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50-364

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
Response to Revised Request for Additional Information
Regarding Generic Letter 96-05, Program at Joseph M. Farley Nuclear Plant, Units 1 and 2

Ladies and Gentlemen:

By letter dated March 17, 1999 and revised April 30, 1999, the NRC transmitted a request for additional information (RAI) regarding the response to Generic Letter (GL) 96-05 for Farley Nuclear Plant (FNP), Units 1 and 2. A response to the RAI was requested by May 21, 1999 and was verbally revised to June 8, 1999. Prior correspondence from Southern Nuclear Operating Company (SNC) to the NRC in regard to Generic Letter 96-05 was dated November 7, 1996, March 14, 1997, and June 10, 1998.

Following GL 89-10, SNC established a MOV test program at FNP well before the Joint Owner's Group (JOG) program was developed. SNC has developed a technical justification for use of motor control center (MCC) testing used in conjunction with at the valve testing of motor operated valves (MOV) used at FNP. Hence, FNP is not presently committed to the interim (phase 1) JOG program. FNP is participating in phase 2. Further, FNP will implement phase 3 of the JOG program. For clarification FNP intends to continue to use its established MOV test program until the JOG issues phase 3 of the MOV program.

The attachment provides a restatement of the NRC questions and the SNC responses.

This letter contains two commitments. FNP is committing to implement phase 3 of the JOG program. A second commitment involves review of valve testing frequency and valve grouping. This is discussed in the response to question 6. This review will be completed by September 1, 1999.

If you have any questions, please advise.

Respectfully submitted,

Dave Morey

EWC/maf- 5rail97.doc
Attachment

A073 1

cc: Southern Nuclear Operating Company
Mr. L. M. Stinson, General Manager – Farley

U. S. Nuclear Regulatory Commission, Washington, D. C.
Mr. L. Mark Padovan, Licensing Project Manager – Farley

U. S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. T. P. Johnson, Senior Resident Inspector – Farley

ATTACHMENT

Response to Revised Request For Additional Information Regarding Generic Letter 96-05

NRC Question

1. In NRC letter dated November 9, 1995, the NRC Staff closed its review of the motor-operated valve (MOV) program implemented at the Joseph M. Farley Nuclear Plant (Farley) in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," based on the results of NRC Inspection Report (IR) 50-348 and 364/94-28 (dated January 6, 1995) and information contained in a letter from the licensee dated March 3, 1995. In IR 94-28, the NRC Staff discussed aspects of the licensee's MOV program to be addressed over the long term. The NRC Staff reviewed those long-term aspects of the MOV program during subsequent inspections at Farley as documented in IR 95-21 (dated March 4, 1996) and IR 96-13 (dated December 23, 1996). The licensee should discuss its consideration of the following long-term aspects of its MOV program: (1) the weaknesses identified in IR 96-13 by the NRC inspectors regarding the licensee's support for the capabilities of several Unit 1 and Unit 2 14" Copes-Vulcan gate valves, including the application of the Electric Power Research Institute (EPRI) MOV Performance Prediction Methodology (PPM) and the limited capability margin of MOV 1-8811A; (2) the potential weakness in the licensee's approach for setting the torque switches for 30 MOVs as described in IR 95-21; (3) the revision of the licensee's Project Desk Instruction PDI 005.3 noted in IR 94-28 to alert personnel to the potential for obtaining nonconservative results when interpolating from high test pressures to lower design-basis differential pressures; and (4) post maintenance testing guidance discussed in IR 94-28 to consider performing a dynamic test after valve repair or replacement.

SNC Response

(1) The weaknesses identified in the report were that "two valves did not have sufficient reduced voltage capabilities to provide the opening "cracking" (unseating) force requirements under worst case design accident conditions."

At the time the EPRI PPM was applied to the valves, the following data for opening (safety function) was calculated:

TABLE 1
CALCULATED THRUST VALUES

MOV NO.	Calculated Cracking Thrust (EPRI PPM)	Calculated Reduced Voltage Thrust (Limitorque Method)
Q1E11MOV8811A	47783	47569
Q2E11MOV8812A	47783	45088

The cracking thrust was calculated using the EPRI PPM formula. This equation uses a ratio of the unseating thrust to static seating of approximately 70%. The reduced voltage thrust calculated above assumed the "worst case" degraded voltage and used the endorsed Limitorque equation for calculating actuator output torque capability. This actuator output torque was subsequently converted to an equivalent stem thrust using a stem factor corresponding to a 0.2 stem-to-stem nut coefficient of friction (COF).

FNP MOV personnel have determined, based on test data, that the use of a 70% ratio for unseating to static seating ratio is overly conservative for solid wedge gate valves. The FNP data for this style valve supports use of a ratio of approximately 50%. In addition, MOV personnel determined that the use of a stem factor corresponding to a 0.2 coefficient of friction was overly conservative for FNP. Subsequently, as part of the development of a motor control center (MCC) testing technical basis document, stem friction factor data from specific FNP testing has been compiled. Using this data for reference, the average COF for the stem configuration used for the two valves is 0.073. Using this COF a 0.0140 stem factor was calculated. The results are presented in Table 2. In addition to the calculated values, the tested stall thrust data for these MOVs is included.

Table 2
Recalcuated Thrust Values

MOV No.	**Reduced Voltage Thrust Capability w/ 0.0140 Stem Factor**	**Tested Reduced Voltage Thrust**
Q1E11MOV8811A	63214	63426
Q2E11MOV8812A	62214	60118

Based on the above information, the valves meet the FNP MOV Program requirements.

(2) The potential weakness in the licensee's approach for setting the torque switches for 30 MOVs as described in 95-21.

The potential weakness was discussed in the inspection report as follows: "During the process of re-setting the torque switches, several instances of the inability to achieve higher values occurred." Generally, the inability to achieve the higher settings was the result of either weak link limitation or actuator reduced voltage capability limitations. As noted in IR 95-21, the inability to set-up the MOV to the higher values was evaluated on a case-by-case basis.

During the closeout inspection for GL 89-10, FNP committed to reset the torque switches on 30 MOVs. The re-setting was completed to implement higher minimum thrust requirements. These higher thrust requirements were developed to obtain additional margin for the subject valves. After the torque values were raised to the maximum permissable value about half of these valves did not attain the target margin. The FNP MOV Program requires an evaluation when available margin is less than the criteria. The valves that fell into this category have been evaluated and are acceptable. Discussion of conservatisim in the criteria is given in responses to other questions. These low margin valves are being tested more frequently, as required by the FNP program.

(3 & 4) These items were previously addressed by four Inspector Follow up Items (IFIs) along with two comments in Inspection Report Nos. 50/348 and 50/364/ 94-28. These are referenced below.

IFI 50/348 and 50/364-28-01 - EPRI PPM for certain 14-inch Copes-Vulcan gate valves
IFI 50/348 and 50/364-28-02 - EPRI PPM for Unit 2 MOV8811A
IFI 50/348 and 50/364-28-04 - Resetting of the torque switches for 30 MOVs
IFI 50/348 and 50/364-28-11 - Overthrust Evaluations
Comment–PDI revision
Comment-Post Maintenance Dynamic Testing

The IFIs were closed, with actions complete, in Inspection Reports Nos. 50/348 and 50/364/95-21 and 50/348 and 50/364/96-13. The comments were reconciled with the report in which they were initially presented.

NRC Question

2. In IR 94-28, the NRC Staff noted that the Farley GL 89-10 MOV program included 94 butterfly valves manufactured by Pratt. The adequacy of the manufacturer-provided torque requirements for these MOVs had not been verified by the licensee. The NRC Staff indicated that the licensee planned to evaluate the adequacy of the Pratt guidance using the EPRI MOV PPM when available. In a letter dated March 3, 1995, the licensee provided a schedule for completion of the EPRI MOV PPM butterfly valve evaluation. In IR 96-13, the NRC Staff found the licensee's evaluation of 16 Pratt butterfly valves using the EPRI MOV PPM to be acceptable. The licensee should describe the basis for its evaluation of the remaining 78 safety-related Pratt butterfly valves at Farley.

SNC Response

The remaining Pratt butterfly valves were tested using criteria established by the Pratt methodology. None of these valves are classified as highly safety significant. A conservative differential pressure (DP) of 150 psid was used to calculate torque requirements. The maximum actual DP for any of these valves is estimated at 130 psid.

FNP has tested two butterfly valves (one Pratt, one Crane flowseal) under dynamic flow conditions. The results of these tests confirmed that the Pratt methodology provided conservative criteria for valve performance.

Based on the above results, the Pratt methodology provides adequate criteria for testing the 78 butterfly valves.

NRC Question

3. In a letter dated June 10, 1998, the licensee updated its commitment to implement the Joint Owners Group (JOG) Program on MOV Periodic Verification in response to GL 96-05. In a safety evaluation dated October 30, 1997, the NRC Staff accepted the JOG program as an industry-wide response to GL 96-05 with certain conditions and limitations. The JOG program includes (1) the JOG interim static diagnostic test program, (2) the JOG 5-year dynamic test program, and (3) the JOG long-term periodic test program. The licensee's letter of June 10, 1998 only mentions the JOG interim static diagnostic test program and the JOG dynamic test program. Where a licensee proposes to implement an approach different from the JOG program, the licensee will be expected to notify the NRC and to provide justification for the proposed alternative approach. The Farley licensee should clarify its commitment with respect to all three phases of the JOG program.

SNC Response

(1) SNC is not committed to the JOG Interim Static Test Program, however, as noted on the cover letter the intent of the program is met using a combination of MCC and at the valve testing.

(2) FNP has committed to test MOVs as part of the JOG dynamic testing program. Currently FNP has designated 4 valves included in the dynamic testing program. The test data from these valves has been or will be submitted to the JOG for review.

(3) As stated in the cover letter, SNC has made a decision to adopt phase 3 of the JOG program. For clarification FNP intends to continue to use MCC testing until the JOG issues phase 3 of the MOV program. Should MCC testing be accepted by the JOG, FNP may elect to use that testing in the MOV testing program.

NRC Question

4. The JOG program specifies that the methodology and discrimination criteria for ranking MOVs according to their safety significance are the responsibility of each participating licensee. In a letter dated March 14, 1997, the licensee stated that MOV safety significance would be based on an existing probabilistic assessment and inputs from an expert panel. As Farley is a pressurized water reactor (PWR) nuclear plant designed by Westinghouse, is the licensee applying the Westinghouse Owners' Group (WOG) methodology for ranking MOVs based on their safety significance as described in WOG Engineering Report V-EC-1658-A "Risk Ranking Approach for Motor-Operated Valves in Response to Generic Letter 96-05" and the NRC safety evaluation dated April 14, 1998? If not, the licensee should describe the methodology used for risk ranking MOVs at Farley in more detail, including a description of (1) the process used to compare Farley high-risk MOVs to a sample list of high-risk MOVs from other Westinghouse plants; and (2) how expert panels were used to evaluate MOV risk significance.

SNC Response

FNP did not use the risk ranking methodology described in WOG Engineering Report V-EC-1658 A. This report was not issued until after FNP had completed risk ranking of MOVs.

(1) A comparison was made of the Farley risk ranking to both the generic function-based listing in the WOG report, and the ranking provided in Table A-1 of WOG Engineering Report V-EC-1 for plants similar to FNP. Based on these comparisons and follow-up conversations with personnel at V. C. Summer, the FNP risk ranking was determined to be consistent with these other sources of related risk ranking information. A comparison of the results of the FNP ranking with other systems of ranking is provided in Table 3.

(2) Farley expert panels were used to evaluate MOV risk significance.

Three categories were established with priority 1 being the highest safety significance and priority 3 being the lowest. This original categorization was performed by MOV program personnel. These rankings were reviewed by an expert panel. This panel was composed of plant personnel from operations, maintenance and engineering. Adjustments to the initial categorization were made based on the expert panel review.

Subsequently, the plant Probabilistic Risk Assessment (PRA) program was used to screen the program MOV population for safety significance. The results were factored into the MOV rankings. An additional expert panel, consisting of plant operations and MOV program personnel, was convened to again review the valve rankings. Some adjustments to valve category assignments were done based on this final review. The FNP ranking is identical to the WOG ranking except for valve applications that do not exist at FNP.

NRC Question

5. From the licensee's letter dated March 14, 1997, it is not clear whether the Farley interim MOV static diagnostic test program is consistent with the JOG program. For example, the licensee noted the use of "criteria-based" and "time-based" methods in establishing the Farley MOV static diagnostic test frequencies. The licensee should discuss its MOV static test matrix and justify any differences between its interim MOV static diagnostic test program and the JOG program.

SNC Response

The FNP at-the-valve test frequency is the shortest interval as determined through the criteria based method or the time-based method and is shortened if personnel are unable to adjust the valve to achieve the program-specified target performance margin. These methods are described below.

a. Criteria-Based – This method "evaluates" each MOV using five criteria. These criteria are; safety significance, total margin (a measure of margin greater than required), safety function (opening/closing), valve type (gate, globe, or butterfly), and the existing setpoint basis (DP test, calculation, etc.). Using a quantitative decision making process, a required criteria-based at-the-valve test frequency is established. This frequency can vary from 1 to 7 cycles.

b. Time-Based – This method establishes an at-the-valve test frequency considering safety significance only. These frequencies are:

Priority 1 - 4 cycles
Priority 2 - 5 cycles
Priority 3 – 7 cycles

Potentially impacting each of the above methods is a stipulated minimum target margin for each MOV within the FNP program. The inability to "set-up" a MOV in a manner that provides an actual performance margin at least equal to the target margin results in more frequent at-the-valve testing. These frequencies are:

Priority 1 – 2 cycles
Priority 2 – 3 cycles
Priority 3 – 4 cycles

A direct comparison to the JOG interim static test matrix is difficult since FNP uses both at-the-valve and MCC-based diagnostic testing. However, the following general information is provided for the FNP static test frequencies. The information considers time-based frequencies only. The criteria-based approach could increase the testing frequencies listed below if the valve were to not have specified margin as previously discussed. Table 3 provides frequency of combined at-the-valve and MCC-based testing.

TABLE 3
FNP AT THE VALVE AND MCC COMBINED TEST FREQUENCIES.

Valve Category	Min. Frequency	Nominal Frequency	Max. Frequency
1	1 cycle	1 cycle	1 cycle
2	3 cycles	3 cycles	2 cycles
3	4 cycles	4 cycles	4 cycles

The JOG test frequencies for a valve with medium margin per the JOG matrix frequency for testing are shown in Table 4.

TABLE 4
JOG TEST FREQUENCIES

Valve Category	Min. Frequency	Nominal Frequency	Max. Frequency
1	3 cycles	2 cycles	1 cycle
2	6 cycles	4 cycles	2 cycles
3	6 cycles	6 cycles	3 cycles

The at-the-valve testing process at FNP is complimented with MCC-based diagnostic testing at a fixed interval ranging from each cycle to every 4th cycle. Priority 1 valves are tested from the MCC each cycle while priority 2 and 3 valves are tested every 3rd and 4th cycles respectively. This testing methodology has been used at FNP since the fall of 1995. The degree of use and level of confidence in the resultant data has evolved at FNP over that period of time. FNP has completed approximately 175 MCC tests during this period. A significant number of these tests involved parallel MCC testing with at-the-valve transducers. This FNP testing, in addition with other test-related data, has provided a high level of confidence in this testing method. Recently, with assistance from Southern Company Services and Crane-MOVATS, FNP assembled a comprehensive technical basis document for the use of MCC testing as part of the FNP MOV periodic verification process. Additionally, Crane-MOVATS has performed and documented an extensive validation of this testing process for condition monitoring of the motor actuator.

In summary, the FNP nominal testing frequency is more often than that specified by the JOG program. The remaining test frequency, including maximum and minimum intervals are at least equal to or more frequent than the JOG recommendations with one exception. That exception is that the maximum frequency for testing a priority 3 (low safety significance) valve having less than the FNP program specified target margin is less often than the JOG frequency. For this case, the FNP program specifies a test frequency of 4 cycles as compared to the JOG recommended 3 cycles. Given the low safety significance and limited number of the impacted priority 3 valves along with the good results of this method that has been in use since 1995, SNC considers this difference to be acceptable. In addition, as previously stated, FNP plans to implement phase 3 of the JOG program. Therefore, the use of MCC valve testing at FNP is temporary unless it becomes an approved JOG methodology.

NRC Question

6. In its letter dated March 14, 1997, the licensee states that various MOV diagnostic measurement techniques will be used as part of two different sets of static diagnostic test frequencies. Depending on MOV safety significance, at-the-valve static diagnostic tests will range from 72 months to 126 months and MCC tests will range from 18 months to 72 months. This combination of test frequencies results in all MOVs being retested at least every 72 months. In the NRC safety evaluation dated October 30, 1997, on the JOG program, the NRC stated that MOVs with scheduled test frequencies beyond 5 years will need to be grouped with other MOVs that will be tested on frequencies less than 5 years in order to validate assumptions for the longer test intervals The NRC stated that this review must include both valve thrust (or torque) requirements and actuator output capability. The licensee should describe how its MOV static diagnostic testing program will satisfy this condition of the NRC safety evaluation.

SNC Response

As previously stated, FNP is not committed to part 1 (interim static test matrix) of the JOG PV Program. Therefore, compliance to the associated safety evaluation is not mandatory. However, the existing FNP static testing process is intended to ensure functional reliability of the FNP MOVs.

The FNP static testing process consists of 2 complimentary elements; at-the-valve and MCC-based diagnostic testing. The maximum time period between diagnostic performance testing is 4 cycles. The maximum frequency is applicable only to low safety significant valves. The frequency of testing high safety significant valves is 1 cycle which is the same as specified by the JOG program.

SNC believes that the schedule in place provides acceptable testing of different types of MOVs, however, FNP intends to review the test frequency and grouping of the MOVs. This review will be completed by September 1, 1999.

NRC Question

7. The licensee should briefly describe its plans for the use of test data from the MCC including (1) correlation of new MCC test data to existing direct force measurements; (2) interpretation of changes in MCC test data to changes in MOV thrust and torque performance; (3) adequacy for use as a post maintenance diagnostic tool (e.g., after packing adjustments); (4) consideration of system accuracies and sensitivities to MOV degradation for both output and operating performance requirements; and (5) validation of MOV operability using MCC testing.

SNC Response

(1) FNP does not attempt to use MCC testing as a replacement for at the valve testing. MCC testing is complementary and is used to reduce the frequency of at the valve testing. Correlation of the test data from both methods is accomplished via the respective acceptance criteria. The acceptance criteria include consideration of appropriate set-up and measurement uncertainty.

(2) Interpretation of changes in the MCC test data and changes to the thrust and torque performance are both evaluated using appropriate criteria. The use of MCC-based diagnostic testing at FNP employs 2 levels of MOV assessment; quantitative and qualitative. The quantitative assessment (performance test) compares the measured motor torque to pre-established acceptance criteria. The acceptance criteria are based either on the existing setpoint requirements or previous test data. The qualitative assessment (condition monitoring) makes use of the Fast Fourier Transform (FFT) capability of the MCC-based testing methodology. The FFT is highly sensitive to changes associated with rotating components within the MOV powertrain. The combination of these 2 assessment methods provides a comprehensive picture of the current MOV performance as compared to the setpoint requirements and any past measurements (FFT).

(3) The use of MCC-based diagnostics is a valuable post-maintenance testing tool. This technology is highly sensitive to motor torque changes. Change in motor torque requirements can be related to changes in the actuator output torque or stem thrust using factors based on FNP-specific test data. In addition to complementing the motor torque evaluation, the FFT data is used to monitor for any otherwise concealed changes in actuator capability resulting from maintenance.

(4) Technique sensitivity and inaccuracies are accounted for within the respective acceptance criteria.

(5) FNP has developed a technical basis document with a vendor, supporting the use of MCC testing as part of the FNP MOV periodic verification process. This document provides the basis for the conversion factors (stem factor and efficiency) employed in quantitatively assessing the results of MCC testing and provides a basis for use of the MCC test technique. This document is avaliable for staff review upon request.

The quantitative assessment of MCC-based test data can be accomplished using the following techniques. These techniques are:

a. Motor Torque Method, and
b. Correlation Method

The motor torque method compares the measured motor torque to acceptance criteria determined from the existing setpoint requirements. The conversion of the existing setpoint requirements into equivalent motor torque terms uses factors (stem factor, actuator efficiency, etc.) supported by FNP test data.

The correlation method utilizes information from past parallel testing (at-the-valve and MCC) to establish acceptance criteria. The correlation factors allow a representative determination of subsequent actuator output based on the measured motor torque from the MCC. Any significant motor and/or actuator performance changes that could affect the validity of the correlation factors would be reflected in the FFT feature of the MCC-based test methodology.

NRC Question

8. The JOG program focuses on the potential age-related increase in the thrust or torque required to operate valves under their design-basis conditions. In the NRC safety evaluation dated October 30, 1997, on the JOG program, the NRC Staff specified that licensees are responsible for addressing the thrust or torque delivered by the MOV motor actuator and its potential degradation. The licensee should describe the plan at Farley for ensuring adequate AC and DC MOV motor actuator output capability, including (1) consideration of recent guidance in Limitorque Technical Update 98-01 and its Supplement 1; and (2) justification of any potential use of Farley's reduced voltage output test methodology discussed in IR 94-28.

SNC Response

FNP does not use DC MOVs. The following items address consideration of the two items referenced in the question as they relate to ensurance of adequate AC MOV output.

(1) FNP completed the re-calculation of actuator capability with reduced voltage using the guidance provided by Limitorque in Technical Update 98-01 (including Supplement 1). The results of the re-calculations have been evaluated and found acceptable for the current field set-up for the MOVs. The results are being incorporated into past MOV Program-related calculations as applicable. Additionally, FNP is in the process of updating the MOV setpoint documents to reflect these re-calculated values. This update is scheduled to be completed prior to the next refueling outage on each unit.

(2) FNP no longer relies on reduced voltage capability established through FNP stall testing. This concern was identified as inspector follow-up item IFI 50/348, 50/364-28-10 as part of the FNP closeout inspection for GL 89-10. This IFI was subsequently noted as closed in Inspection Report Nos. 50-348/95-21 and 50-364/95-21 dated March 4, 1996.