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SUBJECT: Certifies that steam bypass control sys fully functional.

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Arizona Public Service Company
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102-01317-WFC/TDS/kj
June 28, 1989

WILLIAM F. CONWAY
EXECUTIVE VICE PRESIDENT
NUCLEAR

Mr. John B. Martin, Regional Administrator
Region V
U. S. Nuclear Regulatory Commission
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Reference: Letter from W. F. Conway, APS, to J. B. Martin, NRC, dated June 23, 1989

Dear Sir:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2 Restart
File: 89-056-026

On June 23, 1989 I sent you a letter certifying that Unit 2 was ready for restart with the exception of Steam Bypass Control Valve 1008. Additionally, I stated that Unit 2 would not start up until the valve was functional.

Subsequent to my letter it was discovered that that valve's internals were not in the configuration required by the design. Specifically, three wave springs were found in the valve rather than the one required by the design. A formal investigation was initiated in accordance with PVNGS administrative controls. The results of this investigation and corrective action, to date, are described in the attachment to this letter.

Steam Bypass Control Valve 1008 has been restored to its design configuration and tested satisfactorily. This letter and attachment, certifying that the Steam Bypass Control System is fully functional, combined with the referenced letter completes the commitments made prior to restart of Unit 2.

Very truly yours,

W. F. Conway
Executive Vice President -
Nuclear

WFC/TDS/kj
Attachment

cc: R. P. Zimmerman
A. E. Chaffee
S. A. Richards
T. L. Chan
M. J. Davis
T. J. Polich
A. C. Gehr

IE-26

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, William F. Conway, represent that I am Executive Vice President - Nuclear, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

William F. Conway

Sworn to before me this 28 day of June, 1989.

Linda B. Spell
Notary Public

My Commission Expires:

June 5, 1992

Attachment

Background

On June 22, 1989, an initial inspection of Steam Bypass Control System (SBCS) valve 1008 internals was completed. This inspection revealed damage to the piston ring and valve plug. The piston ring was steam cut. The valve plug showed evidence of higher than normal contact forces with the piston ring. These combined impairments explained why the valve would not operate as designed. The damage to the piston ring and plug allowed excessive steam leakage past the piston ring. Excessive leakage past the piston ring can cause bonnet pressure to remain high when the valve is called upon to open. The high contact forces between the piston ring and plug resulted in increased frictional forces. The resulting forces (high bonnet pressure and increased frictional force) can exceed the capability of the pneumatic actuator; thereby preventing the valve from opening. More detailed investigation was required to determine the cause of the piston ring and plug deterioration.

On June 23, 1989 the assembly of SBCS valve 1008 (with internals of a new design) was allowed to progress since the new modification utilizes a modified piston ring and plug assembly and increases the capacity of the pilot valve which will enhance valve operation. Final testing was scheduled for the following day, Saturday, June 24, 1989. Concurrently, detailed inspections of the removed valve internals were being conducted by the system engineer and an engineer from the valve vendor, Control Components, Inc. (CCI). The two engineers were utilizing the technical manual for the valve, CCI proprietary drawings and CCI Field Service Instructions to compare the detailed as-found conditions to the current design requirements for the valve in an effort to determine what caused the piston ring steam cutting and increased frictional forces.

During this inspection additional information regarding the failure of SBCS valve 1008 was discovered. Specifically, three "wave springs" were found in the valve when only one "wave spring" was specified to be installed in accordance with current design. The additional two wave springs resulted in the piston ring being tightly constrained when the valve bonnet hold down stud hex nuts were torqued. This prevented the piston ring from "floating" as designed during thermal transient and other dynamic conditions. The resulting contact between the piston ring and plug led to the damage noted on these components. The final result being excessive steam leakage to the bonnet region and high frictional forces between the piston ring and plug.

Discussion

The discovery of the two additional wave springs resulted in APS initiating a formal investigation in accordance with PVNGS administrative control procedures for incident investigations. As part of the incident investigation, a review of the work documents which installed the wave spring modification in Unit 2 was conducted. The results of that review are summarized below.

During April of 1988, seven (7) of the eight (8) SBCS valves were modified to add a wave spring underneath the piston seal ring. The remaining valve

(CV-1007) had this modification installed under a Startup Non-Conformance Report (NCR) in July of 1985. The wave spring was designed to be installed under the piston ring to maintain contact between the top surface of the piston ring and the disk stack spacer. The continuous contact at this interface would minimize the introduction of foreign material into the piston ring slot. Foreign material could lead to misalignment of the piston ring with subsequent leakage past the piston ring into the valve bonnet. As explained before, excessive leakage past the piston ring into the valve bonnet can prevent proper operation of the valve. The modification to the SBCS valves was installed sequentially as follows:

	Valve	Date Wave Spring Was Installed	Implementing Document
	CV-1007	July, 1985	NCR-SJ-5907
1st	CV-1003	April 08, 1988	WO #00286252
2nd	CV-1001	April 11, 1988	WO #00286241
3rd	CV-1004	April 12, 1988	WO #00286253
4th	CV-1005	April 12, 1988	WO #00286254
5th	CV-1008	April 15, 1988	WO #00286256
6th	CV-1002	April 20, 1988	WO #00286251
7th	CV-1006	April 21, 1988	WO #00286255

A review of the Request for Stores (ROS), related to the above work orders, showed that seven (7) wave springs were initially issued to work on the seven (7) valves in question (ROS #212960).

Reassembly of the SBCS valve internals proceeded in the sequence shown above using the seven wave springs until CV-1002 reassembly began. At this time, it was noted that all seven wave springs had been used. Two additional ROS's (#211350 and #211349) were then issued to acquire the two (2) wave springs necessary for reassembly of CV-1002 and CV-1006. Thus, a total of nine (9) wave springs had been issued for work on the seven (7) valves which were being modified in April of 1988. Based on the logic presented below, it is concluded that one (1) wave spring was installed in six (6) valves, and three (3) wave springs were installed in CV-1008.

To ensure that the installation of three (3) wave springs in CV-1008 was in fact an isolated incident, the following logic was employed to ensure that all seven SBCS valves, which were modified during the April 1988 time-frame, are configured as designed:

1. Valve CV-1008 accounted for three (3) of the initial seven (7) wave springs issued.

2. The remaining four (4) wave springs from the initial seven (7) are installed in CV-1001, CV-1003, CV-1004, and CV-1005. Based on disassembly and inspection of CV-1001, 1003, and 1004, which confirmed that each valve contained only one wave spring, it is concluded that CV-1005 has only one wave spring.

3. Valves CV-1002 and CV-1006 accounted for the additional two (2) wave springs issued.

Following disassembly and inspection of CV-1001, 1003, and 1004, these valves were reassembled with a modified piston ring and plug assembly as previously discussed. During the disassembly and inspection of these valves, stackup dimensions were taken and close examination performed with no abnormalities noted.

To ensure there was no replication of this event to the Unit 1 or Unit 3 valves, the internals of all eight Unit 3 SBCS valves and 3 of the Unit 1 SBCS valves were inspected by the system engineer and the Lead Balance of Plant Engineer. No abnormalities were discovered. Of the remaining five valves in Unit 1, the wave spring modification was never implemented on four of the valves and the fifth valve currently has the modified internals installed. Prior to return to service of Unit 1 and Unit 3 all SBCS valves in those units will have the modified piston and plug assembly installed.

Although the Atmospheric Dump Valves (ADVs) are similar to the SBCS valve in design, their internals have been modified by the installation of a new plug design, a two piece piston ring, and a modified disk stack. There is not, nor has there ever been a modification to the ADVs which installed a wave spring under the piston ring.

Currently, all eight Unit 2 SBCS valves have been tested and are considered completely functional and reliable. Four of the valves contain the modified piston ring and plug assembly, and four of the valves contain the wave spring modification described on page 2 of this attachment. The four valves without the improved internals will be modified as soon as parts become available and plant conditions permit following Unit 2 restart.

The complete detailed investigation to determine why the three wave springs were installed in CV-1008 is in progress with an expected completion date of July 21, 1989. This is not considered a restart issue since all Steam Bypass Control valves are functional.

Summary

Based on a review of the work orders which implemented the wave spring modification, the inspections conducted on the four Unit 2 SBCS valves and the applicable Unit 1 and Unit 3 SBCS valves, and satisfactory operation of all the Unit 2 SBCS valves, APS believes no additional inspections of the Unit 2 SBCS valves are necessary and the SBCS is fully functional. Also, an inservice surveillance program is in place to periodically (every 2 weeks) check the functionality of the SBCS valves. Additionally, SBCS functionability will be demonstrated during ADV testing as the ADV steam flow will be balanced by a SBCS valve during the monthly ADV stroke testing.