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U.S. Nuclear Regulatory Commission
Document Control Desk
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Subject: Catawba Nuclear Station
Docket Numbers 50-413 and 50-414
NRC Bulletin No. 85-03
Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings
NRC Request for Additional Information

Gentlemen:

Mr. J. M. Taylor's (NRC/OIE) letter dated November 15, 1985 issued bulletin 85-03 concerning motor-operated valve (MOV) common mode failures during plant transients due to improper switch settings. The purpose of this bulletin was to request licensees to develop and implement a program to ensure that switch settings on certain safety-related motor-operated valves are selected, set and maintained correctly to accommodate the maximum differential pressures expected on these valves during both normal and abnormal events within the design basis. Duke Power Company has responded to this bulletin for Catawba Nuclear Station (including an expansion of scope to include all safety-related MOVs that are required to be tested for operational readiness) via my letters dated May 16, 1986, November 20, 1986, February 18, 1987, and January 14, 1988, with a final response for Catawba scheduled to be provided after the upcoming CNS unit 1 end of cycle (EOC) 3 and unit 2 EOC 2 refueling outages.

Mr. A. R. Herdt's (NRC/RII) March 23, 1988 letter concerning the Catawba responses indicated that additional information is needed before the NRC can approve the Catawba program, which was consequently requested. Accordingly, please find attached the requested information. Should there be any questions concerning this matter or if further information is required, please advise.

Very truly yours,

Hal B. Tucker

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PBN/86/jsr

Attachment

IE11
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DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
NRC/OIE BULLETIN 85-03
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Question 1:
Has water hammer due to valve closure been considered in the determination of pressure differentials? If not, explain.

Response to Question 1:
Reference: Lyons, J. L., Lyons' Valve Designer's Handbook, Chapter 36

Water hammer contributions to piping differential pressures are significant where the valve closure time is less than or equal to the pressure wave propagation period through the piping network, Tc. Factors which tend to reduce the effects of water hammer during valve closure are valve closure times greater than Tc, pipe fittings, branch lines, parallel circuits, bends, and low flow velocities, all or many of which are present with the Catawba IEB 85-03 motor operated valves (MOVs). In addition, the maximum pressure resulting from water hammer is not introduced until the point of complete fluid shut off and is therefore of more concern from a pipe stress standpoint than for valve differential pressure contributions.

In examination of the IEB 85-03 MOVs, NI-9/10 and CA-46/58 have the fastest closing times (less than 10 seconds), the greatest flow velocities (15.4 and 14 ft/sec., respectively), and long pipe runs (127 and 207 feet, respectively). By conservatively assuming straight pipe runs without branch lines, fittings, etc., the Tc for these cases are .057 and .093 seconds, respectively, and the differential pressure contribution due to water hammer effects is 8.3 and 6.9 psi, respectively. Since these two cases bound the IEB 85-03 MOVs, the effects of water hammer on differential pressure is considered to be negligible and is therefore not included in the maximum expected differential pressure values.

Question 2:
The following MOVs of the SI System are not included in the response of 05-16-86; however, they are shown in the WOG Report of March 1986. Revise the response to include these MOVs, or justify their exclusion. As required by Action Item A of the bulletin, assume inadvertent equipment operations.

(a) MOVs NI144A, NI115A and NI147B are shown normally open in the SI pump miniflow lines in zones F-8, H-8, and G-10 of drawings CN-1562-1.2 Revision 5 (Unit 1) and CN-2562-1.2 Revision 4 (Unit 2). They are shown on Page 25 of the WOG Report, as HV-8814B, HV-8814A and HV-8813, respectively.

(b) MOVs NV202B and NV203A are shown normally open in the CCP miniflow lines on FSAR Figure 9.3.4-7 Revision 14. They are shown of Page 24 of the WOG Report, as HV-8111 and HV-8110, respectively.

Response to Question 2:

NI115A, NI144A and NI147B are excluded from the IEB 85-03 response for the following reasons:

1. These are Kerotest packless globe valves.
   a. Unseating loads are provided by an internal spring in the valve and not the actuator. The disc is not connected to the actuator stem.
   b. Kerotest performed no-flow differential pressure testing on one valve for each valve item number to ensure that the actuator was sized to meet design requirements. A Kerotest valve from each item number was tested to close against design pressure and to open against design differential pressure, although not at flow conditions.
2. NI147B is the redundant isolation valve for NI115A and NI144A. A single failure of any one of these three valves could occur without affecting the isolation of the SI pump miniflow. The miniflow line is manually isolated to switch over from the injection to the recirculation phase of the ECCS. This redundant isolation ability and its effect on system operation is detailed in TABLE 6.3.2-5 (Page 5) of the Catawba FSAR.

Although these MOVs are not included in the IEB 85-03 response, they are included in the Catawba MOV upgrade program which is designed to verify that all safety related and key plant MOVs are sized, set up and maintained in an operable condition.

NV202B and NV203A are excluded from the IEB 85-03 response for the following reasons:

1. These are Kerotest packless globe valves.
   a. Unseating loads are provided by an internal spring in the valve and not the actuator. The disc is not connected to the actuator stem.
   b. Kerotest performed no-flow differential pressure testing on one valve for each valve item number to ensure that the actuator was sized to meet design requirements. A Kerotest valve from each item number was tested to close against design pressure and to open against design differential pressure, although not at flow conditions.
2. NV202B and NV203A are redundant series isolation valves. A single failure of any one of these two valves could occur without affecting the isolation of the CCP miniflow. The miniflow line is manually isolated after the operators verify that RCS pressure is low enough to prevent pump dead head conditions. This redundant isolation ability and its effect on system operation is detailed in TABLE 6.3.2-5 (Page 2) of the Catawba FSAR.

Although these MOVs are not included in the IEB 85-03 response, they are included in the Catawba MOV upgrade program which is designed to verify that all safety related and key plant MOVs are sized, set up and maintained in an operable condition.

Question 3:
The following MOVs in the AFW System are not included in the response of 05-16-86. Explain this exception to the Westinghouse recommendation that "all MOVs within the AFW system should be included on the list of valves to be examined for maximum differential pressure", as stated on Page 5 of the WOG Report. Revise the response of 05-15-86 to include these MOVs or justify their exclusion.

(a) MOV CA6 is shown normally open in the AFW suction line from the AUX FDG Condensate Storage Tank, in Zone B-12 of drawings CN-1592-1.0 Revision 9 (Unit 1) and CN-2592-1.0 Revision 7 (Unit 2).

Response to Question 3:
MOV CA6 was excluded from the IEB 85-03 list for the following reasons:

1. CA6 is not tested for operational readiness under the station IWV program. Testing for operational readiness is a condition for valve selection as defined in action item 'a' of the Bulletin.

2. CA2, CA4 and CA6 are all supplies of condensate grade water to the auxiliary pump suctions from the hotwell, UST and auxiliary feedwater condensate storage tank, respectively. CA2 is placed in the open position and its breaker is de-energized. If CA4 or CA6 should fail closed, condensate grade water would be available to the pump suction from at least two other sources.

3. According to Section 10.4.9.2 of the Catawba FSAR, the condensate grade sources are not safety grade sources. The assured safety grade, seismically designed water source for the auxiliary feedwater system is the Standby Nuclear Service Water Pond.

4. CA6 is a suction valve subject to low differential pressure.

5. Page 5 of the WOG report states,

   "All MOVs within the AFW system should be included on the list of valves to be examined for maximum differential pressure. Generally, AFW MOVs function to:

   D.1 Establish a flowpath(s) from the AFW **safety grade** water source (or its backup) to the steam generators."

   Again, the auxiliary feedwater condensate storage tank supply fed through CA6 is not considered a safety grade water source.

Question 4:
On Page 2 of the tables of the Response of 05-16-86 the function of valves 1NV312A and 2NV314B (Unit 2) is given as "Charging Line Isol." Resolve this apparent discrepancy.

Response to Question 4:
The function of valves NV312A and NV314B is charging line containment isolation. 1NV312A and 1NV314B were incorrectly identified as CCP miniflow isolation valves.

Question 5:
Clarify the response of 05-16-86 to indicate whether the tabulated differential pressures apply to opening the valve, closing the valve or both opening and closing.

Response to Question 5:
The tabulated differential pressure values in the 05-16-86 response represent the system design conditions which, in all instances, meet or exceed the maximum worst case expected differential pressure conditions for both opening and closing the valve. This system design pressure condition is then conservatively applied to both the opening and closing conditions for analysis and field set up purposes. The reason for using the same bounding differential pressure for both opening and closing is to avoid confusion and potential errors when analyzing the valve for required opening and closing thrust.

Question 6:
The proposed program for Action Items B, C and D of the bulletin is incomplete. Provide the following details as a minimum:

(a) Commitment to justify continued operation of a valve determined to be inoperable, and

(b) Considerations of pipe break conditions as required by the bulletin.

Response to Question 6:
The need to justify continued operation could occur during action items b, c, and d of the IEB 85-03. Inoperabilities have been or will be handled in the following ways:

1. Item b is complete and no inoperable valves were identified.
2. Item c - field testing identifies an MOV which will not deliver the required thrust output.
   a. Field adjustments, such as reducing the packing load or increasing the torque switch setting, will be performed to bring the thrust delivered to the valve seat into the proper range.
   b. If the required thrust cannot be achieved through field adjustments, then the design thrust values will be evaluated and lowered, if possible. The thrust calculations and actual worst case differential pressures, rather than the system design differential pressures, will be examined for conservatism.
   c. If the required thrust still cannot be achieved after performing steps 2a and 2b, above, then a justification for continued operation will be developed. If justification for continued operation is not possible, then appropriate actions will be taken in accordance with the Catawba Technical Specifications.
3. Item d - periodic preventative maintenance, or post or predictive maintenance testing identifies an MOV which will not deliver the required thrust output.
   (Same actions as for Item c, above)

Pipe break conditions are accounted for since the differential pressures shown tabulated in the 05-16-86 response assume maximum upstream pressure and atmospheric pressure downstream from the valve.