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U. S. Nuclear Regulatory Commission
Region V
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November 14, 1984
ANPP-31125-TDS/TRB

Attention: Mr. T. W. Bishop, Director
Director of Resident
Reactor Projects and Engineering Programs

Subject: Final Report - DER 82-76
A 50.55(e) Reportable Condition Relating To Target Rock Valves
Do Not Meet Specification/Test Requirements
File: 84-019-026; D.4.33.2

- Reference:
- A) Telephone Conversation between P. Narbut and G. Duckworth on November 24, 1982
 - B) ANPP-22590, dated December 23, 1982 (Interim Report)
 - C) ANPP-23223, dated March 10, 1983 (Time Extension)
 - D) ANPP-23641, dated May 3, 1983 (Time Extension)
 - E) ANPP-27523, dated August 5, 1983 (Time Extension)
 - F) ANPP-28247, dated November 17, 1983 (Time Extension)
 - G) ANPP-28608, dated January 12, 1984 (Time Extension)
 - H) ANPP-28884, dated February 15, 1984 (Time Extension)
 - I) ANPP-29288, dated April 12, 1984 (Time Extension)
 - J) ANPP-29612, dated May 29, 1984 (Interim Report, Rev. 1)
 - K) ANPP-29939, dated July 11, 1984 (Final Report, Rev. 0)
 - L) Meeting with NRC (M. Licitra & H. Garg) to Discuss Comments on Equipment Qualification dated Oct. 9-10, 1984
 - M) ANPM-21123 TFQ/BJA dated October 16, 1984 Notes of REF. L) Meeting

Dear Sir:

Attached is Rev. 1 of our final written report of the Reportable Deficiency under 10CFR50.55(e), referenced above. This supercedes the information provided in our letter of Ref. K) above, and is provided in response to specific NRC requests of the Ref. L) meeting. Please advise if you have any additional questions or comments.

Very truly yours,

E. E. Van Brunt, Jr.
APS Vice President
Nuclear Production
ANPP Project Director

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EEVB/TRB/dlm
Attachment

cc: See Page Two

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Mr. T. W. Bishop
DER 82-76
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cc: Richard DeYoung, Director
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FINAL REPORT - DER 82-76
 DEFICIENCY EVALUATION 50.55(e)
 ARIZONA PUBLIC SERVICE COMPANY (APS)
 PVNGS UNITS 1, 2, 3

I. Description of Deficiency

Combustion Engineering (C-E) has reported deficiencies with thirty (30) Target Rock solenoid valves supplied to PVNGS. Of these, twenty-four (24) one-inch valves Model 77L-001 were assigned to be installed as Safety Injection Tank Valves (eight per unit) and are identified by the following unit tag numbers:

1JSIAHV605	2JSIAHV605	3JSIAHV605
1JSIAHV606	2JSIAHV606	3JSIAHV606
1JSIAHV607	2JSIAHV607	3JSIAHV607
1JSIAHV608	2JSIAHV608	3JSIAHV608
1JSIBHV613	2JSIBHV613	3JSIAHV613
1JSIBHV623	2JSIBHV623	3JSIBHV623
1JSIBHV633	2JSIBHV633	3JSIBHV633
1JSIBHV643	2JSIBHV643	3JSIBHV643

Additionally, six (6) two-inch Model 77L-003 Target Rock solenoid valves were assigned to be installed as Pressurizer Auxiliary Spray valves (two per unit) and are identified by the following unit tag numbers.

1JCHBHV203	2JCHBHV203	3JCHBHV203
1JCHAHV205	2JCHAHV205	3JCHAHV205

To support the PVNGS equipment qualification program, C-E determined that four (4) valves would be returned to C-E for additional testing in accordance with NUREG-0588. Units 1 & 2 were already installed at this time, so valves were selected from Unit 3 stock and identified by model numbers, serial numbers and size as follows:

<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Unit Tag Numbers</u>
77L-001	17	1"	3JSIAHV605
77L-001	18	1"	3JSIAHV606
77L-003	5	2"	3JCHBHV203
77L-003	6	2"	3JCHAHV205

1. Prior to environmental testing

- a. Incorrect Valve Assembly -- Examination found an off-center insulating washer wedged in the land between the pressure housing and the lower case of the reed switch housing. This prevented pressure from the assembly nut being transmitted to the bottom of the solenoid housing and the lower O-ring seal. The misalignment was corrected.

- b. Significant Missing Parts -- The delivered valves lacked O-ring seals on both valves [5] and [6]. In addition, rubber grommets protecting the solenoid leads from chafing by the housing were missing on valves [17] and [18]. The missing O-rings were replaced.

2. Attributed to environmental testing program

- a. Limit switch valve position indicator failures, due to improper curing within the reed switch assembly.
- b. Valve Failed to Open -- About 75% through the seismic test, valve [5] failed to open due to an electrical short in the solenoid. On disassembly, the solenoid was observed to be free to move in all directions.

The lead wires to the other valve tested [18] were also damaged to the extent of exposing the conductors, but they had not as yet come into contact either with each other or with the housing, where the grommet was missing.

- c. Valve Failed to Close -- Although valve [18] was still operating electrically at termination of the test, it was unable to seat properly in the closed position because the soft seat ring had started to come out of its retention groove in the end of the plunger.

II. Analysis of Safety Implications

C-E has reviewed the impact of the reported condition and has determined the following:

"Failure of the Safety Injection Tank (SIT) Valves does not present a significant safety hazard because shutdown and depressurization can be accomplished without it. Removal of SIT from service for repair is also permitted by the technical specification."

"Failure of the Pressurizer Auxiliary Spray Valves could present a significant safety hazard because, in the Palo Verde design, these valves play a vital role in the principal path to cold shutdown for accident situations involving extended loss of off-site power".

Based on the above, this condition is evaluated as reportable under the requirements of 10CFR50.55(e), since if the Pressurizer Auxiliary Spray valves defects were to remain uncorrected, it would represent a significant safety condition. C-E has subsequently reported this condition under the requirements of 10CFR Part 21.

III. Corrective Action

1. Generic

a. Reed Switch Failures (Item I.2a)

It has been concluded that the Reed Switch problems were due, in part, to the high temperatures used to age pre-condition the valve components prior to DBE/DBA testing at C-E. These switches had been shown to perform acceptably in testing by Target Rock as documented in their Report #2375. To preclude potential future switch problems and to resolve any E.Q. concerns, however, these Class Q valves are being refurbished with new "high temperature" reed switches which have been demonstrated as qualified in TRC Report #3996. The environmental conditions achieved in this testing greatly exceed those for PVNGS.

b. Axial Coil Movement and Missing Parts (Items I.2b and I.1a & b)

The root cause of the valve failure (2b) is attributable to the mechanism used to secure the solenoid to the upper works assembly, which is unique to the 77L series of solenoid valves at PVNGS. These valves have a jam nut in combination with a lock washer which is used to secure the solenoid. If, however, the upper works are rotated during handling or installation, the jam nut can become loose, allowing axial rotation of the coils. This matter is addressed in TRC Service Bulletin #8302 dated April 6, 1983.

For TRC solenoid valves manufactured prior to the 77L Series, TRC utilized a jam nut with set screw to secure the solenoids. The set screw precludes the loosening of the jam nut and consequential axial rotation of the coil. The jam nut/set screw arrangement is applicable to all balance of plant (BOP) scope unpotted coil solenoid valves.

To assure that no concerns remain, however, all unpotted coil BOP Q class solenoid valves are being inspected per the TRC service bulletin referred to above.

Regarding the NSSS valves on which the DER was written. This problem was wholly resolved by the Mod III Upgrade to 77L-001 and 003 solenoid valves which included a complete factory refurbishment of these valves with potting of the coil into the solenoid housing. The potting prevents differential movement

between the coil and housing, precluding lead wire abrasion. Additionally, TRC verified that all required parts (grommets, O-rings, seals, washers) were properly installed in the valves during this rework activity. This also closed the concerns of Items 1a and b, above.

It is not entirely clear that the original missing parts defects were a manufacturer responsibility. These valves had already been delivered to the jobsite for installation prior to their reshipment back to C-E labs for testing. It is possible that unfamiliarity with the hardware in the field or in the labs may have resulted in parts being missing. We are aware of no other problems of this type with the TRC product. Further a detailed inspection of a 10% sample of the BOP scope solenoid valves, conducted in response to these concerns, revealed no parts deficiencies which could have compromised the valves' qualification.

2. Specific-C-E Scope Valves 77L-001

- a. C-E letter V-CE-19075 provides the corrective action for modifications of the existing solenoid operators (Top Works) for the Model 77L-001 (Target Rock) one-inch Safety Injection Tank Vent valves for all 3 Units. The modifications upgrade the valves to the qualified Mod III (potted coil) configuration. The valves are identified by the following unit tag numbers:

1JSIAHV605	2SIAHV605	3SIAHV605
1JSIAHV606	2SIAHV606	3SIAHV606
1JSIAHV607	2SIAHV607	3SIAHV607
1JSIAHV608	2SIAHV608	3SIAHV608
1JSIBHV613	2SIBHV613	3SIBHV613
1JSIBHV623	2SIBHV623	3SIBHV623
1JSIBHV633	2SIBHV633	3SIBHV633
1JSIBHV643	2SIBHV643	3SIBHV643

C-E has submitted revised Target Rock Plan TP-ESE-024, Rev. 1 (Log N001-1.01-351-2) and Target Rock Modification Report No. 3862. as well as Qualification Program Document PE-5733A and Attachments (Log N001-1.01-421-1) which provide the results of testing on the Mod III Target Rock valves. This, in conjunction with a supplemental analysis which further defines the operability requirements for both the 1" (77L-001) and 2" (77L-003) solenoid valves, demonstrates qualification to the PVNGS conditions in accordance with NUREG 0588 and 10CFR50.49.

As previously stated, position switch qualification is documented in TRC Report #3996. That report, as well as TRC #2375, provides additional assurance of the validity of our position that these valves are qualified.

Bechtel will implement their scope of the required modifications to the T/R Solenoid operators by the following Design Changes Package prior to fuel load in each Unit:

ISM-SI-301 2SM-SI-301 3CM-SI-301

C-E will submit revised drawings, manuals and qualification documentation as required.

3. Valve Failed to Close
(Item I.2c)

The root cause of the seat extrusion identified herein is attributed to a combination of overtesting during age preconditioning/cycling and the effect of rapid decompression on the EPR softseat into which high pressure nitrogen gas had permeated. Upon valve opening, the seat saw a pressure decrease from 700 psig to 0 psig and the gas entrapped therein was released. Repetitive pressurization-depressurization cycles result in a physical breakdown of the seating material and consequential valve leakage.

It is the project's position that these seats are qualified for at least one core refueling, however. Further, we are following the operating experience of San Onofre Nuclear Generating Station, to determine the acceptability of the TRC "hard seat" alternate to the existing soft seats which provide good gas sealing characteristics and resistance to decompression related damage. It is currently thought that this fix will be pursued as a plant betterment at first refueling.

4. C-E Scope Valves 77L-003

a. The corrective action required for the two-inch Pressurizer Spray Valves is as follows:

- ° Replace existing Unit 1 Model 77L-003 Target Rock solenoid operators with Unit 2 refurbished (Mod III potted coil) solenoid operators of the same model (Tag numbers 1JCHAHV205 and 1 CHBHV203). This will be the final solution to support PVNGS Unit 1 schedule requirements. As stated above, these valves are qualified for their application at PVNGS.

- ° Replace all Units 2 & 3 Target Rock Model 77L-003 two-inch solenoid valves with Valcor two-inch solenoid valves Model V562-563-9, obtained in new condition from Tennessee Valley Authority (TVA) and refurbished by the manufacturer prior to installation. These valves are qualified for 40-year life and this replacement was based on supporting construction schedule for Units 2 & 3.

The Valcor valves will assume the following unit tag numbers.

2JCHAHV205	3JCHAHV205
2JCHBHV203	3JCHBHV203

Bechtel will implement the required valve modifications and valves change-out prior to fuel load in each Unit via the following Design Change Packages:

ISM-CH-307	2SM-CH-307	3SM-CJ-307
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C-E will submit revised drawings, manuals, and qualification documentation, to support corrective action.

- b. C-E has issued Bulletin 82-11 dated November 9, 1982 notifying all utility clients of this deficiency.
- c. Bechtel has identified twelve (12) additional Target Rock solenoid Model 77L (77L-002 and 77L-004) supplied by C-E to PVNGS.

Model 77L-002

1JSIBUV659	2JSIBUV659	3JSIBUV659
1JSIAUV660	2JSIAUV660	3JSIAUV660

These valves are not included in the PVNGS Harsh Environment Equipment Qualification Program, since they are mild environment equipment (i.e., they have no post accident functional or accident mitigation requirements). They are QIE and qualification (seismic and mild environment operability) is still required, however. This qualification is demonstrated as documented in Program PE-5733B. Additionally, these valves have potted coils as part of the original design so the concern of I.2b is not applicable.

Model 77L-004

1JCGBHV526	2JCHNHV526	3JCHNHV526
1JRCEHV403	2JRCEHV403	3JRCEHV403

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These valves are not QIE, have no safety function and are not part of the plant qualification program; therefore, the E.Q. problems identified in this DER are not applicable.

However, Bechtel has issued Investigation Request (IR) No. 18 to inspect all of the above 12 valves for missing parts.