April 23, 2007

Mr. James H. Riley, Director
Engineering
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING TOPICAL REPORT (TR)-103237, "EPRI [ELECTRIC POWER RESEARCH INSTITUTE] MOV [MOTOR-OPERATED VALVE] PERFORMANCE PREDICTION PROGRAM - TOPICAL REPORT" (TAC NO. MD3236)

Dear Mr. Riley:

By letter dated June 8, 2004, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML041700093), as supplemented by letter dated January 6, 2006 (ADAMS Accession No. ML060060564), the Nuclear Energy Institute submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Addenda 3, 4, 5, 6, and 7 to EPRI TR-103237, "EPRI MOV Performance Prediction Program - Topical Report." Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On March 19, 2007, Mr. Mike Melton, Senior Project Manager, and I agreed that the NRC staff will receive your response to the enclosed RAI questions by September 28, 2007.

As discussed with Mr. Melton, the NRC staff may issue an additional set of RAI questions as the review progresses. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-3610.

Sincerely,

/RA/

Tanya M. Mensah, Senior Project Manager
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 689

Enclosure: RAI questions

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT (TR)-103237, "EPRI [ELECTRIC POWER RESEARCH INSTITUTE]

MOV [MOTOR-OPERATED VALVE] PERFORMANCE PREDICTION PROGRAM -

TOPICAL REPORT"

NUCLEAR ENERGY INSTITUTE

PROJECT NO. 689

All section, paragraph, page, table, or figure numbers in the questions below refer to items in TR -103237, unless specified otherwise.

1. The unwedging thrust model discussed in Addendum 3, "An Improved and Validated Gate Valve Unwedging Methodology" (TR-113564, December 1999), to the Electric Power Research Institute (EPRI) TR-103237-R2, "EPRI MOV Performance Prediction Program," uses a minimum static unwedging thrust observed from plant testing. Accordingly, a plant could perform multiple static unwedging tests and then use the lowest measured static unwedging thrust as input to the model to estimate a dynamic unwedging thrust. Provide additional justification for using a single potentially nonconservative static unwedging thrust in the unwedging thrust model.

2. Page 2-3 of Addendum 3 states that the differential pressure load sharing factor (Xo) in the gate valve unwedging equation was adjusted to bound the test data. However, some of the data are not bounded. Provide justification for Xo not bounding all of the test data.

3. On page A-21 in Attachment A, "MPR Calculation 140-189-JEM-1, 'Validation of Refined Gate Valve Unwedging Methodology,'" to Addendum 3, the value of C for valve #9 is shown as 0.226. Identify the manufacturer and pressure rating of valve #9. Discuss the consistency of the C value on page A-21 with the values specified in Table 2-1 of Addendum 3.

4. Addendum 3 states that the test data used to support the unwedging thrust model were for new or recently refurbished valves. Addendum 3 does not appear to address validation of the model for valves that have been in service for a number of years and where changes to critical valve surfaces could affect the conclusions presented. Discuss the justification for the applicability of the model to valves that have been in service.

5. Addendum 3 states that the unwedging thrust model excludes valves that are susceptible to pressure locking or thermal bounding. However, the gate valve unwedging thrust model appears to have been validated using the results of static wedging data at ambient conditions only (i.e., closed and reopened at cold conditions). The applicability of the

model for valves that are closed and reopened at other temperature combinations (i.e., closed hot and reopened cold, etc.) does not appear to have been addressed. Provide justification for the applicability of the unwedging thrust model to valves that have been statically closed at elevated temperature or indicate a limitation in the applicability of the model.

6. Addendum 3 uses data from the EPRI flow loop test program in validating the refined gate valve unwedging equation. On page 3-1, Addendum 3 states that all of the differential pressure opening strokes in the EPRI flow loop test program were preceded by a differential pressure closure stroke (except for one test valve). In light of this specific testing sequence in the EPRI flow loop test program, discuss available MOV operating experience (such as that obtained during performance of the Joint Owners' Group program on MOV periodic verification) that would confirm the validation of the refined gate valve unwedging equation.

7. Table 2-1 in Addendum 3 provides the assumed values of the parameter C in the refined gate valve unwedging equation. Discuss the available test data used to establish the value of C for each of the half wedge angles listed in the table, and the uncertainty associated with the C value for each half wedge angle based on the amount of available test data.

8. Addendum 3 indicates that the refined gate valve unwedging equation bounds the measured test data for 16 of the 18 valves within the EPRI flow loop test program used to validate the refined equation. Discuss the level of confidence in the use of the refined gate valve unwedging equation and the uncertainty factor that might need to be included in the evaluation of individual MOV design-basis capability.

9. The test data used to evaluate the proposed unwedging stem nut coefficient of friction model proposed in Addendum 4, "Use of Static Closure Data for Determining the Stem-to-Stem Nut Coefficient of Friction at Unwedging" (TR-113989, December 1999), to EPRI TR-103237-R2 was performed at ambient conditions. Past research has shown that lubricating characteristics can change at elevated temperature, resulting in changes in the stem coefficient of friction. Provide justification for applying the model to stems and stem nuts that are at elevated temperatures, or clarify the applicability of the model to stems and stem nuts at ambient temperature.

10. Past NRC-sponsored research has shown that different stem lubricants can respond differently at elevated temperature. The lubricants used to validate the unwedging stem nut coefficient of friction model in Addendum 4 were not discussed. Provide additional information on the lubricants used during the testing, the condition of the lubricants, and the applicability of the resulting model to stem nuts at both ambient and elevated temperature conditions.

11. The applicability of the unwedging stem nut coefficient of friction model in Addendum 4 to stem nuts that experience lubrication aging, drying, or excessive contaminants from the atmosphere has not been discussed. Provide justification for using the model for stem nuts that are susceptible to lubrication aging, drying, excessive dirt, and other contaminants.

12. Chapter 3, Addendum 4, concludes that on a population basis the unwedging stem friction coefficient is lower than or comparable to the static closing stem friction coefficient. However, on page 2-3, Addendum 4, states that the unwedging stem friction coefficient data population has a slightly wider range than the static closing stem friction coefficient. Also, Figure 2-2 indicates that a specific value bounds 99 percent of the unwedging stem friction coefficient data while a lower value bounds 99 percent of the static closing stem friction coefficient data. Discuss the basis for the conclusion that the unwedging stem friction coefficient is lower or comparable to the static closing stem friction coefficient on a population basis.

13. Addendum 4 allows a stem friction coefficient value that bounds 95 percent of the static closing stem friction coefficient data for the tested valves at a nuclear power plant to be applied as the unwedging stem friction coefficient for the total MOV population at the plant. Discuss the percentage of valves within the MOV population that need to be tested in applying this assumption. Also, discuss the level of confidence in this method of estimating unwedging stem friction coefficient, and the uncertainty that should be applied in the design-basis capability evaluation for individual MOVs to account for the assumption of unwedging stem friction coefficient.

14. Addendum 4 on page 3-2 allows the measured static closing stem friction coefficient at torque switch trip for a specific valve to be increased by a certain amount to obtain an applicable unwedging stem friction coefficient for that valve, provided the nominal thread pressure for unwedging at design-basis conditions is greater than 6000 pounds per square inch (psi). Discuss the level of confidence in this method of estimating unwedging stem friction coefficient, and the uncertainty that should be applied in the design-basis capability evaluation of the individual valve to account for the assumption of unwedging stem friction coefficient.

15. Addendum 5, "PPM [Performance Prediction Methodology] Version 3.1 Software Changes" (October 2002), to EPRI TR-103237-R2 on page 2-6 states that Version 3.1 of the EPRI PPM provides required thrust/torque predictions for air-operated valves and hydraulically operated valves. For air-operated butterfly valves, Addendum 5 states that the PPM results for incompressible flow applications should be considered best available information while the results for compressible flow applications are considered to be bounding for design-basis predictions. Discuss the uncertainties associated with the use of the EPRI PPM Version 3.1 for air-operated butterfly valve applications and limitations on those applications for PPM Version 3.1 users.

16. Addendum 5 on page 2-7 describes the implementation of the PPM in determining margin for unwedging a gate valve disk. Discuss the approach described in Addendum 5 as it relates to the revisions to the PPM described in Addenda 3 and 4 on unwedging thrust.

17. Addendum 6, "PPM Version 3.2 Software Changes" (November 2003), EPRI TR-103237-R2 on page 2-1 states that Version 3.2 of the EPRI PPM has eliminated the best estimate torque predictions for butterfly valves and that design-basis torque predictions are made as a function of disk angle. Discuss the resolution of the uncertainty associated with the application of the EPRI PPM Version 3.2 to air-operated butterfly valves discussed previously in Addendum 5 for Version 3.1.

18. Addendum 7, “PPM Version 3.3 Software Changes” (October 2005), to EPRI TR-103237-R2 describes multiple errors that are present in previous versions of the EPRI PPM that are said to be corrected in Version 3.3 of the software. Discuss the quality assurance controls placed on previous PPM versions that failed to prevent the identified errors and the corrective actions that have been implemented to identify any additional errors in the previous PPM versions. Discuss the reliability of those previous PPM versions in light of the identified errors and other errors that might not have been identified to date. Also, discuss the quality assurance controls that have been implemented for PPM Version 3.3 to avoid significant errors in its application, implementation, and results.

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