Omaha Public Power District

1623 HARNEY OMAHA, NEBRASKA 68102 TELEPHONE 536-4000 AREA CODE 402

November 24, 1980

Mr. K. V. Seyfrit, Director
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Reference: Docket No. 50-285

Dear Mr. Seyfrit:

Omaha Public Power District received IE Bulletin 80-23, dated November 14, 1980, regarding failures of solenoid valves manufactured by Valcor Engineering Corporation. The District's response to this bulletin is attached.

Sincerely,

W. C. Jones
Division Manager
Production Operations

WCJ/KJM/TLP:jmm

Attachment

cc: U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Washington, D.C. 20555

LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

Attachment

Request No. 1

Determine whether Valcor solenoid valves having P/N's V70900-21-1 or -3 are used to perform any safety-related function at your facility. If so, identify the safety-related systems using these solenoid valves, the total number of such solenoid valves used, and evaluate acceptability of continued operation with potentially defective solenoid valves. A report of the results of the evaluation of continued operation shall be submitted within ten (10) days of the date of this bulletin and should include factors such as (a) operator's ability to promptly identify a failing or failed solenoid valve, (b) effect of solenoid valve failures on safety-related systems and subsequent operator actions required, and (c) possible degradation of the power supply serving a failed solenoid valve and the effects on other components served by said power supply. If no such solenoid valves are used, you need only submit a negative declaration to this effect within thirty (30) days of the date of this bulletin and you need not respond to the remaining items.

Response

The Omaha Public Power District has completed its evaluation of the Valcor solenoids installed at the Fort Calhoun Station Unit No. 1. The evaluation is provided below.

Valcor Solenoid Valve Failure Evaluation

The Valcor valves are installed in the H_2 purge system, component cooling water (CCW) to reactor coolant (RC) pump system, auxiliary feedwater (AFW) to steam generator (SG) supply system, and secondary system steam safety valves, as described below.

HCV-881 and HCV-882

These valves are installed in the H_2 purge system. They fail open, are normally closed with the solenoid energized, and are backed by outboard valves manually locked closed. If the valve fails in a post-LOCA environment, the system's function will be fulfilled by the locked closed outboard valve.

HCV-438A and HCV-438C

These valves are installed in the CCW to RC pumps system. They fail open, are normally open with solenoid de-energized, and are backed by outboard valves which fail closed. The failure of this solenoid would not affect the isolation function since the backup valve is available and fails closed. Also, solenoid failure would not prevent use of the RCP in a post-accident situation. Since the valve is normally de-energized and the solenoid failures to date are due to the combined internal and external heating of the energized solenoid, the system can be expected to perform its design function. Based on the failures to date, the mean time to failure to energized solenoids is estimated to be on the order of weeks.

Response (Continued)

HCV-864 and HCV-865

These valves are in the containment charcoal filter spray system. They fail closed, are normally closed with solenoid de-energized, and are used to douse fires or localized hot spots in the charcoal filters. Since these valves are normally de-energized, the probability of failure upon demand is very remote based on the mean time of failure for energized valves. For intermittent operation in a post-accident mode, no failures should be expected since an operating time of hours versus the few weeks mean failure time is anticipated. Even with the failure of the solenoid, a reduction in the effectiveness of the iodine removal system is remote. This is because two removal systems are available, a dousing system is available for each set of filters, and a fire would not propogate in the filters in a post-accident situation due to the containment spray system. Therefore, the probability of a solenoid failure is low and the probability of reduction in the iodine removal system's effectiveness is exceedingly small.

HCV-1107A and HCV-1108A

These valves are located in the AFW system. They fail open, are normally closed with the solenoid energized, and are automatically opened to supply auxiliary feedwater upon demand. The failure of these valves in the open position was previously analyzed by the District. Based on this analysis, operation failure of these valves in the open position does not violate the assumptions used in the safety analysis.

The failure mode of these solenoids is such that the valve can be expected to go to its "failed" position and the AFW system would accomplish its function. However, even if the valve would somehow fail closed the AFW system can be re-aligned to inject through the main feedwater piping.

MS-291 and MS-292

These valves are installed on the main steam safety valves. They fail closed, are normally closed with the solenoid de-energized, and are used to vent steam with the main steam stop valves closed. Since these valves have normally de-energized solenoids and would be used intermittently, no failure is anticipated. However, if a failure would occur the valve would go to the failed closed position and it would act as a normal main steam safety valve which is consistent with the assumptions of the safety analyses in the Fort Calhoun FSAR.

Failure Detection

See discussion with the testing section, under item 2.

Response (Continued)

Power Supply Degradation

As installed at the Fort Calhoun Station, no degradation of the power supply will occur as a result of the solenoid valve failure. Each of the subject solenoids is fed with a 130 VDC supply from the station batteries via the DC control power distribution system.

Each solenoid control circuit is fused on both the positive and negative leads to provide complete protection for the floating 130 VDC system. Should a solenoid fail and fault, the fuse would blow and clear the fault, not affecting the operation of other equipment supplied by the battery. The size of the station batteries is such that no significant transient would be expected as a result of a solenoid fault and the clearing of the fault.

Request No. 2

Licensees of operating plants using the aforementioned solenoid valves in safety-related applications shall periodically test the coils for potential turn-to-turn shorts in a manner that will not violate any LCO or cause any undesirable transient. The tests should account for coil resistance changes due to temperature effects attributed to the environment and to I^2R losses in the coil to provide accurate indications of changes in resistance due to turn-to-turn shorts.

These tests are to be initiated within ten (10) days of the date of this bulletin. The following schedule is recommended until the units are replaced with qualified units:

(a) Daily for solenoid valves operated in a normally energized mode;

(b) Weekly for solenoid valves operated in a normally de-energized mode.

Whenever the tests indicate that ten percent or more of the coil turns have been shorted, said solenoid valve, or its coil, shall be replaced with a new unit.

Response

The District feels that monitoring of presently installed valve indication is adequate for the detection of a failure of a continuously energized coil and the Commission's recommendation of 2.(b) will be adequate for the detection of coil problems associated with de-energized solenoids.

At present, each valve (for which the Valcor's are pilot operating valves) is equipped with red (open) and green (closed) limit switch position indicating lights. In addition, the control power supply is monitored on valves HCV-1107A and HCV-1108A and will annunciate should a solenoid valve failure also result in a fault.

Response (Continued)

If a continuously energized solenoid was to fail, the valve would shift position to its fail safe position. This would, as a minimum, be indicated in the control room in one of two ways: either with a shift in position lights as a result of coil open circuit or a loss of both indicating lights as a result of a coil fault.

It should be noted that the Commission's testing proposal has raised some serious concerns about the advisability of testing a continuously energized solenoid. To accomplish the test, a current measurement must be made. This requires a very high precision measurement to detect the several milliamp change required under the failure criteria. The measurement requires the insertion of a DVM in the circuit (the DVM would be placed across the fuse, the fuse would be pulled, the current read, and the fuse replaced) or the insertion of a precision shunt meter resistor.

The insertion of a DVM in the circuit would add a very high risk of cycling the valve if poor DVM contact were made and poses some difficulty and problems in physically working on the panel boards. A shunt meter resistor installation would degrade the present panel board wiring and may introduce problems should a fault occur. In addition, at this time the District has no correlating temperature data to make this precision measurement and only some typical values are available from the manufacturer.

To date, no adverse effects have been felt as a result of the failures. The District believes there is no reason that, based on the above analysis and discussions in item 1, repair, rebuilding, or replacement on failure will not be adequate for continued operation with the continuously energized valves. An Operations Memorandum will be issued to heighten operator awareness of the problem.

Since there is no installed means of detecting a de-energized coil and on-line valve cycling in some cases cannot be done, the District will begin a program of weekly coil resistance testing. The District intends to monitor the de-energized resistance, note any changes, and then evaluate required actions.

Conclusion

Based on the information supplied in response to items 1 and 2, the District feels continued operation is safe and justified.

Request No. 3

Licensees of operating plants shall submit a report within forty-five (45) days of the date of this bulletin describing their longer term corrective action plan and the date by which the corrective actions will be implemented. As a minimum, the longer term corrective measures should include the replacement of the coils with fully qualified coils. New solenoid valve assemblies (i.e., a repaired unit with a replacement

Request No. 3 (Continued)

coil or a completely new unit) shall be demonstrated to be qualified for its safety-related application per the applicable requires of IEEE 323-1974, IEEE 344-1975, IEEE 382-1972, and IE Bulletin No. 79-01B and supplements thereto.

Response

The District has initiated a program to replace the Valcor solenoids with LOCA qualified ASCO NP-1 series solenoid valves. It is anticipated this will be completed during the Fall, 1981 refueling outage. If this should change, the Commission will be notified.