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402/636-2000

January 7, 1992
LIC-91-339R

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

References:
1. Docket No. 50-285
2. Letter from NRC (A. B. Beach) to OPPD (W. G. Gates) dated October 2, 1991

Gentlemen:

SUBJECT: OPPD Response to Concerns Identified in NRC Inspection Report No. 50-285/91-22

As requested by the NRC in Reference 2, the attachment to this letter contains Omaha Public Power District's (OPPD) response to eight (8) concerns in NRC Inspection Report No. 50-285/91-22. This inspection examined OPPD's program for implementing commitments to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

If you should have any questions, please contact me.

Sincerely,

W. G. Gates
Division Manager
Nuclear Operations

WGG/sel

Attachment

c: LeBoeuf, Lamb, Leiby & MacRae
R. D. Martin, NRC Regional Administrator, Region IV
D. L. Wigginton, NRC Senior Project Manager
R. P. Mullikin, NRC Senior Resident Inspector

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NRC ITEM 1 - Paragraph 3.3.1

The scope of the program did not include feedwater regulating isolation valves HCV-1103 and 1104. Additional information is needed to ensure that these MOVs are capable of performing their intended function, or that emergency operating procedures and training alert the operators to the potential failure of these MOVs.

The inspectors identified two MOVs in the feedwater system (HCV-1103 and HCV-1104) that were not in the safety-related portion of the system, but were relied upon in several emergency procedures and received steam generator isolation and feedwater isolation signals. The inspectors were concerned that these MOVs had been assigned a safety-related function without adequate consideration of the capability of the MOVs to perform that function. The inspectors indicated that the licensee should ensure that these MOVs are capable of performing their intended function, or that emergency procedures and training alert the operators to the potential failure of the MOVs.

OPPD RESPONSE - ITEM 1

Valves HCV-1103 and HCV-1104 are in Fort Calhoun Station's (FCS) main feedwater system. These valves are located in the auxiliary building, immediately downstream of the main feedwater regulating valves. They are not classified within the FCS design basis as safety-related. The normal position for these valves is open. Although these valves do receive a steam generator isolation signal to close, the steam generator isolation function is provided by the safety-related check valves (FW-161 and FW-162) and the safety-related motor operated valves (HCV-1385 and HCV-1386).

In accordance with the Generic Letter 89-10 recommended actions, ABB/Combustion Engineering (ABB/CE) evaluated all motor operated valves at FCS to determine whether they met the criteria for being classified as "safety-related" according to the definitions provided in the Generic Letter. This work was documented in Combustion Engineering Calculation 002512-MPS-5CALC-001 and showed that valves HCV-1103 and HCV-1104 did not meet the Generic Letter 89-10 safety-related criteria. Review of these valves' relative importance-to-safety shows there is a redundancy requirement for preventing main feedwater pump runout flow during a main steam line break accident. However, upgrading these valves to safety-related is unnecessary, as discussed in Issue No. 1 of NUREG-0138 "Staff Discussion of 15 Technical Issues" dated November 1, 1976.

In order to ensure that HCV-1103 and HCV-1104 are capable of performing their intended function, OPPD will implement a special testing category for these valves. This category will establish a test frequency consistent with the safety-related MOVs included in the Generic Letter 89-10 Program. Since valves HCV-1103 and HCV-1104 are identical to safety-related valves HCV-1385 and HCV-1386, the valve thrust requirements will be the same.

NRC ITEM 2 - Paragraph 3.3.2

The licensee committed to the use of design basis parameters in establishing the setpoints for the torque switch settings. The implementation of this provision on the pressurizer power operated relief valve (PORV) block valves did not utilize the design basis value, but a lower value. Additional information is required to clarify the licensee's position on the issue of use of design basis values.

The inspectors had a concern with the ongoing implementation of the design basis reviews of the licensee's GL 89-10 program. In particular, the licensee's draft Calculation 602512-MPS-5CALC-004 determined that the worst-case differential pressure for the pressurizer power operated relief valve (PORV) block valves (HCV-150 and 151) to be 2485 psid. Nevertheless, the draft calculation assumed that these MOVs would only need to close under 2285 psid because of an emergency procedure statement to close these valves if pressure fell below 2285 psig. The inspectors stated that this would constitute a deviation from the licensee's commitment to Generic Letter 89-10 if the calculation were complete.

OPPD RESPONSE - 1.EM 2

In accordance with Generic Letter 89-10 recommended action (a), design basis conditions for valve opening and closing directions are to be determined. While it is true that the calculation did identify the maximum differential pressure to be 2485 psid, the calculation also determined the required closing differential pressure condition to be 2285 psid and the opening differential pressure to be 2485 psid. The opening condition is not a required valve operation but merely an operator aid to open the PORV block valves so the PORVs will lift to relieve pressure before the pressurizer code safety valves will lift during an overpressure transient.

However, to further improve the accuracy of the calculations, a design basis re-evaluation of the 33 safety-related MOVs was initiated. This includes a detailed system level design basis review of MOV operations during normal, abnormal, surveillance and test, accident response and emergency operation conditions for both valve opening and closing scenarios. This design basis re-evaluation will result in the development and acceptance of in-situ design basis test conditions.

The design basis re-evaluation of valves HCV-150 and HCV-151 is complete and documented in ERIN Engineering and Research Calculation 159-90-05.01, "Reactor Coolant System MOVs HCV-150/151." This calculation also identified different operating conditions for valve opening and closing operations. Summaries of the worst case opening and closing scenarios for valves HCV-150 and HCV-151 follow.

VALVE OPENING

Since the PORV block valves are otherwise normally open, the maximum upstream pressure at which the PORV block valves would be required to open would occur with the PORVs inoperable (stuck open) and the block valves closed for Reactor Coolant System isolation in accordance with the station's Technical Specifications. Automatic pressure relief capability is provided by the safety valves and any manual operator action in response to a pressure transient would likely precede reaching the safety valve setpoint of 2500 psia. However, assuming a loss of all feedwater and initiation of once-through-cooling operations, the block valves could be required to open with pressure near the safety-valve setpoint of 2500 psia.

VALVE CLOSING

The PORV block valves are required to close during Emergency Operating Procedures post-trip actions if a PORV is still open at 2300 psia. To account for instrument inaccuracy, the upstream pressure is conservatively assumed to be at 2369 psia (2300 + 3%). While the rupture disk setpoint may not be exceeded, downstream containment atmospheric conditions of 14.7 psia are assumed for conservatism.

The approach used in determining the above valve operating scenarios is consistent with the NRC's response to Question 15 of Generic Letter 89-10 Supplement 1:

> *For MOVs that are relied upon to move to the open position during a design basis event, the licensee should perform a design-basis review to determine the conditions during which the MOV is called upon to open. For MOVs that are relied on to move to the closed position, the licensee should perform a design-basis review to determine the conditions under which the MOV is called upon to close. The licensee should perform a design-basis review for MOVs that are relied on, at different times, to open or close to determine the conditions for both opening and closing.*

Since worst case design-basis conditions for both valve opening and closing operations (2500 psia opening, 2369 psia closing) have been identified for HCV-150 and HCV-151, these conditions will be utilized in determining/verifying the torque switch settings necessary for proper valve operation. This same approach will be utilized for all 33 safety-related MOVs within the scope of the FCS Generic Letter 89-10 MOV Program.

NRC ITEM 3 - Paragraph 3.3.2

The licensee was using a valve factor of 0.3 for flexwedge gate valves and 0.2 for double disk gate valves. These values have been shown to be inadequate for some MOVs during industry and research tests. The licensee needs to address the capability of their tested valves and to assess its methodology to be used in selecting the valve factors.

The licensee was developing its methodology for verification of MOV sizing and switch settings. The licensee indicated that it intended to use valve factors of 0.3 for flexwedge gate valves and 0.2 for double disk gate valves. These valve factors have been shown to be inadequate for some MOVs during industry and research tests. For example, valve factors for closing flexwedge gate valves have been shown to range up to 1.1, with 0.4 to 0.6 range as the average. For valves manufactured by Crane, the licensee will include additional thrust to account for seating load in accordance with the manufacturer's instructions. The inspector indicated that the use of low valve factors placed additional emphasis on the performance of design basis testing. If such testing demonstrated that the valve factor were inadequate, the licensee would need to address the capability of the tested MOVs and other applicable MOVs, as well as assess its methodology.

OPPD RESPONSE - ITEM 3

Valve factors are dependent not only on the design and manufacturer of the valve but also on the conditions under which it is expected to operate. Recent testing by the Idaho National Engineering Laboratory (INEL) of gate valves indicates that in certain cases the valve factor of 0.3 was exceeded. INEL test results yielded factors of 0.4, 0.5, and a few exceeding 0.6. However, these test results were not conclusive in determining what valve factors are to be assumed for different valve applications, nor did they rule out the use of 0.2 and 0.3. There are many elements that affect the valve factor and there is no substantial technical basis for changing industry practice at this time.

The use of industry valve factors in actuator sizing/torque switch setting calculations allows engineering personnel to estimate stem thrust requirements. The proof of an adequate valve factor lies in testing the valve at its "designed for" conditions. This is the philosophy that OPPD has adopted during the development of its Generic Letter 89-10 MOV Program.

...recently conducted steam blowdown testing of a prototype ... This involved a 2½-inch flexible-wedge gate valve. While ... is preliminary, analysis shows that valve factors at 2522 ... were 0.0... pressure isolation and 0.216 at valve disk ... The analysis of this data also showed that this particular valve ... promotes the use of "low" valve factors in that upstream pressure ... occurs significantly before valve disk wedging. For this particular ... gn, the use of 0.3 for a valve factor would have been bounding and ... epta...

... committed, OPPD will design basis test all safety-related valves where practicable. Where it is not practicable to perform design basis testing, the NRC's "two-stage' approach will be utilized. Upon completion of the design basis testing, the results will be examined to refine the valve stem thrust determination methodology where applicable. To date, limited design basis testing of gate valves has been performed at Fort Calhoun Station.

NRC ITEM 4 - Paragraphs 3.3.2 and 3.4.

The ... see indicated that actuator, motor and valve limitations would be addressed for the torque switch settings. This would imply that inertia effects would be addressed. Information is required to ensure that all applicable limitations, including inertia effects, are considered in establishing the torque switch settings and incorporated into the final guidance document.

For maximum torque switch settings, the licensee indicated that actuator, motor, and valve limitations would be addressed. However, in the draft thrust methodology (August 22, 1991), it was not apparent that motor capability would be considered. Although that document addressed the effects of inertia of the motor actuator following torque switch trip in terms of ... ust limits of the actuator, it did not include consideration of the ... s of inertia with respect to actuator torque or valve thrust limits. In draft Project Instruction 159-90-03.03 (Revision 0), "Switch Setting Determination," the licensee addressed motor capability but did not discuss inertia effects for structural limits. The licensee will need to ensure that all applicable limitations will be considered in establishing the maximum torque switch settings and incorporated into the final guidance document.

OPPD RESPONSE - ITEM 4

Failure to identify valve structural limits (including inertia effects) in the draft thrust methodology was an oversight by the methodology's author. Currently, a detailed valve weak link analysis for each of the 33 safety-related MOVs is being performed. When completed, these analyses will determine the most limiting component of the valve/actuator combination and obtain a limiting thrust value for use in design basis testing. However, in order to proceed with design basis testing in the interim, OPPD has obtained maximum valve thrust limits from valve manufacturers where possible. If it was not possible to obtain vendor data, a review of previous MOV testing data and maintenance records was conducted. The applicable limitations and torque switch settings will be documented in accordance with the MOV Program Plan.

As a result, OPPD has determined conservative maximum allowable valve thrust values to be used initially for testing purposes. These maximum allowable thrust limits will be provided to the contractor determining the recommended maximum switch settings. To ensure that the absolute maximum stem thrust values are not exceeded, the maximum allowable thrust limits incorporate a conservative value for test equipment inaccuracy.

In accordance with Task 4.0/Subtask 4.2 in the Fort Calhoun Station MOV Program Plan, appropriate design basis documents are to be developed. These documents will include all applicable valve and motor actuator limitations for use in establishing maximum torque switch settings. This task/subtask was started in January 1991 and is expected to be completed in December 1993.

NRC ITEM 5 - Paragraph 3.3.2

The licensee indicated a stem friction coefficient of 0.15 would be used. This is less than the industry standard of 0.2. The licensee must provide justification for the use of 0.15, the use of its selected lubricant, and the frequency of preventive maintenance to support these positions.

The licensee's calculations indicated the use of a stem friction coefficient of 0.2 which was the typical industry value. However, the licensee stated during the inspection that it intended to use 0.15 as the stem friction coefficient based on its current lubrication program and the use of Mobilux EP-1 grease. During their walkdown, the inspectors observed several dirty valve stems (See paragraph 3.5). Some of these valves were said to have preventive maintenance performed approximately 17 months ago. Considering that the licensee was also attempting to justify a preventive maintenance schedule of approximately 36 months, this frequency for valve stem lubrication was inadequate to support the assumption of a 0.15 stem friction coefficient without additional justification. Further, the licensee had not justified the use of Mobilux EP-1 in high temperature environments for long time periods. The licensee will need to provide better justification for the assumed value for FCS.

OPPD RESPONSE - ITEM 5

OPPD has revised its methodology and will utilize a valve stem friction coefficient of 0.2 instead of 0.15. However, results from future MOV testing may dictate the use of a different friction coefficient.

OPPD is implementing a new valve stem lubrication program that will utilize Mobilux EP-1 grease and will perform valve stem lubrication inspection activities every 18 months. The results of these inspections will determine if cleaning and re-lubrication of valve stems is warranted. The use of Mobilux EP-1 is recommended by EPRI based upon testing results of EPRI's MOV lubrication study.

Regarding the use of EP-1 in high temperature applications, Mobil Corporation (manufacturer of Mobilux EP-1) recommends a temperature limit of 250 degrees Fahrenheit. Based on testing, EPRI has increased this temperature limit to 300 degrees Fahrenheit. At FCS, valve stem temperature measurements taken on safety-related MOV steam valves (HCV-1041C and HCV-1042C) with a surface pyrometer during normal 100% power operation showed a maximum valve stem temperature of 195 degrees Fahrenheit.

When considering post accident high temperature profiles on the Mobilux EP-1 grease, examination of the worst case containment temperature profile curves show that containment temperatures do exceed 300°F. However, this temperature is not reached until 22 seconds after initiation of the event. All auto-sequenced valves inside of containment for this accident would have fully stroked by this time. Additionally, the time that 300°F is exceeded is only 38 seconds. After 60 seconds, containment temperature drops sharply to 275°F. Long term containment temperature is 200°F.

Insignificant breakdown of the Mobilux EP-1 grease will occur because the grease is located inside the motor actuators and 300°F is exceeded only for 38 seconds. Therefore, the use of Mobilux EP-1 grease as a valve stem lubricant for high temperature applications is justified.

NRC ITEM 6 - Paragraph 3.3.3

The licensee committed to perform design basis testing, however, the Project Plan listed exceptions to design basis testing. The licensee needs to provide information addressing any deviations from its commitments to GL 89-10 and incorporate that information into plant documents.

The licensee was preparing procedures for design basis testing. The NRC expects those procedures to include acceptance criteria for the tests. The licensee intended to use the two-stage approach outlined in GL 89-10 and its supplements for those MOVs that cannot be tested under design basis conditions. The inspectors considered the licensee's stated plans regarding design basis testing to be consistent with the recommendations of GL 89-10. However, on page 6-38 of its Project Plan, the licensee listed exceptions to the performance of design basis testing. One of the listed exceptions suggested that, rather than design basis testing each MOV where practicable, design basis test data from similar valves may be applied. That exception was not consistent with the licensee's commitment to GL 89-10 to test MOVs, where practicable. The licensee indicated that the Project Plan would be revised to be consistent with its commitments to GL 89-10.

OPPD RESPONSE - ITEM 6

The purpose of the FCS MOV Program Plan is to define the tasks necessary for the development and implementation of a successful MOV program. Numerous industry documents from NUMARC, EPRI and Generic Letter 89-10 (and supplements) were used in its development, especially where clarification and/or interpretation of the Generic Letter was required.

The FCS MOV Program Plan section to which the response item refers states:

> *The following exceptions to testing at design basis conditions can be utilized if sufficient technical justification is provided.*
>
> - *if testing is damaging to the plant or the specific MOV*
> - *if testing creates a violation of Technical Specifications or other licensing conditions*
> - *if data on similar valves with appropriate design basis type test data is available*

This wording was taken verbatim from a July 30, 1990 letter from NUMARC to Utility Administrative Points of Contact regarding issues identified in Generic Letter 89-10 Supplement 1.

The NRC response item appears to be directed at the last exception, regarding use of data on similar valves when appropriate design basis type test data is available. This statement is a paraphrasing of the NRC's response to Question 24 in Generic Letter 89-10 Supplement 1, which states:

> *Another alternative is the use of test data from a prototype MOV in the plant, a different plant, or a test facility, provided the application of such data is justified.*

In keeping with the intent of the Generic Letter recommendations, OPPD has already committed to design basis testing where practicable. Appropriate acceptance criteria will be incorporated into the necessary test procedures. The alternatives to design basis testing mentioned above are applicable and consistent with the NRC's "two-stage" testing approach. OPPD intends to follow this alternative approach where valves cannot be design basis tested in the plant. OPPD successfully used this alternative approach when Fort Calhoun Station's PORV block valve prototype underwent steam blowdown testing in November 1991.

Upon reviewing the FCS MOV Program Plan and comparing it to Supplement 1 of Generic Letter 89-10, OPPD concludes that the current revision of the Program Plan meets the intent of the Generic Letter regarding MOV testing alternatives. Therefore, no changes to the FCS MOV Program Plan are necessary.

NRC ITEM 7 - Paragraph 3.3.4

The licensee had not established plans for periodic verification of MOV operability. The licensee must provide information regarding how it intends to address the commitment for periodic verification of MOV operability.

The licensee stated that it may perform static tests of MOVs in an effort to demonstrate their continued capability to perform under design basis conditions. The NRC does not accept static tests, at this time, to demonstrate design basis capability because of the uncertainties in the relationship between the performance of MOVs under static and design basis conditions. Further, the licensee had not established a schedule for these periodic tests. The licensee will need to justify its periodic testing methodology during future NRC inspections. In addition, the licensee will be expected to establish a frequency for periodic testing (verification) consistent with its commitments to GL 89-10.

Observations by the inspectors during the walkdown (see paragraph 3.5) did not support a lubrication frequency beyond the manufacturer's recommendation. The inspectors did not consider the licensee's justification for extending the stem lubrication frequency to be adequate.

OPPD RESPONSE - ITEM 7

In accordance with Generic Letter 89-10, Recommended Action Item d, OPPD has established a task to develop a MOV testing schedule. Specifically, this is Task 3.0/Subtask 3.4 - MOV Testing Schedule. The Task/Subtask Performance Item states:

> *Review and revise as necessary the MOV testing schedule that specifies the frequency of routine testing of the valves. The valves will be reviewed to determine which MOV may be tested while the plant is on-line to reduce the outage workload. If no scheduling criteria exists, establish criteria and the necessary schedule.*

The development of the necessary MOV testing schedule will be based upon several different variables including design basis testing (where practicable) and/or corrective maintenance activities. Utilization of static testing may be justified where:

1. A correlation between static and design basis testing for a particular MOV exists.

2. MOVs experience very low or no differential pressure in performing their safety function (i.e., valve stem packing load dominates).

3. Valves are stroked at or near design basis conditions in accordance with surveillance tests.

A design basis test (if practicable) is justified where corrective maintenance on a valve or motor operator has significantly affected the operation of the MOV.

This task/subtask began in January 1991 and is expected to be completed by June 1994. MOVs that will be design basis tested during the 1992 refueling outage will be evaluated for a suitable periodic verification testing schedule within six months of outage completion. This schedule is consistent with the requirements of Generic Letter 89-10 and with OPPD's commitments. Concerning the lubrication schedule, see OPPD's reply to NRC Item 5.

NRC ITEM 8 - Paragraphs 3.3.4 and 3.4.4

The licensee had not implemented an effective program to evaluate vendor information. The licensee needs to provide its evaluation of how they will evaluate vendors information, including what actions will be taken, if necessary, to address any items of concern.

OPPD RESPONSE - ITEM 8

The control of vendor information is implemented by FCS Standing Order SO-G-62, "Control of Vendor Manuals." SO-G-62 defines the vendor manual control measures which ensure that only current revisions of vendor technical manuals are available to support plant activities. It also addresses the processes for handling vendor manual revisions and updates. The previous revision of SO-G-62 was inadequate regarding updates to procedures as a result of vendor manual changes. To correct this weakness, SO-G-62 was recently revised. This revision requires technical review of vendor manual information updates or revisions which could affect maintenance or operating procedures. OPPD has completed its technical review of the applicable Limitorque communications mentioned in paragraph 3.4.4 and revised the appropriate procedures.