

November 14, 2001

MEMORANDUM TO: Stuart A. Richards, Director  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

FROM: Jack Cushing, Project Manager, Section 2 /RA/  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH JOINT OWNERS GROUP TO  
DISCUSS MOTOR-OPERATED VALVE (MOV) PERIODIC  
VERIFICATION PROGRAM (TAC NO. MA5035)

On October 17, 2001, the NRC staff held a public meeting with representatives of the Joint Owners Group (JOG) to discuss the current status of the JOG program on MOV Periodic Verification. The Boiling Water Reactor Owners Group (BWROG), B&W Owners Group (B&WOG), Combustion Engineering Owners Group (CEOG), and Westinghouse Owners Group (WOG) are conducting the JOG program as an industry-wide response to Generic Letter (GL) 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves." The NRC staff issued GL 96-05 to provide recommendations for long-term MOV programs to be implemented following the initial verification of MOV design-basis capability performed in response to GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." The JOG program consists of the following three phases: (1) an interim MOV static diagnostic test program; (2) a 5-year MOV dynamic diagnostic test program; and (3) a long-term MOV periodic diagnostic test program. The NRC staff prepared a safety evaluation dated October 30, 1997, accepting the JOG program with certain conditions and limitations.

The NRC staff meets with JOG representatives twice a year to discuss the status of the JOG program. Attachment 1 is a list of the meeting participants. Attachment 2 is a copy of the meeting agenda.

At the outset of the October 17 meeting, the NRC staff discussed the status of its review of MOV programs established at nuclear plants in response to GL 89-10 and GL 96-05. The staff completed its review of the GL 89-10 programs through a series of onsite inspections at each nuclear plant. In reviewing the GL 96-05 programs, the staff relied to a significant extent on the commitment of individual licensees to the JOG program, and conducted GL 96-05 inspections at a sample of plants. The staff reviewed GL 96-05 programs developed by licensees that had not committed to the JOG program on an individual basis. The staff has issued safety evaluations closing the NRC review of the GL 96-05 programs at all 103 active operating reactor units. Attachment 3 indicates the completion of the NRC staff's review of GL 89-10 and GL 96-05 programs.

The JOG representatives presented a status of the JOG program and provided an overview of the test results to date. The JOG presentation slides are available on the NRC's website using

ADAMS Accession #ML012950402. The JOG representatives reported that licensees of 98 reactor units continue to participate in the program. The JOG program currently includes 197 valves that are receiving three repetitive dynamic tests with at least a 1-year time interval between tests. Almost all of the first and second set of dynamic tests for the valves in the JOG program have been completed. About one-third of the final set of dynamic tests has been completed. The JOG dynamic testing program is formally scheduled to end in October 2002, but the final dynamic test for some valves will be conducted after that date. Because the JOG dynamic test program includes more valves than originally envisioned, the JOG representatives expect that adequate MOV test data will be available to support the conclusions of the program. JOG will evaluate the results of tests conducted after October 2002 for any impact on the program conclusions.

The JOG representatives discussed the key observations to date from the MOV dynamic tests performed as part of the JOG program. For example, the JOG has determined that, in general, the dominant influence for the increase in valve factor demonstrated by gate valves during sequential dynamic tests is the disassembly and reassembly of valves prior to testing. For some non-disassembled gate valves, the JOG has found that the initial value of the valve factor typically influences the changes in valve factor, such that low valve factors tend to increase and high valve factors tend to remain stable or decrease. However, the JOG is evaluating some exceptions identified to these general trends in gate valve performance. With respect to the JOG's description of the changes in valve factor, the NRC staff noted that the term "degradation" might be implied to mean internal damage to the valve rather than an increase in valve factor, and suggested that a different term might be considered for use in the final JOG report.

The JOG has not identified degradation in bearing friction during dynamic tests of butterfly valves with bronze bearings in treated water systems, or with non-bronze bearings in treated or untreated water systems. The JOG has found significant variation in bearing friction during dynamic tests of butterfly valves with bronze bearings in untreated water systems. At this time, the JOG has not identified any trends with regard to this variation in bearing friction.

The JOG representatives reported that the dynamic testing program has continued to find stable valve factors without degradation during dynamic tests of balanced disk globe valves. The JOG considers that the scope of the test program for balanced disk globe valves and the test results to date support closing its dynamic test activities for these valves. The staff suggested that the JOG review its topical report to verify the process for closing dynamic test activities for a specific valve category, including NRC notification of a test program change. The staff also noted additional aspects of the test scope for balanced disk globe valves that should be considered such as (1) the total number of balanced disk globe valves in GL 96-05 programs in comparison to the 8 valves in the JOG test program; (2) the extent that the tested valves represent the types and manufacturers of balanced disk globe valves; (3) the application of any balanced disk globe valves in GL 96-05 programs in steam environments in light of the testing of balanced disk globe valves in the JOG test program in water systems; and (4) whether disassembly of any balanced disk globe valves might have influenced their performance during the JOG tests. Also during the presentation, the JOG representatives noted that one balanced disk globe valve in an untreated water system demonstrated a significant increase in thrust requirements during mid-stroke operation as a result of organism growth. The staff suggested that the JOG consider preparing a summary of lessons learned at

the completion of its dynamic test program for use by licensees for system application and setup of MOVs and other power-operated valves that would incorporate this and other aspects of valve performance.

The JOG has identified small changes in valve factor during dynamic tests of unbalanced disk globe valves, but considers the changes to be within the uncertainty of the test instrumentation. Although the JOG has not found evidence of degradation in the performance of unbalanced disk globe valves, the JOG representatives indicated that sufficient data does not currently exist to justify closure of the JOG dynamic test activities for unbalanced disk globe valves.

The JOG has evaluated specific data obtained during the dynamic tests of valves in the program for prompt attention. However, the JOG has not issued any new Feedback Notices to its licensee participants since the previous meeting with the NRC staff. The JOG continues to address the issues raised in previous feedback notices, including the increase in valve factor for an Aloyco split wedge gate valve; the potential for under-filled test matrix categories in the JOG program; and the temporary reduction in valve factor observed during the dynamic testing of gate valves that had been recently disassembled and reassembled.

The JOG representatives stated that the ongoing evaluation of the test results will be completed at the conclusion of the MOV dynamic test program. The JOG target date for the submittal of the JOG final topical report to the NRC for review is December 2003. The NRC staff plans to prepare a safety evaluation addressing the JOG final topical report. The staff considers that the periodic meetings held with the JOG to discuss the status of the program will help expedite the review of the JOG final report.

During the October 17 meeting, the NRC staff discussed its sample review of a methodology developed by the BWROG to provide an improved prediction of the performance of dc-powered MOVs. The BWROG developed the methodology in response to concerns identified during dc-powered motor actuator tests at the Idaho National Engineering and Environmental Laboratory (INEEL) sponsored by the NRC's Office of Nuclear Regulatory Research (RES), and reported in NUREG/CR-6620, "Testing of dc-Powered Actuators for Motor-Operated Valves." The NRC staff issued NRC Information Notice 96-48, "Motor-Operated Valve Performance Issues," and its Supplement 1 to alert licensees to updated guidance for predicting ac-powered MOV actuator output and to identify efforts to evaluate dc-powered MOV output. On June 23, 2000, the BWROG forwarded Topical Report NEDC-32958 (Revision 0), "BWR Owners' Group DC Motor Performance Methodology - Predicting Capability and Stroke Time in DC Motor-Operated Valves," to the NRC staff for information. The BWROG did not request the preparation of an NRC safety evaluation on its dc-motor performance methodology, but did ask that the NRC staff acknowledge the availability of the methodology. On October 2, 2000, the BWROG forwarded its recommended BWR utility schedule for implementing the BWROG dc-motor methodology to the NRC. In particular, the BWROG recommended that its utilities evaluate their GL 96-05 dc-powered MOVs that have been assigned a static test frequency of two cycles or less by the JOG program based on their risk significance and margin within 12 months or the first refueling outage, and the remaining GL 96-05 dc-powered MOVs within 2 refueling outages, following NRC acknowledgment of the BWROG methodology. On August 1, 2001, the NRC staff issued Regulatory Issue Summary 2001-15, "Performance of DC-Powered Motor-Operated Valve Actuators," that informs licensees of the availability of improved industry guidance for predicting performance of dc-powered MOV actuators. Based

on the NRC staff's sample review, the BWROG methodology represents a reasonable approach in the improvement of past industry guidance for predicting stroke time and output of dc-powered MOV actuators. The staff considers the BWROG methodology to be applicable to boiling and pressurized water reactors because of the similarity in the design and application of dc-powered MOVs. With the availability of the new BWROG methodology, the staff considers that the regulatory issue of adequate prediction of the performance of safety-related dc-powered MOV actuators can be effectively resolved through implementation of improved industry guidance. During the October 17 meeting, the NRC staff suggested possible areas of improvement of the BWROG methodology in the future. Attachment 4 is the handout provided by the NRC staff on the review of the dc-powered MOV output issue.

In response to an action item from the previous meeting on May 9, 2001, the JOG representatives reported that available as-found test data from its dynamic test program had been reviewed for potential effects of pre-calibration strokes on MOV performance during dynamic tests. The JOG representatives reported that the length of time between static and dynamic diagnostic valve strokes did not appear to affect changes in valve factor for the tested valves. The JOG representatives did not have information on any valve strokes without instrumentation in the interval between static and dynamic diagnostic strokes. The JOG representatives also did not have information on the relative valve factor in cases where valves may or may not undergo static strokes prior to dynamic diagnostic tests. This action item remains open for continued discussion.

As action items from the October 17 meeting, the JOG will review its topical report to determine the appropriate process for modifying its test plan for balanced disk globe valves. The JOG will also address the NRC staff's comments during the meeting on the scope and results of the tests of balanced disk globe valves as part of its effort to modify the test plan.

The NRC staff and JOG representatives set a tentative date of May 8, 2002, for the next public meeting to discuss the status of the JOG program.

Attachments: 1. Meeting Participants  
2. Meeting Agenda  
3. NRC Staff Review of Licensee Programs Established  
in Response to Generic Letters 89-10 and 96-05  
4. DC-Powered MOV Output Issue

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**JOG/NRC PUBLIC MEETING**

**October 17, 2001**

**MEETING PARTICIPANTS**

**CE OWNERS GROUP**

Bob Doyle (APS)  
Frank Ferraraccio (Westinghouse)

**WESTINGHOUSE OWNERS GROUP**

Tim Chan (TVA)  
Ike Ezekoye (Westinghouse)

**BWR OWNERS GROUP**

Wendell Fiock (GE)  
Ted Neckowicz (Exelon)

**B&W OWNERS GROUP**

Brian Merdich (Framatome)  
Bob Schomaker (Framatome)  
Chad Smith (Duke Energy)

**MPR**

Paul Damerell  
Todd Spears

**INEEL**

John Watkins

**NRC**

Jack Cushing  
Tom Scarbrough  
Steve Tingen

**AGENDA**

**NRC/JOG PUBLIC MEETING**

**MOTOR-OPERATED VALVE PROGRAM ON PERIODIC VERIFICATION**

**October 17, 2001**

8:30 a.m.	Introductions (NRC and JOG)
8:35 a.m.	GL 96-05 Review Issues and Status (NRC)
9:00 a.m.	Status of Utility Testing and Data Submittals (JOG)
9:20 a.m.	JOG Test Program Results since previous meeting (JOG)
10:15 a.m.	BREAK
10:30 a.m.	Continue: JOG Test Program Results (JOG)
11:00 a.m.	Status of Utility Feedback Notices (JOG)
11:15 a.m.	Items of Interest (NRC) - Issuance of RIS 2001-15 on dc motor performance issuance
11:45 a.m.	Action Items and Schedule for Next Meeting (NRC and JOG)
Noon	Closing (NRC)

**NRC STAFF REVIEW OF LICENSEE PROGRAMS ESTABLISHED  
IN RESPONSE TO GENERIC LETTERS 89-10 AND 96-05  
(October 17, 2001)**

The NRC staff has completed its review of motor-operated valve (MOV) programs established at all active reactor units in response to GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

Licensees of 98 reactor units committed to implement the Joint Owners Group Program on MOV Periodic Verification in response to GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves."

Licensees of 5 reactor units are implementing plant-specific GL 96-05 programs:

Callaway  
Fort Calhoun  
Palisades  
San Onofre 2/3

The NRC staff has issued safety evaluations closing its GL 96-05 review for all 103 active reactor units.



## DC-POWERED MOV OUTPUT ISSUE

NRC Information Notice (IN) 96-48, "Motor-Operated Valve Performance Issues," and its Supplement 1 (July 24, 1998), alerted licensees to updated guidance for predicting ac-powered MOV output and identified initial efforts to evaluate prediction method for dc-powered MOV output.

NUREG/CR-6620 (May 1999), "Testing of dc-Powered Actuators for Motor-Operated Valves," provided results of the program sponsored by NRC's Office of Nuclear Regulatory Research (RES) and conducted at Idaho National Engineering and Environmental Laboratory (INEEL) that identified concerns regarding dc-powered MOV output.

The Boiling Water Reactors Owners Group (BWROG) developed updated methodology for predicting dc-powered MOV performance and stroke time, including consideration of degraded voltage, ambient temperature effects, motor heatup, and gearbox efficiency.

On June 23, 2000, the BWROG forwarded Topical Report NEDC-32958 (March 2000), "BWR Owners' Group DC Motor Performance Methodology - Predicting Capability and Stroke Time in DC Motor-Operated Valves," to the NRC staff for information.

On August 30, 2000, the NRC staff held a public meeting with the BWROG to discuss dc-motor performance methodology.

In a letter dated October 2, 2000, the BWROG provided a recommended utility implementation schedule of 12 months or the first refueling outage (whichever later) for first priority MOVs, and two refueling outages for second priority MOVs. First priority is defined as dc-powered GL 96-05 MOVs with static test frequency of two cycles or less in the JOG program. Second priority includes the remaining dc-powered GL 96-05 MOVs. The BWROG established the start date for the implementation schedule as the date on which the NRC acknowledged that methodology acceptable.

As part of the GL 96-05 review, the NRC staff discussed with licensees the prediction of dc-powered MOV performance and verified that licensees were aware of the BWROG initiative. The staff indicated ongoing efforts regarding dc-powered MOV output performance in safety evaluations prepared to close GL 96-05 reviews at individual nuclear plants.

The NRC staff conducted a sample review of the BWROG methodology with assistance from RES and INEEL to support preparation of the Regulatory Issue Summary (RIS) to resolve the issue of prediction of dc-powered MOV output.

The BWROG methodology used best available information for some aspects of dc-powered MOV performance that could be refined in the future. Possible areas of improvement of the BWROG methodology include (1) supplementing best available data used in development of methodology with additional information, such as dc-motor performance data for those motors without specific data to strengthen use of vendor curves; (2) comparison to MOV performance from additional operational data that challenges the MOV capability earlier in the valve stroke; (3) consideration of significant temperature rise predicted by methodology in comparison to

actual experience, effects on output, and vendor qualification limits; and (4) clarification of prediction of gearbox efficiency in terms of potential for values below pullout value.

On August 1, 2001, the NRC staff issued RIS 2001-15, "Performance of DC-Powered Motor-Operated Valve Actuators," that informs licensees of the availability of improved industry guidance for predicting performance of dc-powered MOV actuators. Based on a sample review, the BWROG methodology represents a reasonable approach in improvement of past industry guidance for predicting stroke time and output of dc-powered MOV actuators. The BWROG methodology is applicable to BWRs and PWRs because of similarity in the design and application of dc-powered MOVs. With the new BWROG methodology available, the staff considers the regulatory issue of adequate prediction of performance of safety-related dc-powered MOV actuators can be effectively resolved through implementation of improved industry guidance.

The NRC staff continues to monitor long-term MOV periodic verification programs being implemented by licensees in response to GL 96-05.