

March 13, 2001

Mr. Dale E. Young, Vice President  
Crystal River Nuclear Plant (NA1B)  
ATTN: Supervisor, Licensing & Regulatory Programs  
15760 W. Power Line Street  
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER NUCLEAR PLANT, UNIT 3, RESPONSE TO GENERIC  
LETTER 96-05 (TAC NO. M97036)

Dear Mr. Young:

On September 18, 1996, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," requesting each nuclear power plant licensee to establish a program, or to ensure the effectiveness of its current program, to verify on a periodic basis that safety-related motor-operated valves (MOVs) continue to be capable of performing their safety functions within the current licensing bases of the facility.

On November 15, 1996, Florida Power Corporation submitted a response to GL 96-05 notifying the NRC that it had evaluated the generic letter and considered the requested actions to be satisfied through implementation of the MOV program at Crystal River Nuclear Plant, Unit 3 (CR-3). On December 21, 2000, CR-3 provided an updated submittal that described its participation in the Joint Owners Group (JOG) Program of MOV Periodic Verification as part of its implementation of GL 96-05.

The NRC has reviewed CR-3's submittals and applicable inspection reports for the MOV program at Crystal River and finds that CR-3 has established an acceptable program to periodically verify the design-basis capability of the safety-related MOVs. This is based on our understanding of CR-3's commitment to all three phases of the JOG Program on MOV Periodic Verification, and the additional actions described in CR-3's submittals.

As discussed in the attached safety evaluation (SE), the NRC concludes that CR-3 is adequately addressing the actions requested in GL 96-05. The NRC staff may conduct

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inspections at Crystal River to verify the implementation of the MOV periodic verification program is in accordance with the licensee's commitments discussed in the attached SE, and the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification.

Sincerely,

***/RA/***

John M. Goshen, Project Manager, Section 2  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-302

Attachment: Safety Evaluation

cc w/encls: See next page

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John M. Goshen, Project Manager, Section 2  
Project Directorate II  
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Attachment: Safety Evaluation

cc w/encls: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
LICENSEE RESPONSE TO GENERIC LETTER 96-05, "PERIODIC VERIFICATION OF  
DESIGN-BASIS CAPABILITY OF SAFETY-RELATED MOTOR-OPERATED VALVES"  
CRYSTAL RIVER NUCLEAR PLANT, UNIT 3  
DOCKET NUMBER 50-302

## 1.0 INTRODUCTION

Many fluid systems at nuclear power plants depend on the successful operation of motor-operated valves (MOVs) in performing their safety functions. Several years ago, MOV operating experience and testing, and research programs sponsored by the nuclear industry and the U.S. Nuclear Regulatory Commission (NRC), revealed weaknesses in a wide range of activities (including design, qualification, testing, and maintenance) associated with the performance of MOVs in nuclear power plants. For example, some engineering analyses used in sizing and setting MOVs did not adequately predict the thrust and torque required to operate valves under their design-basis conditions. In addition, inservice tests of valve stroke time under zero differential-pressure and flow conditions did not ensure that MOVs could perform their safety functions under design-basis conditions.

Upon identification of the weaknesses in MOV performance, significant industry and regulatory activities were initiated to verify the design-basis capability of safety-related MOVs in nuclear power plants. After completion of these activities, nuclear power plant licensees began establishing long-term programs to maintain the design-basis capability of their safety-related MOVs. This safety evaluation (SE) addresses the program developed by Florida Power Corporation (licensee) to verify periodically the design-basis capability of safety-related MOVs at Crystal River Nuclear Plant, Unit 3 (CR-3).

## 2.0 REGULATORY REQUIREMENTS

The NRC regulations require that MOVs important to safety be treated in a manner that provides assurance of their intended performance. Criterion 1 to Appendix A, "General Design Criteria for Nuclear Power Plants," to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 50) states, in part, that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The quality assurance program to be applied to safety-related components is described in Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50. In Section 50.55a of 10 CFR Part 50, the NRC requires licensees to establish inservice testing (IST) programs in accordance with the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*, and more recently the ASME *Code for Operation and Maintenance of Nuclear Power Plants*.

ENCLOSURE

In response to concerns regarding MOV performance, NRC issued Generic Letter (GL) 89-10 (June 28, 1989), "Safety-Related Motor-Operated Valve Testing and Surveillance," which requested that nuclear power plant licensees and construction permit holders ensure the capability of MOVs in safety-related systems to perform their intended functions 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 trending MOV problems. The NRC requested that licensees complete the GL 89-10 program within approximately three refueling outages or 5 years from the issuance of the GL. Permit holders were requested to complete the GL 89-10 program before plant startup or in accordance with the above schedule, whichever was later.

The NRC issued seven supplements to GL 89-10 that provided additional guidance and information on MOV program scope, design-basis reviews, switch settings, testing, periodic verification, trending, and schedule extensions. GL 89-10 and its supplements provided only limited guidance regarding MOV periodic verification and the measures appropriate to assure preservation of design-basis capability. Consequently, the NRC determined that additional guidance on the periodic verification of MOV design-basis capability should be prepared. On September 18, 1996, the NRC issued GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," requesting each licensee establish a program, or ensure the effectiveness of its current program, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions within the current licensing bases of the facility. In GL 96-05, the NRC summarized several industry and regulatory activities and programs related to maintaining long-term capability of safety-related MOVs. For example, GL 96-05 discussed non-mandatory ASME Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor Operated Valve Assemblies in LWR [Light Water Reactor] Power Plants, OM Code 1995 Edition; Subsection ISTC," which allows the replacement of ASME Code requirements for MOV quarterly stroke-time testing with exercising of safety-related MOVs at least once per operating cycle and periodic MOV diagnostic testing on a frequency to be determined on the basis of margin and degradation rate. In GL 96-05, the NRC stated that the method in OMN-1 meets the intent of the generic letter with certain limitations. The NRC also noted in GL 96-05 that licensees remain bound by the requirements in their code of record regarding MOV stroke-time testing, as supplemented by relief requests approved by the NRC.

In GL 96-05, licensees were requested to submit the following information to the NRC:

- a. within 60 days from the date of GL 96-05, a written response indicating whether or not the licensee would implement the requested actions; and
- b. within 180 days from the date of GL 96-05, or upon notification to the NRC of completion of GL 89-10 (whichever is later), a written summary description of the licensee's MOV periodic verification program.

The NRC is preparing an SE on the response of each licensee to GL 96-05. The NRC intends to rely, to a significant extent, on an industry initiative to identify valve age-related degradation which could adversely affect the design-basis capability of safety-related MOVs (described in Section 3.0) where a licensee commits to implement that industry program. The NRC will

conduct inspections to verify the implementation of GL 96-05 programs at nuclear power plants as necessary.

### 3.0 JOINT OWNERS GROUP PROGRAM ON MOV PERIODIC VERIFICATION

In response to GL 96-05, the Boiling Water Reactor Owners Group (BWROG), Westinghouse Owners Group (WOG), and Combustion Engineering Owners Group (CEOG) jointly developed an MOV periodic verification program to obtain benefits from the sharing of information between licensees. The Joint Owners Group (JOG) Program on MOV Periodic Verification is described by the BWROG in its Licensing Topical Report NEDC-32719, "BWR Owners' Group Program on Motor-Operated Valve (MOV) Periodic Verification," and described by the WOG and the CEOG in their separately submitted Topical Report MPR-1807, "Joint BWR, Westinghouse and Combustion Engineering Owners' Group Program on Motor-Operated Valve (MOV) Periodic Verification." The stated objectives of the JOG program on MOV Periodic Verification are (1) to provide an approach for licensees to use immediately in their GL 96-05 programs; (2) to develop a basis for addressing the potential age-related increase in required thrust or torque under dynamic conditions; and (3) to use the developed basis to confirm, or if necessary to modify, the applied approach. The specific elements of the JOG program are (1) providing an "interim" MOV periodic verification program for applicable licensees to use in response to GL 96-05; (2) conducting a dynamic testing program over the next 5 years to identify potential age-related increases in required thrust or torque to operate gate, globe, and butterfly valves under dynamic conditions; and (3) evaluating the information from the dynamic testing program to confirm or modify the interim program assumptions.

The JOG interim MOV periodic verification program includes (1) continuation of MOV stroke-time testing required by the ASME Code inservice testing program; and (2) performance of MOV static diagnostic testing on a frequency based on functional capability (age-related degradation margin over and above margin for GL 89-10 evaluated parameters) and safety significance. In implementing the interim MOV static diagnostic test program, licensees will rank MOVs within the scope of the JOG program according to their safety significance. The JOG program specifies that licensees need to justify their approach for risk ranking MOVs. In Topical Report NEDC 32264, "Application of Probabilistic Safety Assessment to Generic Letter 89-10 Implementation," the BWROG described a methodology to rank MOVs in GL 89-10 programs with respect to their relative importance to core-damage frequency and other considerations to be added by an expert panel. In an SE dated February 27, 1996, the NRC accepted the BWROG methodology for risk ranking MOVs in boiling water reactor nuclear plants with certain conditions and limitations. In the NRC SE (dated October 30, 1997) on the JOG Program on MOV Periodic Verification, the NRC indicated its view that the BWROG methodology for MOV risk ranking is appropriate for use in response to GL 96-05. With respect to Westinghouse-designed pressurized water reactor nuclear plants, WOG prepared Engineering Report V-EC-1658, "Risk Ranking Approach for Motor-Operated Valves in Response to Generic Letter 96-05." On April 14, 1998, the NRC issued an SE accepting with certain conditions and limitations the WOG approach for ranking MOVs based on their risk significance. Licensees not applicable to the BWROG or WOG methodologies need to justify their MOV risk-ranking approach individually.

The objectives of the JOG dynamic test program are to determine degradation trends in dynamic thrust and torque, and to use dynamic test results to adjust the test frequency and method specified in the interim program if warranted. The JOG dynamic testing program includes (1) identification of conditions and features which could potentially lead to MOV degradation; (2) definition and assignment of valves for dynamic testing; (3) testing valves three times over a 5-year interval with at least a 1-year interval between valve-specific tests according to a standard test specification; (4) evaluation of results of each test; and (5) evaluation of collective test results.

In the last phase of its program, JOG will evaluate the test results to validate the assumptions in the interim program to establish a long-term MOV periodic verification program to be implemented by licensees. A feedback mechanism will be established to ensure timely sharing of MOV test results among licensees and to prompt individual licensees to adjust their own MOV periodic verification program, as appropriate.

Following consideration of NRC comments, BWROG submitted Licensing Topical Report NEDC-32719 (Revision 2) describing the JOG program on July 30, 1997. Similarly, the CEOG and the WOG submitted Topical Report MPR-1807 (Revision 2) describing the JOG program on August 6 and 12, 1997, respectively. On October 30, 1997, the NRC issued an SE accepting the JOG program with certain conditions and limitations as an acceptable industry-wide response to GL 96-05 for valve age-related degradation. On October 19, 1999, the Babcock & Wilcox Owners Group (B&WOG) forwarded Topical Report MPR-1807 (Revision 2) to the NRC, and stated that B&WOG is now participating in the JOG Program on MOV Periodic Verification. In a letter dated May 15, 2000, the NRC staff informed B&WOG that Topical Report MPR-1807 is acceptable for referencing in B&WOG licensing applications to the extent specified and under the limitations delineated in the report and the associated NRC SE dated October 30, 1997.

#### 4.0 CRYSTAL RIVER GL 96-05 PROGRAM

On November 15, 1996, Florida Power Corporation submitted a response to GL 96-05 notifying the NRC that it had evaluated the GL and considered the requested actions to be satisfied through implementation of the MOV program at CR-3. On December 21, 2000, CR-3 provided an updated submittal that described its participation in the JOG Program of MOV Periodic Verification as part of its implementation of GL 96-05.

In its letter dated December 21, 2000, CR-3 described its MOV periodic verification program, including scope, static test frequency, planned dynamic testing, and participation in the JOG program at Crystal River. CR-3 stated that it will ensure that the Crystal River MOV program satisfies the three phases of the JOG program. CR-3 noted that it is performing static as-found diagnostic testing of all GL 96-05 MOVs on a frequency of once every three refueling outages, rather than the JOG interim MOV static test frequency which allows testing up to once every six refueling outages. CR-3 has initiated MOV dynamic testing in accordance with the JOG program. CR-3 is updating the MOV documentation to reflect its participation in the JOG program.

## 5.0 NRC STAFF EVALUATION

The NRC has reviewed the information provided in the licensee's submittals describing the program to verify periodically the design-basis capability of safety-related MOVs at CR-3 in response to GL 96-05. NRC Inspection Reports (IRs) 50-302/92-01, 92-11, 93-02, 94-18, and 95-11 provided the results of inspections to evaluate CR-3's program to verify the design-basis capability of safety-related MOVs in response to GL 89-10. In a letter dated November 13, 1995, the staff closed the review of the GL 89-10 program at CR-3, based on the review of the licensee's submittal dated March 13, 1995, and the NRC inspection results in IR 95-11. The NRC's evaluation of the licensee's response to GL 96-05 is described below.

### 5.1 MOV Program Scope

In GL 96-05, the NRC indicated that all safety-related MOVs covered by the GL 89-10 program should be considered in the development of the MOV periodic verification program. The NRC noted that the program should consider safety-related MOVs that are assumed to be capable of returning to their safety position when placed in a position that prevents their safety system (or train) from performing its safety function; and the system (or train) is not declared inoperable when the MOVs are in their non-safety position.

In its letter dated December 21, 2000, CR-3 stated that the scope of their MOV program included all safety-related MOVs required to perform an active safety function. CR-3 stated that the scope of MOVs in its GL 96-05 program is the same as the scope of MOVs in its GL 89-10 program. Safety-related MOVs not capable of performing their safety function during testing (and their associated system or train) are declared inoperable in accordance with CR-3 Improved Technical Specifications.

The NRC considers that CR-3 has made adequate commitments regarding the scope of its MOV program.

### 5.2 MOV Assumptions and Methodologies

Licensees maintain their assumptions and methodologies used in the development of MOV programs consistent with the plant configuration throughout the life of the plant (a concept commonly described as a "living program"). For example, the design basis of safety-related MOVs is maintained up to date, including consideration of any plant modifications or power uprate conditions.

In IRs 94-18 and 95-11, the NRC reviewed CR-3's justification for the assumptions and methodologies used in the MOV program in response to GL 89-10. With certain long-term items discussed in the following section, the NRC determined that CR-3 had adequately justified the assumptions and methodologies used in its MOV program. CR-3's letter dated December 21, 2000, discussed ongoing activities, such as trending of motor actuator output. The NRC considers CR-3 to have adequate processes in place to maintain the assumptions and methodologies used in its MOV program, including the design basis of its safety-related MOVs.



### 5.3 GL 89-10 Long-Term Items

When evaluating the GL 89-10 program at Crystal River, the NRC discussed in IR 94-18 several items of CR-3's MOV program to be addressed over the long term. CR-3 provided a response to those items in a letter dated March 13, 1995. In a letter dated June 14, 1995, the NRC indicated that CR-3's response was acceptable subject to verification during a subsequent inspection. In IR 95-11, the NRC reviewed those long-term MOV items at CR-3. In its letter dated December 21, 2000, CR-3 reported that all actions described in IR 95-11 necessary to support closure of those follow-up items had been completed. Also, in GL 89-10, the NRC identified pressure locking and thermal binding as potential performance concerns for safety-related MOVs. The NRC completed the review of CR-3's actions in response to GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," in an SE dated October 16, 1997.

In IRs 94-18 and 95-11, the NRC reviewed qualitative and quantitative aspects of CR-3's program for trending MOV performance. In IR 95-11, the NRC noted that CR-3 is tracking diagnostic evaluation data and anomalies, and general inspection items. In its letter dated December 21, 2000, CR-3 provided updated information on its MOV trending program. For example, CR-3 stated that the MOV data to be trended will include actuator thrust, torque, spring pack displacement, motor current, and stem factor. CR-3 will record the data on an initial frequency of once every three refueling outages or prior to relubrication of the valve stem. CR-3 evaluates adverse trends and takes corrective actions, as necessary.

With CR-3's ongoing MOV activities and trending program, no outstanding issues regarding the GL 89-10 program remain at Crystal River.

### 5.4 JOG Program on MOV Periodic Verification

In an SE dated October 30, 1997, the NRC accepted the JOG program as an industry-wide response to GL 96-05 with certain conditions and limitations. The JOG program consists of the following three phases: (1) the JOG interim static diagnostic test program; (2) the JOG 5-year dynamic test program; and (3) the JOG long-term periodic test program. In its letter dated December 21, 2000, CR-3 committed to ensure that the Crystal River MOV program satisfies the three phases of the JOG program without deviation. CR-3 noted that it is performing static as-found diagnostic testing of all GL 96-05 MOVs on a frequency of once every three refueling outages. Based on actual MOV test data, CR-3 verified that its static testing frequency is more conservative than would be expected under the JOG Phase 1 interim MOV static test program. CR-3 has initiated MOV dynamic testing in accordance with Phase 2 of the JOG program. CR-3 is updating the MOV documentation to reflect its participation in the JOG program. The NRC considers CR-3's commitment to ensure that the MOV program at Crystal River satisfies the three phases of the JOG Program on MOV Periodic Verification to be an acceptable response to GL 96-05 for valve age-related degradation.

In its letter dated December 21, 2000, CR-3 stated that it may adjust its MOV test frequency based on margin and risk ranking. CR-3 also noted that it is evaluating the potential use of test data obtained from the Motor Control Center as part of its MOV program. CR-3 will evaluate changes in its MOV program according to its plant procedures and its commitment to the JOG program.

The JOG program is intended to address most gate, globe and butterfly valves used in safety-related applications in the nuclear power plants of participating licensees. The JOG indicates that each licensee is responsible for addressing any MOVs outside the scope of applicability of the JOG program. The NRC recognizes that the JOG has selected a broad range of MOVs and conditions for the dynamic testing program, and that significant information will be obtained on the performance and potential degradation of safety-related MOVs during the interim static diagnostic test program and the JOG dynamic test program. As the test results are evaluated, the JOG might include or exclude additional MOVs with respect to the scope of its program. Although the test information from the MOVs in the JOG dynamic test program might not be adequate to establish a long-term periodic verification program for each MOV outside the scope of the JOG program, sufficient information should be obtained from the JOG dynamic test program to identify any immediate safety concern for potential valve age-related degradation during the interim period of the JOG program. Therefore, the NRC considers it acceptable for the licensee to apply its interim static diagnostic test program to GL 96-05 MOVs that currently might be outside the scope of the JOG program with the feedback of information from the JOG dynamic test program to those MOVs. In the NRC SE dated October 30, 1997, the NRC specifies that licensees implementing the JOG program must determine any MOVs outside the scope of the JOG program (including service conditions) and justify a separate program for periodic verification of the design-basis capability (including static and dynamic operating requirements) of those MOVs.

## 5.5 Motor Actuator Output

The JOG program focuses on the potential age-related increase in the thrust or torque required to operate valves under their design-basis conditions. In the SE dated October 30, 1997, on the JOG program, the NRC specifies that licensees are responsible for addressing the thrust or torque delivered by the MOV motor actuator and its potential degradation. Although the JOG does not plan to evaluate degradation of motor actuator output, significant information on the output of motor actuators will be obtained through the interim MOV static diagnostic test program and the JOG dynamic test program. Several parameters obtained during MOV static and dynamic diagnostic testing help identify motor actuator output degradation when opening and closing the valve including, as applicable, capability margin, thrust and torque at control switch trip, stem friction coefficient, load sensitive behavior, and motor current.

In its letter dated December 21, 2000, CR-3 described the monitoring of MOV actuator capability. For example, CR-3 trends MOV actuator thrust, torque, spring pack displacement, motor current, and stem factor. CR-3 also reported that it had revised its MOV thrust calculations to incorporate the provisions of Limitorque Technical Update 98-01 and its Supplement 1. CR-3 provides additional assurance for the capability of its dc-powered MOVs through assessment of degraded voltage and environmental qualification. CR-3 is also aware of the industry-wide efforts on dc-powered MOVs and will address the new information as appropriate.

The NRC considers CR-3 to be establishing sufficient means to monitor MOV motor actuator output and its potential degradation.

## 6.0 CONCLUSION

The NRC finds that CR-3 has established an acceptable program to verify periodically the design-basis capability of the safety-related MOVs through its commitment to all three phases of the JOG Program on MOV Periodic Verification, and the additional actions described in its submittal documents. Therefore, the NRC concludes that CR-3 has adequately addressed the actions requested in GL 96-05. The NRC may conduct inspections to verify the implementation of the MOV periodic verification program is in accordance with CR-3's commitments discussed in this SE, and the NRC SE dated October 30, 1997, on the JOG Program on MOV Periodic Verification.

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Date: March 13, 2001

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