UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO REMOVAL OF 17 MOTOR-OPERATED VALVES FROM THE GENERIC LETTER 89-10 PROGRAM AT THE DUANE ARNOLD ENERGY CENTER

IES UTILITIES INC.

CENTRAL IOWA POWER COOPERATIVE

CORN BELT POWER COOPERATIVE

DOCKET NUMBER 50-331 (TAC M94130)

1.0 INTRODUCTION

In Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," the NRC staff requested holders of operating licenses and construction permits to provide additional assurance of the capability of safety-related motor-operated valves (MOVs) by reviewing 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. Supplements 4 and 7 to GL 89-10 removed the consideration of mispositioning of valves from the recommendations of the generic letter. In GL 89-10, the staff requested licensees and permit holders to review and document the design basis for the operation of each GL 89-10 MOV including the maximum differential pressure expected during both the opening and closing of the MOV for both normal operations and abnormal events, to the extent that these MOV operations and events are included in the existing approved design basis.

The licensee of the Duane Arnold nuclear power plant originally planned to complete a program in response to GL 89-10 to verify the design-basis capability of the safety-related MOVs at Duane Arnold by June 28, 1994. In a letter dated May 20, 1994, the licensee requested an extension of this commitment to 120 days after completion of the refueling outage that was scheduled to begin in February 1995. In reviewing the licensee's submittal and through subsequent discussions, the staff learned that the licensee intended to remove 17 MOVs from its GL 89-10 program at Duane Arnold. In a letter dated September 14, 1994, the staff raised concerns regarding the removal of those MOVs from the program. During a subsequent meeting on September 22, 1994, the licensee presented its justification for the removal of the MOVs from its GL 89-10 program. Primarily, the licensee does not consider the design requirements of these MOVs to include system recovery from secondary modes of operation such as surveillance testing.

ENCLOSURE

In reviewing the proposed GL 89-10 schedule extension, the staff found that the Duane Arnold licensee had not justified its decision not to consider the capability of MOVs to return to their safety position during surveillance testing (or other temporary operations) when plant technical specifications are not followed. In response to this staff position, the licensee demonstrated, in accordance with the guidance in Supplement 6 to GL 89-10 on schedule extensions, that the 17 MOVs were setup with the best available information and had sufficient capability to justify the requested schedule extension. Further, in a letter dated March 10, 1995, the licensee stated that, until the function of the 17 MOVs is resolved, administrative controls would be instituted to maintain the current torque switch settings for these MOVs and to evaluate operating experience to determine if any adjustments to the settings are necessary.

The staff position on MOVs used during surveillance testing is that an MOV placed in a position that prevents the safety-related system (or train) from performing its safety function must be capable of returning to its safety position, or the system (or train) must be declared inoperable. For example, the staff stated in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," on page 3-7 that, where a system is designed to realign automatically during testing and therefore is not considered out of service, the licensee need not enter a technical specification limiting condition for operation. The staff repeated this position in a safety evaluation (SE) dated October 16, 1995, discussing a proposed reduction in the scope of the GL 89-10 program at the Hatch nuclear power plant, and again in the proposed GL 96-XX, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," issued for public comment in the *Federal Register* on February 20, 1996.

2.0 CONSIDERATIONS IN REVIEWING LICENSEE SCOPE OF GL 89-10 PROGRAM

The NRC staff has been requested by some licensees to review modifications to the scope of their GL 89-10 programs. For example, the staff provided the results of its review of the reclassification of active safety functions of the GL 89-10 MOVs at Hatch in the SE provided by letter to Georgia Power Company on October 16, 1995. The following are considerations that the staff has been using in its review of licensee bases for modifying the scope of GL 89-10 programs:

a. The scope of GL 89-10 extends to safety-related MOVs as defined in the NRC regulations. In GL 89-10, the staff requests licensees to determine the design basis for the operation of each safety-related MOV including the maximum differential pressure expected during both the opening and closing of the MOV for both normal operations and abnormal events, to the extent that these MOV operations and events are included in the existing approved design basis.

b. In Supplement 1 to GL 89-10, the staff stated that safety-related MOVs that are always in their safety position, or would have no affect on the operation of the safety train if placed in the nonsafety position, could be removed from the GL 89-10 program. Containment isolation valves will

always have a safety function to close regardless of their system performance requirements.

c. Section 3.1.2 of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," issued by GL 89-04 (Supplement 1), "Guidance on Developing Acceptable Inservice Testing Programs," dated April 4, 1995, discusses the capability of plant components and surveillance testing. In this regard, safety-related MOVs that are placed in a position that prevents the safety-related system (or train) from performing its safety function must be capable of returning to their safety position, or the system (or train) must be declared inoperable and the appropriate plant technical specifications followed.

d. In the second footnote in GL 89-10, the staff states that design-basis events are defined as conditions of normal operation, including anticipated operational occurrences, design-basis accidents, external events, and natural phenomena for which the plant must be designed to ensure the function delineated as "safety-related" can be performed. The staff further states in the footnote that the design bases for each plant are those documented in pertinent licensee submittals, such as the final safety analysis report (FSAR). In Bulletin 85-03, ""Motor-Operated Valve Common Mode Failures during Plant Transients due to Improper Switch Settings," the staff requested licensees to ensure that MOVs in the high pressure coolant injection/core spray and emergency feedwater systems (Reactor Core Isolation Cooling systems for boiling water reactor (BWR) plants) that are required to be tested for operational readiness in accordance with 10 CFR 50.55a(g) are set and maintained properly.

e. The consideration of pipe breaks should be consistent with the staff's licensing review for the individual facility (i.e., in accordance with Standard Review Plan (SRP) Section 3.6.2).

f. Supplements 4 and 7 to GL 89-10 removed the recommendation that licensees of BWR and pressurized water reactor (PWR) nuclear plants, respectively, consider inadvertent mispositioning of MOVs as part of their GL 89-10 programs.

g. The consideration of long-term passive failures in piping should be consistent with the staff's licensing review for the individual facility and should be in accordance with SRP 3.6.1. Further, the licensee's evaluation of passive failures must consider valve and pump seal failures as discussed in NRC Commission Paper SECY 77-439.

h. Licensees may rely on analysis results for each design-basis event and each system's required capability to satisfy event acceptance limits provided in the updated FSAR where the licensee can demonstrate that the information in the updated FSAR is consistent with the licensing basis of the facility.

i. Licensees are required to meet the single failure criterion in the NRC regulations. Other criteria may also apply at the same time (e.g., loss

of offsite power). Further, safety systems are required to meet the redundancy provisions of Appendix A to 10 CFR Part 50. The consideration of the single failure criterion as applied to anticipated operational transients should be consistent with the staff's licensing review for the individual facility.

3.0 EVALUATION OF MOVs TO BE REMOVED FROM DUANE ARNOLD GL 89-10 PROGRAM

In its submittal dated November 30, 1994, the Duane Arnold licensee provided information on the 17 MOVs to be deleted from its GL 89-10 program. These MOVs, their safety function, and normal position are summarized below:

Residual Heat Removal (RHR) Shutdown Cooling Pump Suction Valves MO-1912/1920/2011/2016

These MOVs are normally closed. The MOVs are opened during reactor shutdown cooling to allow the RHR pump to take suction from a recirculation line of the reactor. The licensee considers the shutdown cooling mode of RHR to be a non-safety-related mode of RHR. The MOVs must remain closed to allow operation of the Low Pressure Coolant Injection (LPCI) and post-Loss-of-Coolant-Accident (post-LOCA) containment heat removal modes of RHR.

RHR Drain to Radwaste Valves MO-1936/1937

These MOVs are normally closed. The MOVs are opened to provide a flow path to drain the reactor or suppression pool to the radwaste system. The licensee considers the reactor/torus drain to radwaste mode of RHR to be non-safety-related. The MOVs must remain closed to allow operation of LPCI or post-LOCA containment heat removal.

RHR Heat Exchanger Outlet Valves MO-1941/2031

These MOVs are normally open. The MOVs allow RHR flow through the heat exchangers before injection into the reactor or containment in the vent of a LOCA. The valves remain open for all safety-related operations.

RHR Cross-tie Valve MO-2010

This MOV is normally open. The MOV must remain open during LPCI operation to ensure that the required flow can be delivered to either recirculation loop. The valve may be closed to allow splitting of the RHR loops so that one loop may be used for post-LOCA containment heat removal while the other loop continues to deliver flow to the reactor core.

High Pressure Coolant Injection (HPCI) Pump Discharge Valve MO-2311

This valve is normally open and must remain open to allow HPCI flow to the reactor core.

Reactor Core Isolation Cooling (RCIC) Pump Discharge Valve MO-2511

This valve is normally open and must remain open to allow RCIC flow to the reactor core.

HPCI/RCIC Test Return Redundant Shutoff Valve MO-2316 and RCIC Test Return Valve MO-2515

These valves are normally closed and must remain closed to ensure that rated HPCI/RCIC flow is delivered to the reactor vessel. These valves may be opened during emergency operating procedure (EOP) operations to allow reactor pressure control. These valves are opened to allow system testing.

Core Spray Test Return Valves MO-2112/2132

These valves are normally closed. The valves must remain closed to ensure that full Core Spray flow is delivered to the reactor core, and to ensure that primary containment integrity is maintained. The valves are opened to allow testing of the Core Spray system.

Core Spray Outboard Injection Valves MO-2115/2135

These valves are normally open and must remain open to ensure full Core Spray flow is delivered to the reactor core. The valves are closed to allow testing of the inboard valves.

As indicated above, each of the 17 MOVs has a safety-related function but is normally in its safety position. Therefore, in accordance with the staff guidelines in reviewing GL 89-10 program scope, the licensee needs to address the capability of these MOVs to return to their safety position when intentionally moved to their nonsafety position (for example, during surveillance testing). The licensee would also need to address any containment isolation functions or pipe break isolation requirements for these MOVs.

In lieu of declaring the MOVs inoperable when in their nonsafety position, the licensee demonstrated that the 17 MOVs were capable of returning to their safety position and established administrative controls to maintain the MOVs capable of performing this function. During an inspection conducted November 13 to 17, 1995, at Duane Arnold, the staff verified the licensee's demonstration of the capability of these 17 MOVs and the administrative controls to maintain their capability. In NRC Inspection Report 50-331/95011 (dated January 25, 1996), the staff considered this demonstration of MOV capability and continuing commitment to maintain capability to be sufficient to justify closure of the staff's review of the Duane Arnold GL 89-10 program. As the licensee categorizes these 17 MOVs separate from its GL 89-10 program, the inspectors retained the final disposition of the acceptability of the GL 89-10 scope reduction as an inspection follow-up item.

In a letter to the NRC on March 18, 1996, the licensee specifically committed (1) to maintain the torque switch settings for the 17 MOVs based on their last

diagnostic test and to include evaluation of degraded voltage conditions, (2) to include requirements for determining the MOV torque switch settings in the MOV Program Manual, and (3) to evaluate industry operating experience and data feedback from the Duane Arnold GL 89-10 program to determine if any adjustments to the torque switches are required.

4.0 POSSIBLE LONG-TERM ACTIONS

The staff is developing a new generic letter to request that licensees establish a program, or to ensure the effectiveness of their current programs, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions. The proposed generic letter specifically addresses MOVs placed in their nonsafety position for activities such as surveillance testing.

The proposed generic letter provides information on possible approaches to periodic verification of MOV design-basis capability. For example, a licensee might apply the MOV Performance Prediction Methodology developed by the Electric Power Research Institute (with the conditions and limitations in the NRC staff's SE dated March 15, 1996) to establish bounding thrust requirements for these valves. Alternatively, the MOVs could be grouped with other MOVs in the Duane Arnold GL 89-10 program to minimize testing of the 17 subject MOVs.

Some of these 17 MOVs at Duane Arnold are operated under dynamic conditions as part of their normal operation. Duane Arnold might consider demonstrating that the normal operation of these MOVs combined with analytical consideration of degraded voltage conditions is sufficient to justify the capability of these MOVs to return to their safety position.

Because of the unique aspects of the Duane Arnold technical specifications, the licensee might evaluate the benefits of revising its technical specifications.

5.0 CONCLUSION

Based on the foregoing, the NRC staff concludes that the 17 MOVs are subject to the requirement that they be capable of returning to their safety position (if they are out of the safety position for surveillance or testing) or the provisions of the appropriate Technical Specifications for the systems (trains) out of service are followed. The licensee also needs to address any applicable containment isolation or pipe break isolation requirements for these MOVs.

The staff considers the commitments as discussed in NRC Inspection Report 50-331/95011, and the licensee's letters of March 10, 1995, and March 18, 1996, to provide adequate confidence that the licensee has demonstrated and will maintain the capability of the subject 17 MOVs to return to their safety position under accident conditions. The staff does not object to the 17 MOVs being grouped outside of the Duane Arnold GL 89-10 program. However, if plant or industry information reveal that one of these MOVs is not capable of returning to its safety position, the staff will expect Duane Arnold to take

appropriate action according to its technical specifications when that MOV is placed in its nonsafety position. Further, the staff will expect the licensee to periodically evaluate the capability of these MOVs to return to their safety position as part of its long-term MOV program.

Principal Contributors: T. Scarbrough, NRR/DE
G. Golub, NRR/DSSA