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SUBJECT: Responds to Generic Ltr 89-10 re safety-related motor-operated valve testing & surveillance.

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DUKE POWER

December 28, 1989

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station
Catawba Nuclear Station
Oconee Nuclear Station
Docket Nos. 50-369, -370; 50-413, -414; and 50-269, -270, -287
NRC Generic Letter No. 89-10
Safety-Related Motor-Operated Valve Testing and Surveillance
-10CFR 50.54(f)

Gentlemen:

NRC Generic Letter No. 89-10 concerning safety-related motor-operated valve testing and surveillance was issued June 28, 1989. The NRC had previously issued NRC Bulletin No. 85-03 and Supplement No. 1 to that Bulletin recommending that licensees develop and implement a program to ensure that valve motor-operator switch settings (torque, torque bypass, position limit, overload) for motor-operated valves (MOVs) in several specified systems are selected, set, and maintained so that the MOVs will operate under design-basis conditions for the life of the plant. By this Generic Letter the NRC is extending the scope of the program outlined in Bulletin 85-03 and its Supplement to include all safety-related MOVs as well as all position-changeable MOVs (as defined in the Generic Letter).

Pursuant to 10CFR50.54(f) and Generic Letter Item 1, Duke is required to advise the NRC in writing by December 28, 1989 that the Generic Letter's recommendations and schedule will be met. For any recommendation that Duke cannot or proposes not to meet, Duke is to inform the NRC and provide a technical justification, including any proposed alternative action, in writing. For any schedule date that cannot be met, Duke is to advise the NRC of a revised schedule and provide a technical justification in writing. Accordingly, please find attached the required information, which is divided into three main sections:

- Introduction - Summarizes the perceived basic intent of the Generic Letter and Duke Power Company's desire for NRC involvement once a program approach is developed and validated. The NRC involvement is to ensure a consistent program exists that satisfies the general objectives of the Generic Letter.

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- Scope - Identifies the approximate number of motor operated valves (MOVs) within the scope of the Generic Letter for Duke's three nuclear stations and provides general discussion on certain considerations in the program development and execution.

- Exceptions and Clarifications - Topics follow the Generic Letter format of Background, Recommendations, Schedule, and Reporting Requirements and are detailed item by item, where applicable. Exceptions and clarifications are presented for each section along with appropriate technical justification.

Note that Duke intends to solicit NRC involvement once a program approach is developed and validated. Generic Letter Item 1 also requires Duke to submit in writing any future changes to scheduled commitments (e.g. changes made on the basis of trending results). However, as discussed in the attachment, Duke does not intend to submit written notification for changes in surveillance frequency (justification for such changes will be retained on site). Any change in the proposed Generic Letter program schedule (Ref. Duke response to Generic Letter Item i) will be submitted as required. Also, as required by 10CFR50.54(f) and Generic Letter Item m, Duke will notify the NRC in writing within 30 days after the actions described in the first paragraph of Generic Letter Item i have been completed (for each station/unit).

As noted in the Generic Letter, this Generic Letter supersedes the recommendations in Bulletin 85-03 and its supplement, and no further responses regarding that Bulletin need be made. Consequently, the Catawba Units 1 and 2 Bulletin 85-03 Action Item f response that was supposed to have been submitted by August 7, 1989 (Ref. my March 23, 1989 letter to NRC) is no longer required and was not made (Bulletin Action Item f responses had already been made on Oconee and McGuire). In addition, the differential test plan and approach for all three stations which, although not required by Bulletin 85-03, Duke had committed to providing to the NRC in that submittal as a supplemental Bulletin response (along with subsequent final Bulletin responses upon completion of that testing) should also no longer be necessary since they should be encompassed by the Generic Letter's recommendations.

I declare under penalty of perjury that the statements set forth herein are true and correct to the best of my knowledge. Should there be any questions concerning this matter or if further information is desired, please contact P. B. Nardoci at (704) 373-7432.

Very truly yours,

Hal B Tucker

Hal B Tucker

PBN192/vm

Attachment

xc: (w/attachment)
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DUKE POWER COMPANY
OCONEE, MCGUIRE, AND CATAWBA NUCLEAR STATIONS
NRC GENERIC LETTER 89-10 INITIAL RESPONSE

INTRODUCTION

The intent of NRC Generic Letter (GL) 89-10 is for licensees to implement programs that ensure all applicable MOVs are capable of operating under design-basis conditions. Past industry experience (including the results of NRC Bulletin 85-03 and those documented in NRC Case Study Report AEOD/C603) indicate high failure rates for MOVs. Most failures on demand appear to be due to improper maintenance, improper training, design misapplication, operational abuse and/or improper switch setting logics. Valves recorded as failing to operate under differential pressure and flow conditions were primarily gate valve designs.

Increased theoretical core melt frequency resulting from higher MOV failure rates provides the justification for the GL 89-10 requirements. NUREG/CR-5140, "Value-Impact Analysis for Extension of NRC Bulletin 85-03 to cover All Safety-Related MOVs", documents this justification based on reported Bulletin 85-03 failure rates, cost estimates from MOVATS Incorporated, a "best estimate" MOV population of 100 per unit (low of 80, high of 130), conducting full design-basis differential pressure testing on 10 percent of the applicable population, and replacing 1 percent due to "uncorrectable deficiencies."

The NRC recognizes in the GL that the MOV issue is not a simple task:

> "Assurance of MOV operability is a complex task. It involves many factors such as development of strong testing and maintenance programs, management support, and coordination of engineering, maintenance, and testing. This effort should be viewed by all concerned as a long-term ongoing program."

The initial NRC sponsored motor operated gate valve blow-down testing conducted by INEL at Wyle Labs in early 1988 revealed phenomenon that could not be explained without additional testing (February 1, 1989 meeting to review Phase 1 blow-down test results, Crowne Plaza Holiday Inn, Rockville, MD; NRC EGG-SSRE-8547, "Boiling Water Reactor Water Cleanup System Flexible Wedge Gate Isolation Valve Qualification and High Energy Flow Interruption Test, Interim Analysis and Data Report", Volumes 1 and 2, July, 1989).

Follow-up NRC sponsored testing was completed at the end of October, 1989, but the results have not yet been made public. Detailed analysis of results from actual testing requires considerable time, cross-disciplinary expertise, some degree of judgment, and often raises more questions than answers. Few, if any, individuals in the world appear to completely understand the variables which affect the ability of a valve to open and close under prescribed process conditions. Organizations with the most expertise, such as the U.S. Nuclear Navy and Siemens-KWU, require extensive "proof" or "prototype" testing for new MOVs, but tend to steer away from in-situ design-basis testing (November 17, 1989 telecon with Mr. Conran, Naval Reactors Group, KWU presentation to NRC, "Program to Exchange European MOV Experience and Technology with the United States," Rockville, MD, April 14, 1989).

The program is further complicated by evolving MOV diagnostic technology. Recent industry testing and the INEL initial blow-down testing revealed that an industry accepted technique for measuring stem thrust (NUREG/CR-4380, "Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to Detect Degradation, Incorrect Adjustment, and Other Abnormalities in Motor Operated Valves", January, 1986) now has potentially more measurement uncertainty than once considered.

Duke Power Company recognizes the need to ensure that safety-related equipment will perform its design function. Therefore, the main objective in Duke's response to this GL is to implement a program that provides a high degree of assurance that all applicable MOVs are capable of performing their design function. Once a program approach is developed and validated, NRC involvement will be solicited to ensure that a quality program is being pursued to meet this objective. An industry solution can potentially be developed that would benefit all groups concerned.

SCOPE

Duke will include in the scope of the GL (with the exceptions and clarifications presented in this response) all MOVs in safety-related piping systems not blocked from inadvertent operation using our currently accepted practices for prevention of inadvertent operation (as detailed in the FSAR for each station). The approximate number of applicable MOVs are:

Oconee	-	117 MOVs per unit (351 total for three units)
McGuire	-	230 MOVs per unit (460 total for both units)
Catawba	-	280 MOVs per unit (560 total for both units)

MOVs in heating, ventilation and air-conditioning (HVAC) systems will not be included. Justification for not including MOVs in HVAC systems is found in the fact that most operate under low differential pressure conditions (measured in inches of water) such that the static (no flow or differential pressure) seating and unseating forces are dominant. Any switch setting problem for HVAC MOVs is detectable during routine operation with or without flow and differential pressure.

Due to the extensive number of applicable MOVs per unit (far in excess of the 130 "high" NUREG/CR-5140 MOV figure at our McGuire and Catawba stations and above the NUREG/CR-5140 "best" estimate of 100 at our Oconee station) significant resources will be required for program implementation. Areas impacted include not only Management and working level station personnel, but also those in Design Engineering, Maintenance Support, and Licensing. The Duke program will attempt to emphasize certain safety significant MOVs within the Phase 1 time period specified in the Duke response to GL Item i. MOVs selected for Phase 1 will be determined based on input from various sources, including station specific Probabilistic Risk Analysis (PRA) results.

Conflicting driving forces surround the development of a sound, quality program and the schedule to address the key issues of the GL. The safety significance of the MOV issue would seem to dictate that it receive immediate attention. However, a more cautious approach is also dictated since all of the root cause factors that affect the behavior of an MOV when it is challenged to operate at specified process conditions are not currently understood. For example, proving that a MOV successfully strokes against design-basis test process conditions may unknowingly induce degradations that would prevent it from stroking successfully against the same conditions in actual operation. Only after the root cause factors are understood can an effective test program be launched. Until such time, certain seemingly appropriate actions resulting from the GL recommendations may be determined later to have actually degraded the ability of the MOV to perform its design function. More currently defined areas, such as design reviews, upgraded maintenance, training and trending programs can, and should proceed in a more timely manner.

Duke sees two primary areas that require additional investigation before a meaningful differential pressure testing program can be successfully implemented.

1. Definition of key valve design variables - these are the critical valve parameters that control its thrust/torque requirement when stroked against specified process conditions. Once these variables are defined and controlled, differential pressure testing becomes more meaningful. Criteria can then be established for valve similarity to permit extrapolation of prototype or in-plant test results from one valve to another. Ideally, these key design variables can also be controlled during valve maintenance to ensure valve performance is not compromised.

2. Definition of extrapolation methods - this is the criteria which permits test results from one process condition to be correctly applied to another process condition.

Each of the above two areas contain numerous sub-elements. Early in-house investigative work will focus on developing and proving criteria for these two areas of uncertainty. Duke is currently working with the Bechtel-KWU/Alliance to develop and prove a methodology for addressing these areas. Industry efforts will also be carefully followed for new developments. If early initiatives aimed at defining the above two areas fail, then alternative program approaches may be pursued.

EXCEPTIONS AND CLARIFICATIONS

GL Background

Once adopted, the new ANSI/ASME OM-8 standard should provide testing that is more directed at verifying MOV operability at design basis conditions than the

existing ASME Code Section XI stroke time testing. Duke may pursue combining Code testing and the required GL surveillance testing to eliminate duplication of effort.

The last sentence of the second paragraph on page 2 of the GL states, "Currently, the most accurate method of determining switch settings and overall competence of the MOV is to perform testing at or near design-basis conditions, either in situ or on prototype valves." As explained in the previous section of this response, the application of results from prototype or in situ tests of "similar" valves is limited without identification and control of the critical valve variables. Also, assessment of results from tests conducted at what is believed to be design-basis conditions can be somewhat vague without appropriate extrapolation techniques to account for seemingly minor differences in process conditions (for example, testing at design basis differential pressure, but not temperature or flow).

GL Recommended Actions

Duke Response to GL Item a

For evaluating design-basis process conditions, only events within our existing, approved design-basis will be considered (see GL item e). Other factors which could affect MOV operation (such as degraded voltage) will also be considered. Switch settings or control logics, however, will be selected to permit bi-directional operation of each MOV at the established design-basis conditions. This is to permit recovery from mispositioning and applies whether or not the MOV is required for bi-directional operation to achieve its design function. Individual exceptions may apply where operability is an issue.

Duke Response to GL Item b

Switch settings for all applicable MOVs will be reviewed and revised as necessary using our existing programs for control of work performed on nuclear station equipment.

Duke Response to GL Item c

Each applicable MOV will at least be baseline stroke tested against static conditions (no flow or differential pressure) to ensure switch settings are within design specifications.

Differential pressure testing will be performed only where deemed practical and only to the extent that the test will provide information useful for the Duke program methodology. The degree of testing will likely vary according to valve type and design. For instance, it is believed that most rising stem globe valves will behave according to existing industry calculations. Therefore, only limited testing should be required to validate the program methodology for this valve type. For gate and butterfly valve designs more extensive testing may be required to validate the program methodology.

A methodology will be pursued for establishing valve similarity in order to provide adequate justification for not differential pressure testing. Defining similarity is key for being able to provide adequate justification based on test results from other valves, whether in-plant or prototype.

Design margins which conservatively bound valve and actuator sizing factors will be considered acceptable justification for not differential pressure testing.

Bench test methods which simulate actuator loading may be used in place of differential pressure testing to investigate, establish, and/or quantify certain phenomenon.

In summary, the intent of the Duke program will be to establish a sound engineering solution, supported by test results. As new insights are gained into valve behavior and criteria is developed for establishing valve similarity, differential pressure testing of every valve that can be tested may prove to be unnecessary and may actually be detrimental to the future performance of the valve. For example, if the main objective of a differential pressure test is to determine how actuator performance is affected by severe loading conditions, then appropriate bench testing may be a preferred approach. Also, if attainable test conditions are far deficient of design-basis conditions then testing would likely yield little, if any, meaningful information.

Duke Response to GL Item d
Procedures will be reviewed and revised as necessary to ensure the correct switch settings for applicable MOVs are set and maintained.

Duke Response to GL Item e
See Duke Response to Item a.

Duke Response to GL Item f
See Duke Response to Item c.

Duke Response to GL Item g
Duke will review and consider the list provided in GL Attachment A.

Duke Response to GL Item h
Duke interprets this section to mean that only valid failures of applicable MOVs and the corrective actions that are performed as a direct result of a valid failure will be subject to the documentation and trending requirements contained in this recommendation. This data will be used to modify the periodic test frequency of GL Item j.

GL Schedule

Duke Response to GL Item i
The Duke program will follow a two phase schedule. Phase 1 will attempt to emphasize all safety-related MOVs in piping (non-HVAC) systems which are determined to have high safety significance based on input from various sources, including station specific PRAs, in a time period of 5 years (from December 28, 1989)/3 RFOs (after June 28, 1990), whichever is longer. Phase 2 will address the balance of applicable GL MOVs within 8 years (from December 28, 1989)/6 RFOs (after June 28, 1990), whichever is longer.

This schedule assumes that the critical valve variables necessary to define valve similarity and the extrapolation methods for testing at non-design-basis conditions are developed in time to support this proposed schedule. Otherwise, certain program elements will extend beyond the specified time period. Also, industry findings and developments that alter the program approach will necessarily cause affected program elements to extend beyond the specified time period.

Justification for exceeding the specified completion time for certain program elements is the abnormally large number of applicable MOVs and the fact that the information necessary to establish a root cause (rather than symptomatic) problem approach is not yet available and must be developed. (References: Enclosure 3 of an April 26, 1989 NRC memo to Thomas E. Murley from Eric S. Beckford uses 45 MOVs per year and 150 MOVs total for the GL cost justification. A May 3, 1989 presentation to the ACRS Mechanical Components Subcommittee by O. Rothberg and R. L. Baer uses a 45 to 50 MOVs per year basis for program justification.)

Duke Response to GL Item j
The surveillance interval will originally follow the same schedule as outlined in Duke's response to GL Item i, above. Future changes in the surveillance interval will be based on maintenance history (see Duke Response to GL Item h) and other pertinent factors. The basis for any adjustment to a surveillance schedule will be documented and available for review only. No formal written response will be submitted for changes in the surveillance schedule.

Duke Response to GL Item k
No comments on this item.

GL Reporting Requirements

Duke Response to GL Item l
The 6 month initial response is contained herein.

As stated in Duke's response to GL Item j, no written notification will be submitted for changes in surveillance frequency. However, the documentation to support such changes will be retained and available on site. Any change in the proposed GL program schedule (see Duke Response to GL Item i) will be submitted.

Duke Response to GL Item m
No comments on this item.

General

As stated on page 7, the GL supersedes the requirements of Bulletin 85-03. Therefore, all commitments made by Duke under Bulletin 85-03, including scope, schedule and program elements are superseded by this response.