate heat sink) and two separate redundant flow trains with each flow train taking suction from and returning water to it's respective spray pond. There are two redundant cross connections through the common wall of the spray ponds. Each cross connection is controlled by a normally closed, seismically qualified, manually operated butterfly valve (HCV 207, and HCV-208).

On December 5, 1989, work to troubleshoot/repair both valves began using approved work authorization documents (work orders). Maintenance personnel (utility, non-licensed) determined that the operator gear box was rusted to the point that the gears were frozen. Additionally, it was noted that the torque shaft for 1-HCV-207 had some vertical motion. Since the operator gears could not be moved, the torque tube circular motion could not be checked. The torque tube to valve connection could not be visually checked because the valve is submerged in the spray pond and a protective guide tube covers the torque tube. Therefore, the work order for 1-HCV-207 was amended to have the valve removed from the spray pond for inspection.

To ensure a similar problem did not exist in Unit 2 or 3, the cross connect valve operators were verified to be moving freely. On December 12, 1989, APS engineering determined the cause of the operator failure was lack of preventive maintenance. There was no preventive maintenance task associated with the valves. The work orders for both valves were then amended to rework the operator gear box. The necessary parts were ordered and received, and on March 20, 1990, the operator gear box for 1-HCV-208 was reworked.

On March 24, 1990, divers removed 1-HCV-207 from the spray pond. An inspection of the valve discovered the key that connects the operator torque tube to the valve stem was missing. The cause of the key being missing was unknown, therefore inspections of the five other cross connect valves in Units 1, 2 and 3 using the divers were scheduled.

The five other cross connect valves were operated while divers verified valve disc movement. One of the Unit 2 cross connect valves (Valve No. 2-HCV-207) did not operate properly. On April 2, 1990, divers removed 2-HCV-207 from the spray pond. The key connecting the torque tube to the valve stem was missing. On April 3, 1990, a root cause engineering evaluation was initiated.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

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Palo Verde Unit 1

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

On April 17, 1990, the system engineer (utility, non-licensed) determined the root cause of the missing keys to be a material misapplication. The keys were manufactured from a carbon steel material that was susceptible to corrosion when exposed to the spray pond water. A Reportability Evaluation Request (RER) was initiated on April 17, 1990 to determine if the condition met 10CFR21 reporting requirements.

On May 21, 1990, the material misapplication was determined to be reportable pursuant to 10CFR21, and consequently 10CFR50.72 and 10CFR50.73.

- C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Other than the spray pond cross connect valves described in I.B., there were no structure, systems, or components in operable at the start of the event which contributed to the event.

- D. Cause of each component or system failure, if known:

Note: This section includes information requested by 10CFR21 concerning the nature of the defect and dates for which information was developed.

On September 20, 1989, the Unit 1 spray pond cross connect valves were found not to operate. On December 5, 1989, the cause of the inability to operate was found to be a rusted operator gear box. The rust was the result of a failure to have a preventive maintenance task for the valve.

The root cause of the missing keys was determined on April 17, 1990, to be a material misapplication by the valve manufacturer, Henry Pratt Company. The cross connect valves were bought specifically for the spray ponds and the bid specification clearly stated that the valves would be submerged in the spray pond. The valves were supplied with a carbon steel key that connected the valve stem to the operator torque tube. The corrosion of the carbon steel keys caused the key in two of the valves to completely corrode away and significant degradation in the other valves as described in Section I.B.

- E. Failure mode, mechanism, and effect of each failed component, if known:



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The essential spray pond water completely corroded away the valve stem to torque tube key in two of the valves. Without the key, the valve operator cannot transmit any torque to the valve stem, therefore preventing manipulation of the valve. The inability to open these valves could potentially have effected the capability to provide long term cooling (i.e., ultimate heat sink capability) following a loss of coolant accident.

- F. For failures of components with multiple functions, list of systems or secondary functions, that were also affected:

Not applicable - there were no failure of components with multiple functions. There were no other Henry Pratt valves supplied for underwater service that contained a similar material misapplication.

- G. For failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

The inability to operate the Unit 1 essential spray pond (ultimate heat sink) cross connect valves was discovered with Unit 1 defueled. The ultimate heat sink is not required in Modes 5 and 6 by Technical Specifications. The cross connect valves were repaired and operable prior to entry into a Mode where they were required operable.

The inoperability of the one Unit 2 essential spray pond valve was discovered with the Unit in Mode 6. The condition was corrected with the unit in Mode 6. The other valve was demonstrated to be operational using divers. The key was subsequently replaced while the unit was in Mode 6.

The Unit 3 cross connect valves were verified to be operational while the unit was in Mode 1 (POWER OPERATION). The carbon steel keys were subsequently replaced with stainless steel keys on May 8 and 9, 1990.

- H. Method of discovery of each component or system failure or procedural error:

The missing keys were discovered during an investigation to determine why the valves were not operating properly. There were no procedural errors.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

## I. Cause of Event:

The cause of this event is described in Section I.D.

## J. Safety System Response:

Not applicable - there were no safety system responses and none were necessary.

## K. Failed Component Information:

The essential spray pond cross connection valves were supplied by the Henry Pratt Company. They are 10 inch Series 1400 butterfly valves. The same type valves are installed in Units 1, 2 and 3.

	UNIT 1	UNIT 2	UNIT 3
Valve	1JSPEHCV0207	2JSPEHCV0207	3JSPEHCV0207
Valve	1JSPEHCV0207	2JSPEHCV0208	3JSPEHCV0208

Further information concerning the number and location of valves supplied to other facilities with a material not suited for its operational environment should be obtained from the Henry Pratt Company.

## II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

Each generating unit is provided with two independent Seismic Category I essential spray ponds (the ultimate heat sink) and two separate redundant flow trains with each flow train taking suction from and returning water to it's respective spray pond. There are two redundant cross connections through the common wall of the spray ponds. Each cross connection is controlled by a normally closed, seismically qualified, manually operated butterfly valve (HCV 207, and HCV-208).

The essential spray ponds provide the heat sink for engineered safety features and safety related components during normal shutdown or during accident conditions. In the event of a loss of coolant accident, both spray ponds combined have sufficient water inventory to provide the necessary cooling for 27 days without water makeup and under the worst historical meteorological conditions. Section 9.2.5.4 of the Updated Final Safety Analysis Report (UFSAR) assumes that only one train of the essential spray pond system is operated for long term cooling following





LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

a design basis LOCA. Therefore, one of the cross connect valves would have to be opened to provide sufficient water inventory for 27 days.

The material misapplication in the cross connection valves led to the inability to open one of the redundant cross connect valve in Units 1 and 2. The condition did not prevent the operation of the redundant valve as verified by the divers in April 1990. This condition therefore had not affected the capability to cross connect the spray ponds as discussed in the UFSAR.

Had this condition not been discovered, additional key corrosion could have prevented the operation of both cross connect valves in a unit. If this condition had existed and a design basis LOCA had occurred, the capability to cross connect the spray ponds by manually opening the valves would have been lost until repairs or valve removal could be completed. The UFSAR assumes that the spray ponds are connected in order to have a sufficient volume of water to remove decay heat with one spray pond train in service. Without the cross connection, each spray pond train does not have a sufficient water volume to remove decay heat for 27 days.

## III. CORRECTIVE ACTIONS:

## A. Immediate:

The operator gear box for 1-HCV-207 and 1-HCV-208 were reworked. The smooth operation of the gear boxes in the Unit 2 and 3 valves were verified.

## B. Action to Prevent Recurrence:

The carbon steel key in all six cross connect valves has been replaced with a stainless steel key.

A review of all Henry Pratt valves supplied for underwater service has been performed. No other deficiencies were identified.

A preventive maintenance task has been developed to periodically inspect and lubricate the essential spray pond cross connect valve operators once in a refueling cycle.

In addition, an engineering review of components exposed to a chemistry similar to the spray pond water will be performed to ensure a similar condition does not exist in other components. This review will be completed by November 15, 1990.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 80.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-930), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

## IV. PREVIOUS SIMILAR EVENTS:

One similar event has been reported under Unit 1 LER 88-018. The LER described a condition where Henry Pratt valves used in a different system had a component manufactured from a material not compatible with the operating environment. The corrective actions taken for the previous event could not have prevented this event since there was no documentation available to APS that provided the material the spray pond cross connect valve keys were manufactured from.

