



Palo Verde Nuclear  
Generating Station

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192-01076-WEI/AKK/RAS  
November 22, 2000

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Station P1-37  
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 2  
Docket No. STN 50-529  
License No. NPF-51  
Licensee Event Report 2000-005-00**

Attached please find Licensee Event Report (LER) 50-529/2000-005-00, prepared and submitted pursuant to 10CFR50.73. This LER reports the failure of a Unit 2 high pressure safety injection discharge check valve to properly seat and prevent backflow.

An investigation of this condition is being conducted in accordance with the APS corrective action program and additional investigative activities remain to be completed before APS can determine the root cause of this condition. APS will report the final investigation results in a supplement to this LER, which is expected to be submitted by January 31, 2001. APS makes no commitments to the NRC in this submittal.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV and the resident inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Sincerely,

WEI/AKK/RAS

Attachment

cc: E. W. Merschoff (all with attachment)  
J. H. Moorman  
J. N. Donohew  
INPO Records Center

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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Palo Verde Nuclear Generating Station Unit 2

DOCKET NUMBER (2)

05000529

PAGE (3)

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TITLE (4)

## Safety Injection Discharge Check Valve Back-leakage Causes Degraded Safety Injection Flow

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 NAME	DOCKET NUMBER
10	27	2000	2000	005	00	11	22	2000	N/A	N/A
OPERATING MODE (9)		6	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		0	20.2201(b)		20.2203(a)(2)(v)		X		50.73(a)(2)(i)	50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(i)		X		50.73(a)(2)(ii)	50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)				50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)				50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		X		50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)				50.73(a)(2)(vii)	

## LICENSEE CONTACT FOR THIS LER (12)

NAME

Daniel G. Marks, Section Leader, Regulatory Affairs

TELEPHONE NUMBER (Include Area Code)

623-393-6492

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

## SUPPLEMENTAL REPORT EXPECTED (14)

X

YES

(If yes, complete EXPECTED SUBMISSION DATE).

NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH

01

DAY

31

YEAR

2001

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 23, 2000, at approximately 1600 Mountain Standard Time, Palo Verde Unit 2 was in Mode 6 (REFUELING) when surveillance testing of the "B" train high pressure safety injection (HPSI) pump discharge check valve (2PSIBV405) revealed back-leakage in excess of surveillance test acceptance criteria. Further investigation revealed the cause of the back-leakage was a bent disk stud.

APS engineering has determined that while 2PSIBV405 was in this condition the HPSI system minimum flow requirements would not have been met by the redundant "A" train HPSI system during certain events when the "B" train HPSI pump was not operating. An investigation of this condition is being conducted in accordance with the APS corrective action program and additional investigative activities remain to be completed before APS can determine the root cause for the bent disc stud and when the condition occurred.

A previous similar event was reported in LER 50-528/1998-006-01.

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

### 1. REPORTING REQUIREMENT(S):

APS is reporting this condition based on the assumption that the "B" train High Pressure Safety Injection system (HPSI)(EIS: BQ) discharge check valve (2PSIBV405)(EIS: V) was degraded for some period of time prior to discovery during 18 month surveillance testing. Based on this assumption APS is reporting this condition in accordance with:

10CFR50.73(a)(2)(i)(B) because it is probable that the condition existed for a period of time in excess of the Limiting Condition for Operation (LCO) Allowed Outage Times (AOT).

10 CFR 50.73(a)(2)(ii)(B) because the high pressure safety injection system may not have had suitable redundancy which is considered outside the design basis.

10CFR50.73(a)(2)(v) because the degraded condition of 2PSIBV405 alone may have prevented the fulfillment of the safety function to mitigate the consequences of an accident.

### 2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

2PSIBV405

2PSIBV405 was manufactured by Borg-Warner and is an ASME Class 2, 4 inch, 1500 pound, bonnet pressure seal, two piece welded body swing check valve. The disc assembly is suspended from the underside of the valve bonnet. After failing surveillance testing, 2PSIBV405 was discovered to have a bent disk stud which allowed excessive freedom of movement between the swing arm and the valve disc.

Emergency Core Cooling System (ECCS)

The ECCS, of which the HPSI is a subsystem, is designed to provide core cooling in the unlikely event of a loss-of-coolant accident (LOCA). The ECCS prevents significant alteration of core geometry, precludes fuel melting, limits the cladding metal-water reaction,

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removes the energy generated in the core and maintains the core subcritical during the extended period of time following a LOCA.

The ECCS accomplishes these functional requirements by use of redundant active and passive injection subsystems. The active portion consists of high and low pressure safety injection pumps and associated valves. The passive portion consists of pressurized safety injection tanks (SIT)(EIS: BP). During an event requiring ECCS actuation, a flow path is required to supply water from the refueling water tank (RWT)(EIS: BQ) to the reactor coolant system (RCS)(EIS: AB) via the HPSI pumps and their respective supply headers to each of the four cold legs.

### 3. INITIAL PLANT CONDITIONS:

On October 23, 2000, at approximately 1600 MST, Palo Verde Unit 2 was in Mode 6 (REFUELING) when testing began on 2PSIBV405.

On November 3, 2000 at 0500 MST, Palo Verde Unit 2 was in Mode 5 (COLD SHUTDOWN) when 2PSIBV405 was returned to an operable status.

Reverse flow testing of selected Unit 1 and Unit 3 HPSI discharge check valves was conducted between October 27, 2000 and October 28, 2000, during which time Palo Verde Units 1 and 3 were in Mode 1 (POWER OPERATION) at approximately 100 percent power.

There were no inoperable structures, systems, or components that contributed to the event.

### 4. EVENT DESCRIPTION:

On October 23, 2000, at approximately 1600 MST, the 18 month surveillance testing of 2PSIBV405 was commenced in accordance with the inservice testing program. The surveillance testing results revealed back-leakage in excess of the acceptance criteria of < 10 gpm at 50 pounds per square inch differential (psid). No technical specification limiting conditions for operation were entered as the ECCS was not required in Mode 6.

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On October 24, 2000, 2PSIBV405 was tested again using higher capacity testing equipment and again failed to meet acceptance criteria.

On October 25, 2000, APS engineering personnel visually examined the valve internals with a boroscopic camera and determined that the valve disc had become cocked under the top of the valve seat.

On October 26, 2000, at approximately 2240 MST, a troubleshooting and diagnostic procedure was implemented which uses the "A" HPSI pump to provide a pressure force and flow to seat 2PSIBV405. Results of the troubleshooting and diagnostic procedure indicated 2PSIBV405 remained cocked open as indicated by a pressure of 460 pounds per square inch gauge (psig) at the suction of HPSI pump "B."

On October 27, 2000, at approximately 1400 MST, 2PSIBV405 was disassembled and engineering personnel observed a bent disc stud which allowed excessive freedom of movement (articulation) between the swing arm and the valve disc. At approximately 1500 MST, APS made notification of the findings regarding 2PSIBV405 to the NRC via the Emergency Notification System (reference ENS# 37465).

On October 27, 2000, at approximately 1715 MST, further investigation of the reverse flow test failure of 2PSIBV405 revealed that disc articulation had not been factored into the initial valve alignment of Unit 1 HPSI discharge check valves 1PSIAV404 and 1PSIBV405, or Unit 3 HPSI discharge check valve 3PSIBV405. Although these three valves had previously passed surveillance testing, they were reverse flow tested again to provide additional assurance they would perform their design function. By October 28, 2000, at approximately 0632 MST, the Unit 1 and Unit 3 HPSI discharge check valves had successfully completed reverse flow testing.

On November 3, 2000 at 0500 MST, upon completion of rework activities, 2PSIBV405 was returned to an operable status.

#### 5. ASSESSMENT OF SAFETY CONSEQUENCES:

The degraded HPSI flow condition did not result in any challenges to the fission product barriers or result in any offsite releases. Therefore there were no actual adverse safety

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consequences as a result of this condition. However, it is known that the back-leakage condition would have prevented the high pressure safety injection system from meeting design basis minimum flow requirements under certain plant conditions.

The assessment of safety consequences of the failed HPSI check valve is being evaluated as part of the ongoing investigation and the results will be reported in a supplement to this LER which is expected to be submitted by January 31, 2001.

#### 6. CAUSE OF THE EVENT:

An investigation of this condition is being conducted in accordance with the APS corrective action program and additional investigative activities remain to be completed before APS can determine the root cause of the bent disc stud condition. Engineering personnel are investigating whether the operation of 2PSIBV405 under partially voided piping conditions may have contributed to valve degradation and whether recent events involving ECCS venting (e.g., LER 50-529/2000-003-00) may be directly related to 2PSIBV405's degradation. However, this relationship has not been confirmed and 2PSIBV405 may have gradually degraded over time or may have failed catastrophically shortly before the condition was discovered during surveillance testing.

#### 7. CORRECTIVE ACTIONS:

The internals of HPSI discharge check valve 2PSIBV405 were replaced during Unit 2's ninth refueling outage and the valve was returned to an operable status on November 3, 2000.

Unit 1 and 3 HPSI discharge check valves 1PSIAV404, 1PSIBV405, and 3PSIBV405 were reverse flow tested and confirmed operable by October 28, 2000.

The damaged 2PSIBV405 components were sent to Southwest Research Institute where APS engineering personnel will oversee testing of the components.

Corrective actions to prevent recurrence will be developed upon completion of the condition investigation and will be reported in the supplement to this LER.

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## 8. PREVIOUS SIMILAR EVENTS:

LER 50-528/1998-006-01 reported a similar event where the Unit 1 train "A" and Unit 2 train "B" HPSI pump discharge check valves failed because the valve discs became cocked under the top of the valve seat, preventing full closure. The cause for the previous event was vertical misalignment, which was attributed to inadequate maintenance instructions.

APS personnel investigating this event reviewed the previous event and subsequent procedural enhancements regarding disc articulation. Based on the findings to date, the condition reported in this LER do not appear to be the result of vertical misalignment and therefore, the underlying concern or sequence of events is not the same as the previously reported condition.