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November 16, 1984

ANPP-31154-TDS/TRB

U. S. Nuclear Regulatory Commission  
Region V  
1450 Maria Lane - Suite 210  
Walnut Creek, California 94596-5368

Attention: Mr. D. F. Kirsch

Subject: Final Report - DER 84-78  
A 50.55(e) Reportable Condition Relating To Valcor Solenoid  
Valve.  
File: 84-019-026; D.4.33.2

Reference: A) Telephone Conversation between D. Hollenbach and T. Bradish  
on October 4, 1984  
B) ANPP-31031, dated November 1, 1984 (Interim Report)

Dear Sir:

Attached is our final written report of the Reportable Deficiency under  
10CFR50.55(e) referenced above.

Very truly yours,

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

EEVB/TRB/nj  
Attachment

cc: See Page Two

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Mr. D. F. Kirsch  
DER 84-78  
Page Two

cc: Richard DeYoung, Director  
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U. S. Nuclear Regulatory Commission  
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FINAL REPORT - DER 84-78  
DEFICIENCY EVALUATION 50.55(e)  
ARIZONA PUBLIC SERVICE COMPANY (APS)  
PVNGS UNIT 1

I. Description of Deficiency

During startup testing, four Valcor safety-related solenoid valves either failed to operate or failed while operating. Also, there were instances where the position indication for these valves was incorrect and required adjustment, or was lost due to a switch failure. The valves that failed are the blowdown sample valves 1J-SGA-UV-227, 1J-SGB-UV-228 and the pressurizer sample containment isolation valves 1J-SSA-UV-204, -205. As documented by Nonconformance Report (NCR) SE-4933, troubleshooting identified inoperative valve coils as the cause of the valve failures.

During normal operation, valves SG-227 and SG-228 are open (i.e., the coils are continuously energized) and fluid temperature is 545°F (Reference drawing log No. N001-22.02-27). Valves SS-204 and SS-205 are closed during normal operation (i.e., the coils are de-energized) and fluid temperature is 653°F (Reference drawing log No. N001-30.01-54).

Evaluation

Valcor has analyzed the failed valve actuation coils and position indicating switches. The root cause of the failures was attributed to overheating of the coils which in turn overheated the switches. The coils became excessively hot because of a combination of the high working fluid temperatures and operation of the valves at dc voltages higher than assumed in the initial equipment qualification report for extended periods of time. Overvoltage operation is considered to be the primary cause of these failures. CESSAR Final Safety Analysis Report (FSAR) Section 8.3.2 "DC Power System Interface Requirements" state that (1) dc power supplied shall be 125 volts with maximum limits of 105 volts to 140 volts. These coils were designed for a normal operating voltage of 125 volts dc. The coils and switches were also designed to withstand the higher temperature associated with operating at 140V-dc for short periods of time (operation at 135V-dc increases the coil temperature by approximately 40°F over that achieved by operation at 125V-dc). The coils and the position indicating switches were not designed to withstand these higher operating temperatures for extended periods of time.

The PVNGS Q-Class battery systems will be operated at 135V-dc at least 98% of the time, and at 140V-dc a maximum of 2% of the total time the battery chargers are "on." With the chargers "off," the battery terminal voltage will be 124.8V-dc. Equipment qualification work which was performed on continuously energized equipment, assuming a 125V-dc input voltage, will require a reevaluation to determine the impact of higher voltage operation. This activity is now underway (Reference 3).

It is also planned to verify the actual temperature rise of these units through a thermal mapping reexamination to be conducted in the field (Reference 3). As with previous exams, the results of this activity will be factored into the respective qualification reports with revisions to equipment qualification lives/replacement intervals as required.

## II. Analysis of Safety Implications

The sampling valves are required to operate in post-design basis event (DBE) conditions, since a sample is required to be taken in the first 36 hours post-DBE and periodically thereafter. Also, position indication on these valves is required for 120 days after a DBE. Had this deficiency gone uncorrected, these valves might not have been available for use. Therefore, this condition is evaluated as reportable under the requirements of 10CFR50.55(e).

The unavailability of these valves for their intended use may pose a substantial safety hazard to the public. Therefore, this condition is evaluated as reportable under 10CFR Part 21.

## III. Corrective Action

To prevent coil overheating, Valcor will supply a qualified, timed, dropping resistor, which will be installed in-line, upstream of the coil. This device allows the valve solenoid coil to be energized at full line voltage. After 2 to 3 minutes, a resistor is switched into the circuit. This reduces the coil voltage to 40-60 volts, which is sufficient to maintain the valves in an open position. This voltage reduction allows the coils to run significantly cooler, precludes a reduction in the qualified life, and prevents premature failure of the coils and switches due to overheating. The operating conditions of all Valcor solenoid valves are currently being revised in order to determine the applicability of the use of the dropping resistor. Design Change Packages 10M-SG-126, 2SM-SG-126, and 3CM-SG-126 are being prepared to implement the addition of the timed, dropping resistor.

The use of the dropping resistor, and thereby the reduction of the coil temperature, will also eliminate the position switch failures. In order to insure that "position switch drift" does not occur, Valcor is developing a new procedure for setting the switches which will use switches of different "sensitivities" based on the operating conditions of each particular valve. This procedure will be available by November 16, 1984.

Combustion Engineering has identified ASCO and Target Rock as suppliers of the other Q-Class Solenoid Valves which require investigation. This activity is currently being pursued by C-E and will be resolved prior to fuel load.

The respective valve vendors have been contacted to review temperature survey information to determine if there will be any deleterious effects from operating the valves at 135V-dc for extended periods of time and intermittently at 140V-dc.

IV. References

1. C-E to Bechtel letter V-CE-31182, dated October 17, 1984  
(C. Ferguson to W. G. Bingham)
2. APS to C-E letter ANPP-30637-JTB/EJG, dated September 25, 1984  
(C. Ferguson to E. E. Van Brunt, Jr.)
3. Bechtel to APS letter B/ANPP-E-121465, dated September 20, 1984