November 16, 2001

MEMORANDUM TO: Cynthia A. Carpenter, Chief
Risk Informed Initiatives, Environmental, Decommissioning, and Rulemaking Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

FROM: Peter C. Wen, Project Manager **/RA/**
Risk Informed Initiatives, Environmental, Decommissioning, and Rulemaking Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF OCTOBER 18, 2001, MEETING WITH THE NUCLEAR ENERGY INSTITUTE AND ELECTRIC POWER RESEARCH INSTITUTE REGARDING MOTOR-OPERATED VALVE THRUST UNCERTAINTY METHOD

On October 18, 2001, the NRC staff held a public meeting with representatives of the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI) to discuss NRC staff comments on Addendum 2, "Thrust Uncertainty Method," to the EPRI Topical Report TR-103237-R2, "EPRI Motor-Operated Valve (MOV) Performance Prediction Program," describing the EPRI MOV Performance Prediction Methodology (PPM). Attachment 1 is a list of the meeting participants. Attachment 2 is a copy of the meeting agenda.

NEI submitted Addendum 2 to EPRI Topical Report TR-103237-R2 to the NRC staff by a letter dated September 8, 1999. NEI and EPRI briefed the staff and obtained the staff's comments on this topical report at a public meeting held on September 20, 2000. (Refer to ADAMS Accession #ML003754425 and ML003766626 for a summary of that meeting.) By a letter dated January 5, 2001, NEI submitted a response prepared by EPRI to the staff comments (ADAMS Accession # ML012950349). To help EPRI prepare for the October 18 meeting, the NRC staff held a telephone conference with NEI and EPRI on October 4 to relay the NRC staff's overall concerns regarding the database used in developing and validating the Thrust Uncertainty Method.

In beginning its presentation at the October 18 meeting, EPRI briefly described the Thrust Uncertainty Method for the meeting participants using material from the meeting on September 20, 2000 (ADAMS Accession #ML003754425). In summary, the Thrust Uncertainty Method attempts to establish the average conservatism in the thrust predicted by the EPRI MOV PPM to be necessary to operate gate valves under dynamic flow conditions. The Thrust Uncertainty Method then treats the conservatism as a random uncertainty that is statistically combined with other uncertainties. In this effort, EPRI compared the thrust required to operate sample gate valves during flow loop tests conducted as part of the EPRI MOV Performance Prediction Program several years ago to the thrust requirement predicted by its MOV PPM. EPRI calculated an average prediction ratio from the sample gate valves operated under either cold or hot water conditions. Although EPRI calculated an average prediction ratio for both opening and closing gate valves from its available test data, EPRI specifies that the Thrust Uncertainty Method is only applicable for predicting the thrust required to close gate valves. In applying the Thrust Uncertainty Method, a licensee would use the average prediction ratio specified in Addendum 2 to the EPRI topical report to reduce the EPRI MOV PPM thrust prediction for a specific gate valve to a nominal value for the thrust predicted to be required to close the valve. The licensee would then determine a thrust prediction uncertainty for that valve by comparing the EPRI MOV PPM thrust prediction to the nominal thrust prediction obtained using the Thrust Uncertainty Method. Finally, the licensee would establish a minimum required thrust to be provided at the torque switch trip based on the nominal thrust prediction combined with bias and random uncertainties (including rate-of-loading effects, diagnostic test equipment uncertainty, torque switch repeatability, and the thrust prediction uncertainty).

The NRC staff's comments on the Thrust Uncertainty Method provided during the meeting on September 20, 2000, focused on three major issues regarding the acceptability of the method. First, if the valves used in calculating the conservatism of the EPRI MOV PPM as part of the Thrust Uncertainty Method were not fully preconditioned, the thrust required to operate those valves might increase with age. If so, the Thrust Uncertainty Method might become inadequate to ensure the capability of those valves over time and service. Second, in that the EPRI MOV PPM was developed as a first-principles model rather than a statistical database model, it was not clear that sufficient test data are available to determine in a reliable manner the conservatism of the EPRI MOV PPM for a wide range of gate valve types and their service conditions. Third, the validation of the Thrust Uncertainty Method as described in Addendum 2 to the EPRI topical report did not provide a clear indication that the MOVs included in the validation effort would continue to be able to perform acceptably if their torque switches were set using the Thrust Uncertainty Method. The staff also stated that the comparison of the prediction ratio for the torque switch trip thrust determined by the Thrust Uncertainty Method to the prediction ratio for the dynamic thrust requirement determined by the EPRI MOV PPM did not provide adequate support for the continued capability of the MOVs used in the validation of the Thrust Uncertainty Method.

In the NEI submittal dated January 5, 2001, EPRI provided a response to each of the comments provided by the NRC staff and also included two appendices to further amplify its response to specific comments. At the October 18 meeting, the NRC staff discussed its review of those responses with NEI and EPRI. Attachment 3 provides a summary of EPRI's responses to the NRC staff comments on the Thrust Uncertainty Method and the results of the discussion during the October 18 meeting. At the end of the discussion, the staff stated that several significant concerns remain regarding the establishment and validation of the Thrust Uncertainty Method. In particular, the data used in the Thrust Uncertainty Method to establish an average prediction ratio for determining a nominal value for the thrust required to close a gate valve represented a very small sample of the total population of safety-related motor-operated gate valves in the nuclear industry. Further, the non-normal distribution of the prediction ratios of the actual thrust required to close the sample gate valves under cold water conditions to the EPRI MOV PPM thrust prediction reflected a median value (0.745) higher than the mean value (0.697) used for the average prediction ratio in the Thrust Uncertainty Method. The staff commented that EPRI's effort to validate the Thrust Uncertainty Method could be improved by performing an analysis with a "95/95 upper tolerance limit" using the median value from the prediction ratio data with a standard deviation based on the median of the data. The staff also stated that the comparison of the Thrust Uncertainty Method prediction ratio to the EPRI MOV PPM prediction ratio in Appendix C to Addendum 2 of the EPRI topical report is insufficient to support the assumption that the reliability of MOVs set using the Thrust Uncertainty Method would be consistent with the probabilistic risk assessments relied on by the licensees applying the method. Finally, the staff noted that a significant concern exists regarding the viability of the Thrust Uncertainty Method for gate valves operated under hot water conditions because of the minimal amount of test data used in establishing an average prediction ratio, and the failure of the Thrust Uncertainty Method to predict an adequate torque switch setpoint for a valve in the small test sample.

In response to the NRC staff's concerns, EPRI proposed several actions to help support its development and validation of the Thrust Uncertainty Method. First, EPRI proposed to revise the Thrust Uncertainty Method to apply the median value of the prediction ratios in predicting a nominal value for the thrust required to close a gate valve under cold water conditions. Second, EPRI proposed to remove the applicability of Thrust Uncertainty Method from gate valves under hot water conditions. As part of this proposal, EPRI plans to revise the upper bound of the cold water range from 100°F to 150°F to provide flexibility in the application of the Thrust Uncertainty Method. Third, EPRI proposed the performance of an analysis with a 95/95 upper tolerance limit using the median value of the prediction ratios to help support the validation of the Thrust Uncertainty Method. In proposing to perform these actions, EPRI requested that the NRC staff allow MOVs set using the Thrust Uncertainty Method to receive the same consideration as MOVs set using the EPRI MOV PPM in the Joint Owners Group (JOG) Program on MOV Periodic Verification established in response to Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves." EPRI stated that it would supplement the responses provided in the NEI submittal dated January 5, 2001, with the results of the above described actions and its response to staff comments provided during the October 18 meeting. EPRI noted that the supplemental response would include its evaluation of the reliability of MOVs set using the Thrust Uncertainty Method, and its plot of prediction ratios versus rate-of-loading effects for all gate valves used in validating the Thrust Uncertainty Method.

At the conclusion of the October 18 meeting, the NRC staff indicated that it was receptive to EPRI's proposal to help address the concerns regarding the development and validation of the Thrust Uncertainty Method. The staff noted that final acceptance of the Thrust Uncertainty Method would depend on its review of the supplemental information prepared by EPRI and submitted by NEI on the revised methodology and the confidence analysis. With regard to the treatment within the JOG Program on MOV Periodic Verification of MOVs set using the Thrust Uncertainty Method, the staff suggested that EPRI provide support in its supplemental response for an assumption that MOVs set using the Thrust Uncertainty Method could be considered to have high capability margin in the interim static diagnostic testing phase of the JOG program. However, the staff stated that the appropriate treatment to be applied as part of the long-term JOG program to MOVs set using the Thrust Uncertainty Method cannot be determined until JOG establishes, and the NRC staff reviews, the criteria for long-term periodic verification of the design-basis capability of safety-related MOVs in the JOG final topical report. With regard to the EPRI's plans to revise the upper bound of the cold water range from 100°F to 150°F, the staff commented that EPRI should address the basis for its proposed change of the temperature boundary in its supplemental response.

As the action item from the meeting on October 18, 2001, EPRI will prepare a supplement to its responses provided in the NEI submittal dated January 5, 2001, to incorporate its proposed revision of the Thrust Uncertainty Method, and the updated validation and analysis in response to NRC staff comments. EPRI planned to complete the supplemental response in the time frame of about one month. The NRC staff will review the EPRI supplemental response when submitted by NEI for preparation of a safety evaluation supplement on the acceptability of the Thrust Uncertainty Method described in Addendum 2 to EPRI Topical Report TR-103237-R2.

Attachments:

1. Meeting Participants
2. Meeting Agenda
3. Discussion of EPRI Response to NRC Staff Comments on Thrust Uncertainty Method

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NRC/NEI MEETING ON MOV THRUST UNCERTAINTY METHOD
LIST OF ATTENDEES
October 18, 2001

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Stephen Tingen	NRR/DE/EMEB
Dan Lurie	NRC/OCFO
Peter Wen	NRR/DRIP/RGEB
John Watkins	INEEL
Jim Riley	NEI
John Hosler	EPRI
Paul Damerell	MPR Associates
Thomas Walker	MPR Associates
Chad Smith	Duke Power

ATTACHMENT 1

Agenda for NRC-Industry Meeting on
Addendum 2, “Thrust Uncertainty Method,”
to the EPRI Topical Report TR-103237-R2,
“EPRI Motor-Operated Valve Performance Prediction Program”

Introduction and Opening Remarks	NRC/NEI/EPRI
Review EPRI Comment Responses	EPRI
Discussion	All
Wrap up - review results, action items, expectations.	NRC/NEI/EPRI

ATTACHMENT 2

DISCUSSION OF EPRI RESPONSE TO NRC STAFF COMMENTS ON THRUST UNCERTAINTY METHOD

1. In Comment #1 on the Electric Power Research Institute (EPRI) Thrust Uncertainty Method (TUM) provided during the public meeting on September 20, 2000, the NRC staff noted that the scope of the valves included in the EPRI Motor-Operated Valve (MOV) Performance Prediction Methodology (PPM) did not constitute a statistical database, but rather provided a reasonable validation of the EPRI MOV PPM. In its response to Comment #1 provided in a letter submitted on January 5, 2001, by the Nuclear Energy Institute (NEI), EPRI states that the flow test loop is a significant source of data for Stellite seat coefficients of friction (COFs). In Appendix B of Addendum 2 to EPRI Topical Report TR-103237-R2, EPRI calculates the prediction ratio of the flow loop measured thrust requirement to the EPRI MOV PPM predicted thrust requirement for each of 62 cold water closing strokes from a total of 14 valves and 12 hot water closing strokes from 7 valves. EPRI assigns the mean value of the prediction ratios for cold water closing strokes (0.697) and for hot water closing strokes (0.775) as the average prediction ratio in reducing the EPRI MOV PPM thrust prediction to a nominal value. The NRC staff's review of the data in Appendix B of Addendum 2 to the EPRI topical report reveals that 35 of the 62 cold water closing strokes, and 6 of the 12 hot water closing strokes, had prediction ratios above the mean value. The staff determined that the median value of prediction ratio data for the cold water closing strokes was 0.743 and for the hot water closing strokes was 0.776. The mean value of prediction ratio data for the cold water closing strokes appears to be reduced by the presence of a few strokes with very low prediction ratios. EPRI's assertion that the TUM accounts for the conservatism of the Stellite COFs is not supported by the range of prediction ratios from 0.174 to 1.014 (where the EPRI MOV PPM underpredicted the thrust required to stroke the valve) for cold water closing strokes and from 0.608 to 1.039 for hot water closing strokes. The staff discusses data provided by EPRI in Appendix B to the NEI submittal dated January 5, 2001, in a later comment. In response to the discussion of the variability of the data, EPRI proposed at the public meeting on October 18, 2001, to revise the TUM to use the median value of the prediction ratios in determining a nominal thrust prediction from the EPRI MOV PPM. EPRI also proposed to perform an analysis with a "95/95 upper tolerance limit" using the median value of the prediction ratios and a standard deviation based on the median value to help support the validation of the TUM. EPRI also proposed to remove the application of the TUM to closing gate valves under hot water conditions, but to raise the temperature limit to 150°F for cold water conditions. The NRC staff will review EPRI's supplemental response providing the revised TUM, the confidence analysis, and basis for the higher temperature limit, when submitted for resolution of this comment.

2. In Comment #2, the staff asked whether EPRI had evaluated the change in reliability in MOVs that might result from the application of the TUM. EPRI responded that the MOV PPM and the TUM both provide predictions of required thrust and minimum allowable thrust at torque switch trip (TST) that will ensure reliable MOV operation. EPRI also suggested that the statistical approach in the TUM had been accepted by the NRC. EPRI also points to Table 4 in Appendix C of Addendum 2 to EPRI Topical Report TR-103237-R2 that compared the prediction ratios of the measured thrust to the MOV

PPM predicted thrust to the prediction ratios of the measured thrust to the expected thrust at TST using the TUM. In response to a specific question on the relative importance of uncertainties when implementing the TUM, EPRI notes that the percentage effect of each uncertainty is not affected (if converted to thrust requirement uncertainties) while the thrust in pounds of force is reduced. The NRC staff notes that EPRI should make clear that the NRC's acceptance of the statistical approach relates to the use of the square-root-of-the-sum-of-the-squares (SQRSS) method for combining random uncertainties, and not acceptance of the TUM. With respect to Table 4 in Appendix C, the two sets of prediction ratios are distinct in that the first set relates to the design thrust required to operate the valve (without consideration of setup parameters and their uncertainties) and the second set relates to the thrust at TST (with consideration of setup parameters and uncertainties). The staff does not consider a comparison of these sets of prediction ratios to provide sufficient support for the reliability of MOVs set using the TUM. At the October 18 meeting, EPRI presented an evaluation of the reliability of MOVs set using the TUM based on the satisfactory TUM prediction of the thrust required at torque switch trip for the sample MOVs. EPRI also discussed its plot of prediction ratio versus rate-of-loading effects to provide a graphical analysis of the reliability of the sample MOVs set using the TUM. The NRC staff suggested that EPRI supplement its discussion in Appendix C of Addendum 2 to EPRI Topical Report TR-103237-R2 to help validate the TUM and the effect of its application on continued MOV reliability.

3. In Comment #3, the NRC staff asked whether EPRI had evaluated the need for changes to the treatment of MOVs in programs established in response to Generic Letter (GL) 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," where the TUM is applied rather than the EPRI MOV PPM. EPRI responded that it did not believe that valves set using the TUM would need to be considered in a plant's GL 96-05 program with regard to potential increases in required thrust with service. EPRI also suggested that MOVs set using the TUM could continue to be considered "high margin" valves in the Joint Owners Group (JOG) Program on MOV Periodic Verification. The NRC staff considers the application of the TUM to remove some of the bounding margin established as part of the EPRI MOV PPM. Therefore, the setup of MOVs using the TUM might not bound potential increases in operating thrust requirements. At the October 18 meeting, the staff suggested that EPRI provide support for an assumption that MOVs set using the Thrust Uncertainty Method could be considered to have high capability margin in the interim static diagnostic testing phase of the JOG Program on MOV Periodic Verification. The staff indicated that the appropriate treatment to be applied as part of the long-term JOG program to MOVs set using the Thrust Uncertainty Method cannot be determined until JOG establishes, and the NRC staff reviews, the criteria for long-term periodic verification of the design-basis capability of safety-related MOVs in the JOG final topical report.

4. In Comment #4, the NRC staff asked EPRI to explain the difference between certain data in a table in Addendum 2 to EPRI Topical Report TR-103237-R2 and the original EPRI test data reports. EPRI responded that the data differences could be the result of zero offset adjustments. At the October 18 meeting, EPRI stated that their review suggested that these differences would have only a minor effect on the report's conclusions.

5. In Comment #5, the NRC staff suggested that the overall test data obtained by EPRI for the MOV PPM indicated low to moderate friction coefficients and that low loading conditions might result in significant scatter in the test data. In its response, EPRI pointed to a histogram in the EPRI Topical Report TR-103237-R2 of 26 tested gate valves with a 0.484 mean apparent disk friction coefficient for cold water low flow strokes and a 0.153 standard deviation. EPRI also stated that the loading conditions applied to the valves covered the maximum differential pressures permitted by the valve pressure class and, therefore, considered the loading conditions to be high. In reviewing the referenced test data, the NRC staff noted that the data referenced by EPRI appeared to include a larger population of tested gate valves (26 valves) than used in determining the average prediction ratio for cold water closing strokes (14 valves) for the TUM. The staff also found that Appendix B of EPRI Topical Report TR-103237-R2 reveals that the testing covered a range of differential pressures with many valve strokes under relatively low load conditions. At the October 18 meeting, EPRI explained that several valves had been excluded from the data set for various reasons. The staff will evaluate the resolution of this comment with the review of the supplemental EPRI response when submitted.

6. In Comment #6, the NRC staff asked EPRI to discuss the linear relationship between the prediction ratio and the friction coefficient which might suggest that the TUM could become less conservative if the friction coefficient increases with service. EPRI responded that any method of MOV setup would become less conservative if the friction coefficient increase with stroking. However, EPRI expected the TUM to cover increases in friction with stroking based on the use of the EPRI MOV PPM. The NRC staff considers the linear relationship between the prediction ratio and friction coefficient to suggest that valves that exhibit higher friction coefficients will have less (and possibly inadequate) margin than valves that exhibit lower friction coefficients. At the October 18 meeting, EPRI indicated that its confidence in the TUM to provide an acceptable prediction of the thrust required to close gate valves is based on its assumption that the probability of a valve exhibiting both a high valve factor and rate-of-loading effect is very small. The staff suggested that EPRI discuss this assumption in its supplemental response.

7. In Comment #7, the NRC staff requested EPRI to explain the application of the TUM to Aloyco split-wedge gate valves in light of their specific issues in applying the EPRI MOV PPM. In its response, EPRI indicated that the TUM only applies to flow isolation for Aloyco split-wedge gate valves. At the October 18 meeting, EPRI also stated that the TUM will be applicable to Aloyco split-wedge gate valves where the valve is required only to achieve flow isolation in performing its safety-related function.

8. In Comment #8, the NRC staff requested EPRI to explain the basis for applying, as part of its validation of the TUM, the prediction values for load sensitive behavior developed by EPRI rather than the load sensitive behavior of the specific test valves used to support the TUM. EPRI responded that the rate-of-loading data used to evaluate the TUM (5.6% bias and 26.4% random uncertainty) was obtained from the flow loop test population of the EPRI MOV Performance Prediction Program. At the October 18 meeting, the staff suggested that EPRI clarify that the rate-of-loading uncertainty for the MOVs used in the validation of the TUM is consistent with the uncertainty determined from the flow loop test population. The staff also suggested that EPRI provide guidance for the application of the rate-of-loading uncertainty by licensees based on their plant-specific data.

9. In Comment #9, the NRC staff requested EPRI to describe the calculated stem rejection load in the TUM. EPRI responded that the stem rejection load was the product of the upstream pressure and stem area. At the October 18 meeting, EPRI indicated its determination that, as applied in the TUM, the input of calculated stem rejection load does not result in a significant difference in the TUM thrust prediction from use of stem rejection load determined from the actual valve traces.

10. In Comment #10, the NRC staff requested EPRI to explain the basis for comparing the prediction ratio of dynamic thrust predictions from the EPRI MOV PPM to a prediction ratio of thrust predicted to be delivered at torque switch trip using the TUM. EPRI responded by providing an additional validation in Appendix B to its response. In Comment #2, the NRC staff discusses the concern regarding the validation of the TUM based on a comparison of the prediction ratio of dynamic thrust predictions from the EPRI MOV PPM to a prediction ratio of thrust predicted to be delivered at torque switch trip using the TUM. The staff's review of the Appendix B to the NEI submittal is discussed below.

11. In Comment #11, the NRC staff requested EPRI to explain the basis for determining an average prediction ratio for the EPRI MOV PPM to support the TUM rather than evaluating the uncertainty in data obtained from the Stellite separate-effects friction tests conducted by EPRI. EPRI responded that valve flow tests are considered to be a better source of data than laboratory testing. EPRI also stated that the friction separate effects tests were not designed to provide statistically-representative data. EPRI provided a summary of the Stellite separate effects data to help support its view that the prediction ratios used in the TUM are conservative relative to the separate-effect ratios of nominal to maximum coefficient of friction. The NRC staff notes that EPRI's view during development of the EPRI MOV PPM appeared to be that use of first principles with data to validate the application of those principles was the preferred approach. With respect to the concern regarding the statistical representation of the Stellite separate-effects data, the staff notes that the TUM data obtained from the EPRI MOV PPM is also not statistically representative. At the October 18 meeting, EPRI explained that the use of the separate-effects friction tests to evaluate the uncertainty of the EPRI MOV PPM had been considered, but was determined to not provide the best approach because of a concern regarding the preconditioning of the test specimens.

12. In Appendix A to the NEI submittal dated January 5, 2001, EPRI discussed its review of the preconditioning of the flow loop test valves. For the 14 gate valves used to determine the average prediction ratio for cold water conditions in the TUM, EPRI provided a table indicating the differential pressure, number of strokes, initial friction coefficient, and final friction coefficient for the preconditioning of each valve. EPRI also provided the differential pressure and range of friction coefficients obtained during the cold water flow tests for each valve. In evaluating the data, EPRI indicated that most of the test valves received a large number of preconditioning strokes. EPRI noted MOVs #6 and #29 exhibited preconditioning friction coefficients that were outside the range of cold water test friction coefficients. EPRI also provided the friction coefficients for low and high DP tests for flow loop test valves and considered the average friction coefficient (0.422) to be consistent with the product of the average prediction ratio for cold water conditions (0.697) and the low stress cold water friction coefficient (0.61). As reflected in the table providing high and low DP friction coefficients, EPRI indicated that the Stellite friction coefficient is typically higher under low DP conditions. In reviewing

the information provided by EPRI, the NRC staff found that several MOVs exhibited low preconditioning friction coefficients compared to the cold water test friction coefficients. With respect to the evidence of low initial friction coefficients, the staff noted that, in applying the EPRI MOV PPM, licensees were cautioned regarding the use of friction coefficients less than 0.3 because such low friction coefficients might not be stable and increase with service. At the October 18 meeting, EPRI stated its view that the differential pressure effect on friction coefficient is adequately addressed in the EPRI MOV PPM without the need to incorporate this effect in the TUM. The staff will review EPRI's supplemental response for resolution of these issues.

13. In Appendix B to the NEI submittal dated January 5, 2001, EPRI presented an alternative method to help support the development and validation of the TUM. In the appendix, EPRI derived an equation comparing the TUM thrust prediction to the MOV PPM thrust prediction with rate-of-loading and stem rejection/packing load variables. EPRI determined that the TUM would not predict a torque switch trip thrust requirement less than the MOV PPM thrust prediction with varying variable assumptions. EPRI did not include other setup uncertainties such as measurement error and torque switch repeatability in its evaluation. EPRI also did not compare the TST thrust that would have been required using the MOV PPM for the design thrust prediction to the TST thrust predicted by the TUM. In evaluating additional flow loop test data, EPRI found the TUM to predict at least the thrust requirement predicted by the MOV PPM, where the EPRI rate-of-loading assumptions are included, for all cold water valve strokes and all (but one) hot water valve strokes. The NRC staff's review of the data for the 68 cold water strokes of 20 valves provided in Appendix B to the NEI submittal found a 0.745 median value for the prediction ratios with a lower mean value of 0.704 caused by a few valve strokes with very low prediction ratios. Further, the staff noted that the hot water data only included 5 strokes of 3 valves. In Figure B-3 of the appendix, EPRI plotted the ratio of maximum measured thrust at wedging to EPRI MOV PPM default predicted thrust versus the actual rate-of-loading demonstrated by the test valve. On the figure, EPRI superimposed a line representing the torque switch thrust requirement predicted by the TUM with several rate-of-loading assumptions. At the October 18 meeting, EPRI stated that Figure B-3 includes all applicable PPM test data including various differential pressure conditions. EPRI also presented a revised figure that superimposed a line representing MOV setup using the original EPRI MOV PPM. The NRC staff stated that revision of Figure B-3 could help provide support for EPRI's view that the setup of MOVs using the TUM will continue to satisfy the reliability assumptions for safety-related MOVs in typical probabilistic risk assessments. For example, EPRI might use the figure (1) to indicate MOV setup using the original EPRI MOV PPM, (2) to address potential MOV setup variations resulting from uncertainties in test equipment and torque switch repeatability, and (3) to explain EPRI's assumptions regarding the low probability of simultaneous high valve factor and rate-of-loading effects. The staff noted that EPRI could demonstrate its assumed conservatism of the EPRI MOV PPM by applying the actual test valve factor in the EPRI MOV PPM, and comparing the predicted thrust requirement to the actual measured dynamic thrust requirement. The staff will review EPRI's supplemental response to determine whether the above discussed issues are resolved.

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