VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 18, 1987

W. L. STEWART
VICE PRESIDENT
NUCLEAR OPERATIONS

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

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Docket Nos. 50-280
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License Nos. DPR-32
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Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
RESPONSE TO REQUEST FOR ADDITIONAL
INFORMATION FOR IEB 85-03

As requested by your letter of August 18, 1987, the additional information regarding our previous responses to the NRC IE Bulletin 85-03, "Motor Operated Valve Common Mode Failures During Plant Transient Due to Improper Switch Settings" is attached.

If additional information is required, please contact me.

Very truly yours,

W. L. Stewart

Attachment

cc: U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N. W.
Suite 2900
Atlanta, Georgia 30323

Mr. W. E. Holland
NRC Senior Resident Inspector
Surry Power Station

Mr. Chandu P. Patel
NRC Surry Project Manager
Project Directorate II-2
Division of Reactor Projects-I/II

IE11
1/1

NRC Request 1

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

Response

The effect of water hammer due to valve closure is negligible and therefore has not been considered in determination of pressure differentials. Water hammer, which is caused by the sudden decrease in velocity of a flowing fluid, is a relevant design consideration when the fluid flow is stopped instantaneously. The motor operators for the valves identified have a sufficiently long travel time to closure and the corresponding decrease in fluid velocity is gradual enough such that a shockwave does not develop. Consequently the MOVs will not be subjected to the pressure increases associated with water hammer conditions.

NRC Request 2

Please explain why the following MOV's are not included in Attachment 2 of the response of 10-17-86, or revise Attachment 2 to include them. As required by Action Item a of the bulletin, assume inadvertent equipment operations.

a) 1275A (2275A), 1275B (2275B), 1275C (2275C), 1381 (2381) and 1373 (2373) in mini-flow lines leading from the charging pumps to the seal water heat exchanger are shown normally open, on UFSAR figures 9.1-2 and 9.1-5.

b) 1287A (2287A), 1287B (2287B), 1287C (2287C), 1869A (2869A) and 1869B (2869B) in safety injection lines of the charging pumps to the hot legs are shown on UFSAR figures 9.1-2 and 9.1-5.

Response

a. The MOV's in the high pressure safety injection system which were included in our response to the bulletin were selected based on the following two criteria:

   1. MOV's required to operate (open or close) in the initial lineup to establish a high pressure injection flow path from the Refueling Water Storage Tank (RWST) to the reactor coolant system for short term, high pressure, cold leg injection.

   2. MOV's which if inadvertently opened or closed would isolate high pressure safety injection to the cold legs.

   The functions required to establish high pressure safety injection to the RCS cold legs include isolation of the normal suction of the charging pumps from the VCT, isolation of the discharge of the charging pumps to the normal charging line, alignment of the charging pump suction to the RWST, and alignment of the discharge of the charging pumps to the cold legs.

   The recirculation flow path for the high head safety injection/charging pumps is established from the discharge of the pumps through MOV-1275A (2275A), MOV-1275B (2275B), MOV-1275C (2275C) and MOV-1373 (2273) passing through the seal water heat exchangers before returning to the pump suction. Mini-flow circulation is individually controlled for charging pumps A, B, and C by operation of MOV-1275A (2275A), MOV-1275B (2275B), and MOV-1275C (2275C), respectively. The flow from each pump is headered together and passes through a common isolation valve, MOV-1373 (2373). These four mini-flow isolation valves are normally open and no longer receive a signal to automatically close on a safety injection signal (as in the original design) in order to establish the flow path to the reactor coolant system. The mini-flow recirculation flow path is now required by the emergency procedures to be manually isolated when the reactor coolant system pressure drops to the reactor coolant pump trip setpoint in order to deliver the required design flow. The flow path is required to be reestablished when the reactor coolant system pressure increases to 2000 psig to protect the charging pumps from overheating. Mini-flow isolation is accomplished by closing MOV-1275A, B, and C (2275A, B, and C). In the event that one of these valves fails to close, the common isolation valve, MOV-1373 (2373) would be manually closed to isolate mini-flow.

These valves were not originally included in the list of MOV's required by the bulletin since they did not meet the selection criteria identified above. That is, they are not required to operate in the initial lineup in order to deliver flow to the cold legs nor would inadvertent operation isolate safety injection. In response to this request for additional information, we have reviewed our original selection criteria and the selection criteria documented by Westinghouse for the Westinghouse Owners Group (WOG) in response to this bulletin. Our review indicates that our original selection criteria for high pressure safety injection MOV's are consistent with the WOG methodology with the exception that the WOG criteria specifically includes the function that the pump mini-flow valves should be correctly positioned to assure proper pump operation and required design flow. Therefore, Attachment 2 of our response of 10/17/86 will be revised to include MOV-1275A (2275A), 1275B (2275B), 1275C (2275C), and 1373 (2373).

MOV-1381 (2381) is an outside containment isolation valve in the reactor coolant pump seal water return line. This valve is not in the high head safety injection flow path to the reactor coolant system cold legs and its position will not affect the proper operation of the charging pump recirculation flow path. During normal operation, reactor coolant pump seal water returns through this valve, combines with charging pump mini-flow and passes through the seal water heat exchanger before returning to the suction of the charging pumps. Therefore, MOV-1381 (2381) should not be included on the list of MOV's required by the bulletin.

b. During the initial phase of safety injection, the high head safety injection/charging pumps discharge through pump discharge valves MOV-1286A, B, and C (2286A, B, and C) to the RCS cold legs. Later, during the recirculation mode, one of the high head safety injection/charging pumps is isolated from the other charging pump to provide two independent paths to the RCS. Two independent paths provide protection against a long-term passive failure which may cause a complete loss of high head safety injection flow. In the cold leg lineup, one high head safety injection/charging pump discharges through the alternate discharge valve MOV-1287A, B, or C (2287A, B, or C) and MOV-1842 (2842). During hot leg recirculation, one high head safety injection/charging pump discharges through its normal discharge valve and MOV-1869B (2869B) to the hot legs, while the other high head safety injection/charging pump discharges through its alternate discharge valve and MOV-1869A (2869A) to the hot legs.

MOV-1287A, B, and C (2287A, B, and C) were not included in the list of valves required by the bulletin since these normally open valves are not in the initial high head safety injection flow path to the RCS cold legs. As described above, a flow path is established through these discharge valves after the initial injection mode to establish an independent flow path to the cold legs and the hot legs during hot leg recirculation. In addition, inadvertent closure during the initial injection mode would not isolate flow to the cold legs.

MOV-1869A (2869A) and 1869B (2869B) were not included in the list of valves required by the bulletin since these valves are also not in the initial high head safety injection flow path to the RCS cold legs. These valves are opened approximately 18 hours after a loss-of-coolant accident to establish hot leg recirculation. In addition, if these valves are inadvertently opened during the initial cold leg injection mode, safety injection would not be isolated.

As described in the response to Item 2(a) above, we have reviewed our original selection criteria for MOV's in the high pressure safety injection system for comparison with the selection criteria documented by Westinghouse in their study prepared for the WOG. In the WOG report, Westinghouse defined the high pressure coolant injection system as "only those portions of the system required during the safety injection phase, up to/not including the manual or partial auto transfer to recirculation from the containment sump after the RWST empties. Therefore, recirculation modes of operation (long term cold leg recirculation and hot leg recirculation) are not included in the definition of high pressure coolant injection since these modes of operation require the functioning of the RHR or Low Head Safety Injection (LHSI) system which has been excluded from the definition". The WOG report also states that "it is important to note that the high pressure coolant injection system was defined based on the requirement of establishing a high pressure injection flow path from the RWST to the RCS for short term, high pressure, cold leg injection". We find that our original selection criteria are consistent with the WOG report in this respect.

Therefore, based on the function of the valves in question, our original selection criteria, and the criteria documented in the WOG study, it is concluded that MOV 1287A (2287A), MOV 1287B (2287B), MOV 1287C (2287C) MOV 1869A (2869A) and MOV 1869B (2869B) should not be included in the list of MOV's required by the bulletin.

NRC Request 3

Please expand the proposed program for action items b, c, and d of the bulletin to include the following details as a minimum:

a) commitment to a training program for setting switches, maintaining valve operators, using signature testing equipment and interpreting signatures,

b) commitment to justify continued operation of a valve determined to be inoperable, and

c) description of a method possibly needed to extrapolate valve stem thrust measured at less than maximum differential pressure

Response

a. Training programs for maintenance personnel have been and will continue to be presented to ensure that qualified personnel are available for setting switches, maintaining the operators and using the latest predictive analysis equipment. Where required, additional assistance is obtained from qualified vendors.

   The continuing training programs for electricians and mechanics include a course on motor-operated valves. This training includes the following activities:

   - description of electrical and mechanical operation of the MOV.
   - testing and setting of MOV limit and torque switches.
   - description of MOV preventive and corrective maintenance procedures.
   - review of related industry information associated with MOVs.

   Furthermore, the electrician development program includes job performance measures on testing, adjusting, and replacing limit and torque switches. There is also a dedicated team of electricians trained by MOVATS personnel on using the interpreting signature test equipment. This team is responsible for all testing and maintenance of safety-related MOV switches.

b. In the event a valve is determined to be inoperable, a Station Deviation Report is written and forwarded to the Shift Supervisor for a review of the impact on the continued operation of the system. These Deviation Reports are also reviewed by the Superintendent-Operations and by the Station Nuclear Safety and Operating Committee.

c. All of the valves originally indicated as bulletin valves are capable of being tested at the maximum differential pressure. However, in light of the determination made as a result of Item 2(a) of this request, it is not yet known what the maximum differential pressure will be or if it will be feasible to achieve it on those valves.

   Should it not be feasible to achieve the determined maximum differential pressure on any valve the following methodology will be used. The valve would be tested at various percentages of the maximum differential pressure, using the MOVATS equipment and load cell, up to the limiting differential pressure. A plot would be made of the recorded thrusts verses the product of the valve orifice size times the maximum differential pressure. The thrust required to operate against the maximum differential pressure would then be extrapolated using the standard point-point method. If the implemented thrust setting (based on the maximum differential pressure) falls on or above the extrapolated line then it would be deemed acceptable. Any implemented thrust setting that falls below the line would be reevaluated and changed where required. The normal MOVATS signature analysis methods and statistical confidence factors would also be utilized to ensure the acceptability of the thrust settings.