

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

February 26, 1992

NRC INFORMATION NOTICE 92-17: NRC INSPECTIONS OF PROGRAMS BEING DEVELOPED
AT NUCLEAR POWER PLANTS IN RESPONSE TO
GENERIC LETTER 89-10

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the general conclusions derived from the NRC inspections of the programs being developed at nuclear power plants in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

In GL 89-10 (June 28, 1989), the NRC staff requested that holders of nuclear power plant operating licenses and construction permits ensure the capability of motor-operated valves (MOVs) in safety-related systems by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and determining trends of MOV problems. The NRC staff requested that licensees complete the GL 89-10 program by the end of the third refueling outage or 5 years from the issuance of the generic letter, whichever is later. On June 13, 1990, the NRC staff issued Supplement 1 to GL 89-10 to provide detailed information on the results of public workshops held to discuss the generic letter. On August 3, 1990, the NRC staff issued Supplement 2 to GL 89-10 to allow licensees additional time to review and to incorporate the information provided in Supplement 1 into their programs in response to the generic letter. Upon reviewing the results of NRC-sponsored MOV tests, the NRC staff issued Supplement 3 to GL 89-10 on October 25, 1990, which requested licensees of boiling water reactor (BWR) nuclear plants to take action in advance of the GL 89-10 schedule to resolve concerns about the capability of MOVs used for containment isolation in the steam supply line of the high pressure coolant injection and reactor core isolation cooling systems, in the supply line of the reactor water cleanup system, and in other systems directly connected to the reactor vessel. In

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Supplement 4 to GL 89-10, the NRC staff indicated that BWR licensees need not address inadvertent MOV operation in their GL 89-10 programs. The NRC staff is considering whether or not similar actions should be taken regarding the need for licensees of pressurized-water reactor (PWR) nuclear plants to address the inadvertent operation of MOVs in their programs to respond to GL 89-10.

Description of Circumstances

The NRC staff has conducted inspections at more than 30 nuclear power plant sites of programs being developed by licensees in response to GL 89-10. The reports of those inspections are available in the NRC Public Document Room. In performing the inspections, the NRC staff has followed Temporary Instruction (TI) 2515/109 of January 14, 1991, "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." Part 1 of TI 2515/109 provides guidance for reviewing the program being established by the licensee in response to GL 89-10, and Part 2 provides guidance for reviewing program implementation. The NRC has focused these inspections on reviewing the GL 89-10 programs (Part 1 of TI 2515/109). The staff is issuing this information notice to provide the more significant results of those NRC inspections.

In GL 89-10, the NRC staff requested that licensees prepare descriptions of their programs established in response to GL 89-10 within 1 year after the generic letter was issued or by the first refueling outage after December 28, 1989, whichever was later. The NRC staff's response to Question 44 in Supplement 1 to GL 89-10 provided guidance on information expected in the program descriptions. The NRC inspectors found some licensees to have program descriptions that are thorough while other licensees did not.

Attachment 1 is a discussion of the inspection findings pertaining to the recommendations of GL 89-10.

Related Generic Communications

In addition to NRC Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and its supplements, the NRC has addressed this and related topics in NRC Information Notices 89-88, "Recent NRC-Sponsored Testing of Motor-Operated Valves;" 90-40, "Results of NRC-Sponsored Testing of Motor-Operated Valves;" 90-72, "Testing of Parallel Disc Gate Valves in Europe;" and 91-61, "Preliminary Results of Validation Testing of Motor-Operated Valve Diagnostic Equipment."

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contact: Thomas G. Scarbrough, NRR
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Attachments:

1. Inspection Findings Pertaining to the Recommendations Contained In Generic Letter 89-10
2. List of Recently Issued NRC Information Notices

INSPECTION FINDINGS PERTAINING
TO THE RECOMMENDATIONS CONTAINED IN GENERIC LETTER 89-10

Administration

Some licensees have not ensured adequate management oversight and direction for the motor-operated valve (MOV) program. One licensee had contracted an internal audit that revealed problems with the MOV program similar to those found subsequently during the NRC inspection, but the licensee had not taken action to correct the deficiencies. The safety significance of the MOV program and the extensive resources needed to develop and implement the program make it imperative that licensee's management closely monitor its staff's activities.

Scope

In issuing Generic Letter (GL) 89-10, the NRC staff intended that the scope include all safety-related MOVs and other MOVs in safety-related systems. In Supplement 1 to GL 89-10, the NRC staff limited the scope of GL 89-10 to safety-related MOVs and other MOVs that are position-changeable in safety-related piping systems, as well as safety-related MOVs that might be in nonsafety-related piping systems. The NRC staff's response to Questions 3-13 in Supplement 1 to GL 89-10 provided further guidance on the scope of GL 89-10. For example, in the NRC staff's response to Question 4 in Supplement 1, the staff defined "position-changeable" as any MOV in a safety-related piping system that is not blocked from inadvertent operation from the control room. In Supplement 4 to GL 89-10, the NRC staff indicated that licensees for boiling water reactor (BWR) plants need not address inadvertent MOV operation in their GL 89-10 programs. The NRC staff is considering whether or not similar actions should be taken regarding the need for the licensees of pressurized-water reactor (PWR) plants to address inadvertent MOV operation in their programs to respond to GL 89-10.

The NRC inspectors found most licensees to be establishing the scope of their GL 89-10 programs consistent with the recommendations of the generic letter. However, some licensees needed to improve the documentation of their justification for excluding particular MOVs from the GL 89-10 program.

Design-Basis Reviews

In recommended action "a" of GL 89-10, the NRC staff requested the licensees to review and document the design basis for operating each MOV within the generic letter program to determine the maximum differential pressure and flow (and other factors) expected for both normal operations and abnormal conditions. The NRC staff's response to Questions 14 to 18 and 36 in Supplement 1 to GL 89-10 provides guidance on performing design-basis reviews under GL 89-10.

Many licensees are appropriately reviewing plant documentation such as the final safety analysis report and the technical specifications as part of their design-basis reviews. However, some licensees had failed to identify worst-case conditions for various design-basis scenarios. Some licensees have

assumed nominal reactor pressure for differential pressure across MOVs in lines directly connected to the reactor vessel without evaluating whether this differential pressure bounds the worst-case MOV design-basis differential pressure. At certain facilities, the licensee found errors in the previous design basis determinations for many MOVs that would have affected the capability of the MOVs to perform their safety function if called upon under design-basis conditions.

Some licensees focused on differential pressure and had not adequately addressed other design-basis parameters such as flow, fluid temperature, ambient temperature, and the effects of seismic and dynamic events. Although differential pressure is the primary design-basis parameter used to predict the thrust requirements in the industry's equations, the other design-basis parameters are needed to ensure that the test results demonstrate that the MOV would operate under design-basis conditions. Some licensees have not ensured that generic studies of design-basis differential pressure apply to specific plants.

MOV Sizing and Switch Settings

In recommended action "b" of GL 89-10, the NRC staff requested licensees to review and revise, as necessary, the methods for selecting and setting all MOV switches. The NRC staff's response to Questions 19-21 in Supplement 1 to GL 89-10 provides guidance on selecting and setting MOV switches.

The recommendations of GL 89-10 for selecting and setting MOV switches apply to switches for torque, torque bypass, limit, and thermal overload. The licensees are using various methods to determine the proper size of MOVs and their appropriate torque switch settings. Some licensees have increased the valve factors assumed in the industry's equations used to predict the thrust required to operate the valves to reflect experience throughout the industry and at their specific plant. However, other licensees continue to use old guidance from valve vendors and manufacturers in estimating the thrust requirements that may be found inadequate during design-basis tests.

The NRC inspectors found that licensees for various facilities had not done the following when establishing methods to size MOVs and set their switches:

- (1) Provide justification for assumptions regarding stem friction coefficients and changes in stem friction over the lubrication interval
- (2) Consider effects that can reduce the thrust delivered by the motor operator under high differential pressure and flow conditions in relation to the thrust delivered under no-load conditions
- (3) Consider the effects of ambient temperature on motor output and thermal overload sizing
- (4) Demonstrate applicability of industry's databases in predicting thrust requirements
- (5) Consider inertia in establishing the maximum settings for torque switches

- (6) Demonstrate applicability of contractors' studies of actuator capability
- (7) Demonstrate applicability of generic motor curves for specific motors
- (8) Provide justification for removing conservatisms (such as the application factor) from the industry's standard sizing calculations
- (9) Consider torque switch repeatability
- (10) Consider uncertainties regarding the accuracy of MOV diagnostic equipment.

Some licensees have had problems in performing MOV sizing and switch setting calculations because of (1) incorrect spring packs installed in MOVs, (2) incorrect MOV data on the motor or actuator nameplates and in the procurement documents from the vendor, and (3) spring packs with different performance characteristics from different manufacturers, but with the same part number.

One licensee determined that the MOV sizing and switch setting activities to establish motor operator capability had not adequately addressed the effect of those activities on other MOV safety functions. These activities had hindered the ability of the clutch of certain MOVs to be released to enable the MOV to be manually operated in the event of an evacuation of the control room.

Many licensees are updating their degraded voltage studies to ensure that the worst-case minimum voltage available at the motor has been determined for each MOV. Some licensees had not ensured that their assumptions of minimum voltage available at the MOVs were consistent with their licensing commitments in safety analyses. Some licensees did not justify the assumptions for the starting point for the degraded voltage calculations, current used to calculate cable losses, losses caused by the resistance of thermal overload devices in the circuit, or the effects on MOV stroke time under degraded voltage conditions. Of particular significance, the inspectors found one licensee to be assuming an excessively small locked-rotor power factor (0.2) in the motor for use in the calculation of voltage drop from the motor control center to the MOV. The licensee's selection of this power factor was based on guidance in an Institute of Electrical and Electronics Engineers' standard that was not applicable to the size of motors typically used to operate valves in nuclear power plants. The assumption of an excessively small power factor causes an underestimation of the cable voltage drop and may result in the overestimation of MOV capability under design-basis conditions.

Licensees are improving their documentation of current and required MOV switch settings, but some weaknesses remain. For example, one licensee had simplified its control over changes to torque switch settings to expedite the process but, in so doing, caused the concern that the quality assurance department may not participate adequately in accepting those changes. Some of the weakness in documenting torque switch settings appears to result from the difficulty in reading the switches. Some licensees have raised torque switch settings for MOVs above the manufacturer's maximum specified value without performing an adequate safety analysis in accordance with the requirements of 10 CFR 50.59.

Design-Basis Differential Pressure and Flow Testing

In recommended action "c" of GL 89-10, the NRC staff requested licensees to test MOVs within the generic letter program in situ under their design-basis differential pressure and flow conditions. The NRC staff allows alternate methods to be used to demonstrate the capability of the MOV if testing in situ under those conditions is not practicable. The NRC staff suggested that the licensees follow a two-stage approach for a situation in which design-basis testing in situ is not practicable and the licensees could not justify an alternate method of demonstrating MOV capability. In performing the two-stage approach, a licensee would evaluate the capability of the MOV using the best data available and then would obtain applicable test data within the schedule of the generic letter. The NRC staff's response to Questions 22-32 and 37 in Supplement 1 to GL 89-10 provides guidance on design-basis testing and the two-stage approach.

Many licensees have committed to test MOVs within the scope of their GL 89-10 program under design-basis conditions, where practicable. Some licensees have indicated that most MOVs can be tested at or near design-basis conditions. Other licensees (primarily those of BWR plants) estimate that a much smaller percentage of MOVs can be tested at or near design-basis conditions. These licensees have not thoroughly evaluated the ability to conduct MOV tests under design-basis or maximum achievable conditions.

Licensees who have begun differential pressure and flow testing have found some MOVs to require more thrust to operate than predicted by the industry's standard equation with typical valve factors (such as 0.3 for flexible wedge gate valves) assumed in the past. For example, the Alabama Power Company, the licensee of the Joseph M. Farley Nuclear Plant, found less than half of the 55 flexible wedge gate valves tested under differential pressure and flow conditions to have their thrust requirements bounded by the industry's standard equation with a 0.3 valve factor. The industry's test results confirm the conclusions of NRC-sponsored MOV research that the industry's past methods of determining the size of MOVs and setting their torque switches were inadequate for some MOVs.

The NRC staff has found weaknesses in the licensees' procedures for conducting the differential pressure and flow tests, the acceptance criteria for the tests in evaluating the capability of the MOV to perform its safety function under design-basis conditions, and the process for incorporating the test results into the methodology used by the licensee in predicting MOV thrust requirements. The NRC regulations and the plant's technical specifications (TS) establish requirements for licensees' actions and reporting when safety-related equipment is determined to be, or has been, unable to perform its safety functions. Some licensees did not appear aware of their obligations to address MOV operability following testing performed under their programs established in response to GL 89-10. For example, some licensees have not been evaluating the results of MOV tests to verify the capability of the tested MOVs to perform their safety functions under design-basis conditions and to evaluate the adequacy of their methodology to size and set other MOVs. Some licensees appeared to discard test data as suspect without careful evaluation. The NRC

staff has also found a lack of coordination among licensees in disseminating and using MOV test data. For example, some licensees are not considering tests conducted by other licensees which might reflect on the adequacy of their assumptions in predicting thrust requirements.

For MOVs that cannot be tested under design-basis differential pressure and flow conditions, the NRC inspectors have found that some licensees are not following their commitments to the two-stage approach (discussed in Supplement 1 to GL 89-10) to test those MOVs at the maximum differential pressure and flow achievable. If the test pressure and flow are near to the design-basis conditions, the licensee may be able to justify extrapolating from the test results to demonstrate the capability of the MOV to perform its safety function under design-basis conditions. Where the MOV cannot be tested near design-basis conditions, the licensee can use the results of the test at maximum achievable conditions to help confirm valve factor assumptions in its sizing and switch setting methodology and to set the MOV using the best available data. The licensee may also find TS actions and reporting requirements that take effect as a result of tests of MOVs at less than full design-basis differential pressure and flow conditions if those tests reveal that the MOVs could not perform their safety functions under design-basis conditions.

Testing MOVs at maximum achievable conditions is especially helpful in establishing a plant-specific database if the licensee estimates that only a small percentage of MOVs can be tested at or near design-basis conditions.

Some licensees who, in their initial response to GL 89-10, committed to implement the recommendations of GL 89-10 to test MOVs where practicable have indicated an interest in grouping certain MOVs to reduce the amount of testing (although testing of those MOVs would be practicable). Item 1. of GL 89-10 states that licensees shall submit any changes to scheduled commitments, and that revised schedules or alternative actions may be implemented without NRC approval with justification retained on site.

In their initial responses to GL 89-10, some licensees stated that they would attempt to group MOVs to limit the extent of design-basis testing. The preliminary results of design-basis tests at several plants (for example, Catawba, Farley, Oconee and Surry) indicated that apparently identical MOVs performed significantly different under high differential pressure and flow conditions. This could cause difficulty in grouping MOVs in such a manner that a small sample of MOV tests can be used to demonstrate that all MOVs can perform their safety functions under design-basis conditions.

The motor operators for most gate valves are set to close on torque to provide adequate leakage control. Licensees are attempting to develop a method to ensure that MOVs closed using the limit switch meet the requisite leakage limitations in safety analyses without causing an MOV overstress condition.

Periodic Verification of MOV Capability

In recommended action "d" of GL 89-10, the NRC staff requested that licensees prepare or revise procedures to ensure that adequate MOV switch settings are

determined and maintained throughout the life of the plant. In paragraph "j" of GL 89-10, the NRC staff recommended that the surveillance interval be based on (1) the safety importance and (2) the maintenance and performance history of the MOV, but that the interval not exceed 5 years or 3 refueling outages, whichever is later. Further, the staff stated that the capability of the MOV should be verified if the MOV is replaced, modified, or overhauled to an extent that the existing test results do not represent the MOV. The NRC staff's response to Questions 33-35 and 38 in Supplement 1 to GL 89-10 provides guidance on periodically verifying MOV switches and performing tests after completing maintenance.

The recommendation of GL 89-10 for verifying periodically the adequacy of MOV switch settings includes torque, torque bypass, limit, and thermal overloads. Many licensees have stated that they will attempt to use tests of MOVs with diagnostic equipment under zero differential pressure and flow conditions (static conditions) to demonstrate the adequacy of torque switch settings and the continued capability of MOVs to perform their safety functions under design-basis conditions. However, to date, none of those licensees have provided justification for applying the results of tests conducted under static conditions to demonstrate design-basis capability. These licensees appear to be waiting on yet to be developed generic justification for static or low differential pressure and flow testing.

At least one licensee indicated an intent to clean and lubricate the valve stem before performing periodic verification testing. This would be inconsistent with demonstrating that the MOV had been set adequately and was capable of performing its function at the end of the test interval.

In GL 89-10, the NRC staff stated that testing at design-basis conditions need not be repeated unless the MOV is replaced, modified, or overhauled to the extent that the licensee considers that the existing test results are not representative of the MOV in its modified configuration. Many licensees are improving their methods to demonstrate that the MOVs are capable of performing their safety functions under design-basis conditions following maintenance.

MOV Failures, Corrective Actions, and Trending

In recommended action "h" of GL 89-10, the NRC staff requested that licensees analyze or justify each MOV failure and corrective action. The staff also requested that the documentation include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration. The staff noted that the licensee must retain and report all documentation in accordance with the plant's requirements. The staff also suggested that the material be examined every 2 years or after each refueling outage after the program is implemented as part of the monitoring and feedback effort to establish trends of MOV operability. These trends could provide the basis on which the licensee can revise the testing frequency established to verify periodically that the MOV has adequate capability. The NRC staff indicated that the system should be well-structured and should track, capture, and share history data on individual components. The NRC staff's response to Questions 39 and 40 in Supplement 1 to GL 89-10 provides guidance on identifying trends of MOV problems.

The NRC inspectors have found some licensees to have weaknesses in evaluating MOV failures and deficiencies (such as the operability effects of spring pack relaxation). Some licensees have not been thorough in performing root cause analyses of MOV problems. Most licensees are attempting to improve their methods for identifying trends in MOV problems.

Schedule

In GL 89-10, the NRC staff requested that, by June 28, 1994, or by the third refueling outage after December 28, 1989, whichever is later, licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that were initiated in order to satisfy the actions recommended in the generic letter. The NRC staff's response to Question 41 in Supplement 1 to GL 89-10 provides guidance on the schedule for implementing these actions specified in GL 89-10.

Some licensees have not made adequate progress for resolving the MOV issue for their facilities within the recommended schedule of GL 89-10. The findings of licensees as they begin to initiate their programs in response to GL 89-10 and the results of the NRC inspections of GL 89-10 programs reinforce the importance of promptly resolving this safety-significant issue. The NRC staff has accepted limited extensions of the GL 89-10 schedule for particular licensees who have provided justification.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-16	Loss of Flow from the Residual Heat Removal Pump during Refueling Cavity Draindown	02/25/92	All holders of OLs or CPs for nuclear power reactors.
92-15	Failure of Primary System Compression Fitting	02/24/92	All holders of OLs or CPs for nuclear power reactors.
92-14	Uranium Oxide Fires at Fuel Cycle Facilities	02/21/92	All fuel cycle and uranium fuel research and development licensees.
92-02, Supp. 1	Relap5/Mod3 Computer Code Error Associated with the Conservation of Energy Equation	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-13	Inadequate Control Over Vehicular Traffic at Nuclear Power Plant Sites	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-12	Effects of Cable Leakage Currents on Instrument Settings and Indications	02/10/92	All holders of OLs or CPs for nuclear power reactors.
92-11	Soil and Water Contamination at Fuel Cycle Facilities	02/05/92	All uranium fuel fabrication and conversion facilities.
92-10	Brachytherapy Incidents Involving Iridium-192 Wire Used in Endobronchial Treatments	01/31/92	All Nuclear Regulatory Commission (NRC) licensees authorized to use iridium-192 for brachytherapy; manufacturers and distributors of iridium-192 wire for use in brachytherapy.

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Attachments:

1. Inspection Findings Pertaining to the Recommendations Contained In Generic Letter 89-10
2. List of Recently Issued NRC Information Notices

Document Name: GL 89-10 INSPECTION RESULTS IN

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*OGCB:DOEA:NRR
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