

NOTICE OF DEVIATION

IES Utilities, Incorporated
Duane Arnold Energy Center

Docket No. 50-331
License No. DPR-49

During an NRC inspection conducted on November 29 through December 9, 1993, a deviation of your commitments to the NRC with regard to Generic Letter (GL) 89-10 was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Action," 10 CFR Part 2, Appendix C, the deviation is listed below:

The licensee's December 28, 1989 response to GL 89-10 indicated the intent to meet GL 89-10 recommendations which included performing differential pressure (dp) tests where practicable and submitting any changes to scheduled commitments to the NRC staff.

Contrary to the above, as of November 29, 1993, the dp/full flow test scope was significantly reduced in that the licensee was no longer performing design-basis dp/full flow tests where practicable and furthermore, did not inform the NRC staff. The test program scope was not consistent with commitments to GL 89-10. (50-331/93019-02(DRS))

Please provide to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with a copy to the Regional Administrator, Region III, and a copy to the NRC Resident Inspector, in writing within 30 days of the date of this Notice, the reasons for the deviation, the corrective steps which have been taken and the results achieved, the corrective steps which will be taken to avoid further deviations, and the date when your corrective action will be completed. Where good cause is shown, consideration will be given to extending the response time.

Dated at Lisle, Illinois this
14th day of January, 1994.

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/93019(DRS)

Docket No. 50-331

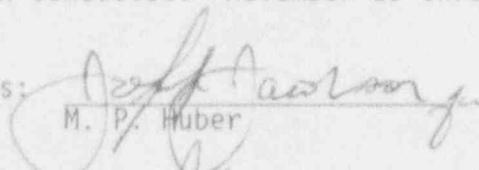
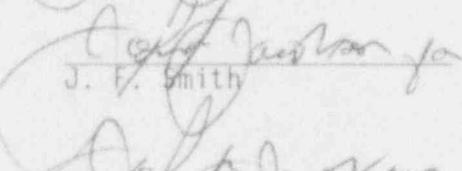
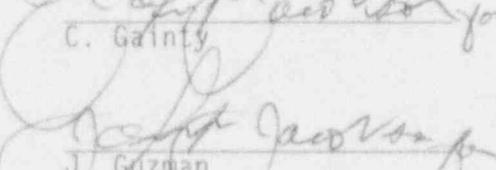
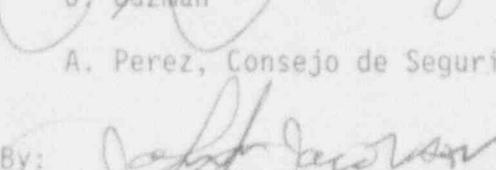
License No. DPR-49

Licensee: IES Utilities, Incorporated
IE Towers
P. O. Box 351
Cedar Rapids, IA 52406

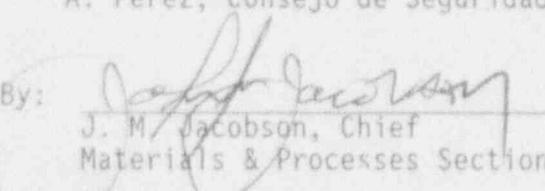
Facility Name: Duane Arnold Energy Center

Inspection At: Palo, Iowa

Inspection Conducted: November 29 through December 9, 1993

Inspectors:  1-11-94
M. P. Huber Date
 1-11-94
J. F. Smith Date
 1-11-94
C. Gainty Date
 1-11-94
J. Guzman Date

Observer: A. Perez, Consejo de Seguridad Nuclear, Spain

Approved By:  1-11-94
J. M. Jacobson, Chief Date
Materials & Processes Section

Inspection Summary

Inspection conducted November 29 through December 9, 1993 (Report No. 50-331/93019(DRS)).

Areas Inspected: Announced safety inspection of the implementation of the licensee's response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve (MOV) Testing and Surveillance" (2515/109).

Results: The inspection disclosed significant weaknesses in the implementation of the GL 89-10 program. Two violations (Sections 2.3, 3.7, and 3.7.3), one non-cited violation (Section 3.7.1), one deviation (Section 3.2) and three unresolved items (Sections 3.3.2, 3.7.2 and 3.11.3) were identified.

The licensee demonstrated a strength in the area of testing initiatives such as the lubrication degradation and AC motor testing programs.

TABLE OF CONTENTS

	<u>Page</u>
1.0 Persons Contacted.....	4
2.0 Licensee Action on Previous Inspection Findings.....	5
3.0 Inspection of the Implementation of the Program Developed in Response to Generic Letter 89-10.....	5
3.1 Program Scope.....	5
3.2 Differential Pressure (dp) Testing Scope.....	5
3.3 Design Basis Reviews.....	7
3.3.1 Differential Pressure and Flow Requirements.....	7
3.3.2 Degraded Voltage Calculations.....	7
3.4 MOV Brakes.....	7
3.5 MOV Switch Settings.....	8
3.6 Schedule.....	8
3.7 Design Basis Capability.....	8
3.7.1 MOV Testing Reviews.....	9
3.7.2 Feedback of Test Data to Parallel Train Valves.....	9
3.7.3 Evaluating Nonconforming Conditions.....	10
3.8 Evaluation of Test Data and VOTES Traces.....	10
3.9 Periodic Verification of MOV Capability.....	10
3.10 MOV Failures, Corrective Actions and Trending.....	10
3.11 Associated Reviews.....	10
3.11.1 Maintenance.....	10
3.11.2 Walkdown.....	11
3.11.3 Pressure Locking and Thermal Binding.....	11
3.11.4 Training.....	11
4.0 Licensee Self-Assessment.....	12
5.0 Unresolved Items.....	12
6.0 Exit Meeting.....	12

DETAILS

1.0 Persons Contacted

IES Utilities, Incorporated (IE)

- * J. Franz, Vice President, Nuclear
- * G. Van Middlesworth, Assistant Plant Superintendent, Operations and Maintenance
- * K. Peveler, Manager, Corporate Quality Assurance
- * M. McDermott, Manager, Engineering
- * J. Bjorseth, Maintenance Superintendent
- * B. Wohlers, Motor-Operated Valve (MOV) Program Manager
- * P. Bessette, Regulatory Compliance Supervisor
- * B. Murrell, Regulatory Compliance
- * M. Fairchild, MOV Coordinator, Engineering
- * C. McDonald, MOV Coordinator, Maintenance
- * R. Mayhugh, Electrical Engineer
- * B. Turnbull, Maintenance Engineer
- * T. Gordon, Electrical Maintenance Supervisor
- * L. Heckert, Regulatory Communications
- * J. Kinsey, Licensing Supervisor
- * D. Lausar, Project Engineering Supervisor
- * J. Kozman, Engineering Supervisor
- * N. N. Sikka, Electrical Engineering Supervisor
- * T. Sims, Technical Support Specialist
- * D. Robinson, Regulatory Communications
- * T. Erger, Systems Engineering Group Leader
- * C. Bleau, Systems Engineering Supervisor
- * A. J. Roderick, Test and Surveillance Supervisor
- * S. Catron, Licensing
- * R. Mitchell, Quality Assurance
- * H. Ahn, Safety Analysis
- * K. Chen, Mechanical Engineering
- * D. Wiley, Mechanical Engineering
- * R. Howe, Quality Assurance Engineer
- * D. P. Blair, Quality Assurance Assessment Supervisor
- * B. Klotz, Quality Assurance Group Leader
- * B. Bernier, Mechanical Engineering Supervisor
- * R. Baldyga, Maintenance Engineering Supervisor

U. S. Nuclear Regulatory Commission (NRC)

- * R. M. Pulsifer, Project Manager
- * J. A. Hopkins, Senior Resident Inspector

* Denotes those attending the exit meeting on December 9, 1993.

2.0 Licensee Action on Previous Inspection Findings (92701)

2.1 (Closed) Unresolved Item (50-331/92011-02(DRS)): Establish critical torque switch setting requirements and verify in-plant torque switch settings. The licensee satisfactorily completed the necessary design basis calculations and performed the required verifications.

2.2 (Closed) Unresolved Item (50-331/93015-03(DRP)): This item addressed the licensee's corrective actions related to the high pressure coolant injection (HPCI) outboard isolation valve, MO2239, failure described in LER 50-331/93009. Actions taken to resolve the problems associated with the failure were reviewed during the inspection. As a result of the review, a violation was issued for performing tests which did not incorporate appropriate acceptance limits, as discussed in section 2.3 below.

2.3 (Closed) Licensee Event Report 93009 (50-331/93009-LL): HPCI steam supply isolation valve tripped its supply breaker due to inappropriate torque switch setting. The torque switch setting had been changed to provide increased thrust within the allowable thrust window, but the acceptance criteria included no provision for controlling the maximum current permitted or for ensuring that the motor would not stall prior to torque switch trip.

The licensee revised the test procedure to include acceptance criteria to prevent a recurrence of the overcurrent trip. However, the revised procedure did not ensure that the actuator motor was capable of operating the valve under design basis conditions including degraded voltage. The licensee indicated that motor capability would be addressed in the test procedure acceptance criteria. Static testing performed in accordance with test procedures which did not incorporate appropriate acceptance limits for determining operability was considered a violation of 10 CFR 50 Appendix B, Criterion XI (50-331/93019-01a(DRS)). This LER was closed.

3.0 Inspection of the Implementation of the Program Developed in Response to Generic Letter 89-10

3.1 Program Scope

Two MOVs, MO4629 and MO4630, were removed from the GL 89-10 program since they do not perform an active safety function. The inspectors reviewed the removal justification and found it adequate. A total of 105 MOVs remain in the DAEC GL 89-10 program.

3.2 Differential Pressure (dp) Testing Scope

The dp test program scope was reduced from 95 MOVs, planned at the time of the Part 1 inspection, to 23 MOVs. This revised scope was not consistent with the licensee's GL 89-10 commitments and the NRC's understanding of these commitments as indicated during the Part 1 inspection performed June 16 through 26, 1992.

The change in program scope to no longer perform design basis dp and flow testing where practicable, as committed to in the licensee's acceptance of the

recommendations of the GL 89-10, was considered a deviation (50-331/93019-02(DRS)).

Ten dp tests had been completed at the time of the Part 2 inspection. Thirteen additional tests were scheduled to be performed prior to the completion of the program.

The licensee has excluded MOVs from dp testing using reasons that are not necessarily addressed in the guidance of the GL. The inspectors considered the justifications to be incomplete and will review the exclusions during a future inspection. The reasons for exclusion from the dp test program included:

- 1) Oversized MOVs.
- 2) MOVs routinely operated at greater than 80% of the design-basis dp.
- 3) Maximum achievable test dp's were less than 80% of the design-basis dp.

Oversized MOVs. The licensee provided documentation (Appendix F. of the MOV Program Plan, Rev. 2) to justify the exclusion of "oversized" MOVs. In certain cases, it may be reasonable to exclude an MOV from dp testing when the valve is significantly oversized even if the valve can practicably be dp tested. However, dp testing could provide additional assessment capabilities and data for valves that cannot be dynamically tested.

The essence of the justification is that a valve factor of 1.0 for gate valves and 1.6 for globe valves encompasses all dp test data. However, out of the five dp tests reviewed, one gate valve dp tested at DAEC had a valve factor exceeding 1.0. Furthermore, use of other assumptions for the stem factor and load sensitive behavior without complete justification (see the MOV Switch Setting section of this report) also call into question whether the chosen factors envelop all MOVs designated as oversized.

MOVs routinely operated at greater than 80% of the design-basis dp. The licensee excluded MOVs from dp testing on the basis that the valve operates at greater than 80% of the DBDP. This approach was not consistent with GL 89-10 recommendations; however, it may be acceptable if the test is not practicable or would not provide useful data or, with small dp loads, when static running loads are comparable to dynamic running loads. The justification provided by the licensee for exclusion of these valves (Appendix H of their MOV Program Plan, Rev. 2) was not supported by test data and ultimately did not address whether a valve that operates at 80% design-basis dp will necessarily operate at 100%.

The licensee intends to generate an Operability Evaluation/Analysis by June of 1994 for all untested valves, however, the NRC was concerned that the relatively small number of dynamic tests may not provide an adequate data base. This issue will be reviewed during a future inspection.

Maximum achievable test dp's were less than 80% of the design-basis dp. Dp testing on valves where the maximum achievable test dp was less than 80% of the design basis dp was not planned by the licensee. This exclusion was addressed in Appendix J of the licensee's MOV Program Plan, Revision 2 and will be reviewed during a future inspection.

3.3 Design Basis Reviews

3.3.1 Differential Pressure and Flow Requirements

The inspectors reviewed the licensee's design basis maximum expected differential pressure calculations and found them to be acceptable.

3.3.2 Degraded Voltage Calculations

The licensee's methodology for calculating MOV capability at degraded voltage could yield incorrect results. The method presumed that the torque necessary to trip the torque switch would require a constant value of power, regardless of motor voltage. This did not correspond to data which could be derived from ac motor performance curves.

Other non-conservative assumptions were used to determine the voltage available for MOV operation at degraded voltage. The licensee used a power factor that was less than the factors published by Limitorque Corporation. Using a low power factor in degraded voltage calculations would give a higher available voltage, and subsequently, greater motor capability than would be calculated using a higher (conservative and bounding) power factor. The Reduced Voltage Factor used by the licensee was calculated based on a lower rated motor voltage, which would provide a higher factor than was actually available. The Reduced Voltage Factor was used in the Limitorque sizing equation if the motor voltage input was less than 90% of the rated motor voltage.

The licensee committed to review their methodology and to ensure that appropriate conservatism existed or to revise the method for evaluating MOV capability at degraded voltage conditions and re-perform the calculations. The inspectors requested that the licensee respond to this issue and include the plans for the revised methodology and schedule for determining degraded voltage conditions and MOV switch settings, based on the revised calculations. This was considered an unresolved item pending future NRC review of the licensee's response (50-331/93019-03(DRS)).

Information from Limitorque's Technical Update 93-03, issued September 1993, was incorporated into the licensee's calculations for evaluating AC motor output. Technical Update 93-03 was issued by Limitorque to provide guidance in addressing a potential 10 CFR 21 condition regarding the reduction in MOV 3-phase AC motor torque output at elevated temperatures.

3.4 MOV Brakes

The inspectors considered the licensee's response to a motor brake manufacturer's technical bulletin to be adequate. The bulletin stated that

the brakes might not operate (release) at less than 90% of rated voltage. The licensee reviewed all MOVs with brakes and found that three fell into the less-than-90% category. Calculations for two of the three were modified to reflect the fact that they did not have to perform their safety function until after the voltage had been restored to at least 90%, therefore these brakes would operate properly. The third could be called on to operate at less than 90% of rated voltage. However, the licensee's calculations demonstrated that the motor would start with the brake on and achieve a running speed which would drop the current and increase the motor voltage to a point at which the brakes would then release.

3.5 MOV Switch Settings

The inspectors noted that additional justification was needed for the generic programmatic assumptions used to determine torque switch settings, such as valve factors, stem friction coefficients, load sensitive behavior, and stem lubrication degradation. Generic program assumptions included a valve factor of 0.5 for gate valves and 1.1 for globe valves; a stem friction coefficient of 0.15; and 15% for load sensitive behavior. No margin for stem lubrication degradation was included based on the licensee's test program (see section 3.11.1).

The inspectors expressed concern that the number of valves that were being dp/full flow tested may not be adequate to justify the generic programmatic assumptions. The licensee committed to verify programmatic assumptions as test results become available. The inspectors will review this area in a future inspection.

3.6 Schedule

The licensee planned to accomplish the actions recommended in GL 89-10 in accordance with the recommended schedule. However, based on the work necessary to resolve the issues identified in this report and the limited number of tests that remain indicated that it may be difficult for the licensee to complete the required justifications within the schedule. The inspectors advised the licensee that results of the planned testing needed to be evaluated and incorporated into the program, as necessary, prior to program completion. If a testing schedule extension becomes necessary, the NRC should be notified as soon as possible.

3.7 Design Basis Capability

The inspector reviewed static and dynamic test packages for various MOVs. Dynamic tests were conducted at greater than 80% of design basis conditions and the licensee utilized a straight line extrapolation to determine the output thrust at the design basis dp. The licensee had not performed multi-point testing and did not justify that the extrapolation method was adequate to predict design basis thrust requirements. Therefore, the inspectors considered these tests to be the first stage of the two stage approach where the valves have been setup using the best available data, as recommended by GL 89-10. Justification for the use of a linear extrapolation will be reviewed during a future inspection.

The licensee's review of dynamic test results for the Residual Heat Removal (RHR) drain to radwaste surge tank inboard isolation valve, MO1937, conducted September 16-17, 1993, was not completed. Acceptance criteria in the test required the operability of MO1937 be determined by extrapolation, however, this step of SpTP-187 was not completed, and yet the valve was returned to service. In response to the inspector's concerns, the licensee issued a deviation report and performed the required calculation. The test data extrapolation indicated that MO1937 met the specified criteria. Failure to evaluate and document the data from testing of MO1937, before returning the valve to service, was contrary to 10 CFR 50, Appendix B, Criterion XI, "Test Control," which states, in part, that "test results shall be documented and evaluated to assure that test requirements have been satisfied." This was identified as a violation (50-331/93019-01b(DRS)).

3.7.1 MOV Testing Reviews

In reviewing the test data, the inspectors found the licensee was reviewing previously completed MOV testing using acceptance criteria that appeared to be acceptable. Testing completed prior to the implementation of the criteria currently used was inadequate for evaluating the capability of an MOV to perform under design-basis conditions. Further, the licensee had not evaluated whether the amount of thrust margin between torque switch trip thrust and the thrust required to close the valve was adequate if the test had not been conducted under design basis differential pressure conditions. Also, the licensee had not properly considered the inaccuracy of the diagnostic equipment or the repeatability of the torque switch in evaluating whether adequate margin was available.

Criterion XI, "Test Control," of 10 CFR Part 50, Appendix B, requires licensees to evaluate the results of tests to assure that test requirements have been satisfied. Failure of the DAEC to properly evaluate results from MOV dynamic testing performed as part of its commitment to GL 89-10 constitutes a violation of Criterion XI. However, the licensee identified this violation and it is not being cited because the criteria specified in Section VII.B.2 of the "General Statement of Policy and Procedures for NRC Enforcement Actions," (Enforcement Policy, 10 CFR Part 2, Appendix C) were satisfied. Specifically, the licensee had identified that test acceptance criteria needed revision and developed MOV test evaluation forms to review the results of previous dp and static tests. In addition, the licensee revised plant procedures to incorporate appropriate acceptance criteria in dp and static test procedures.

3.7.2 Feedback of Test Data to Parallel Train Valves

Discussions with the licensee indicated that test data may not have been fed back into calculations for other directly applicable MOVs (such as parallel train MOVs). The results of dynamic testing must be fed back into calculations as soon as practical in order to have maximum confidence in the settings applied to those MOVs which have not been tested dynamically. No concerns with specific valves were noted during the inspection, however, the inspectors requested a response from the licensee addressing this issue. The response should include plans for evaluating the operability of valves in

parallel trains and any potential programmatic changes to ensure that reviews of parallel train valves will be conducted following future tests. This was considered an unresolved item pending NRC review (50-331/93019-04(DRS)).

3.7.3 Evaluating Nonconforming Conditions

When selecting valves for review during the inspection, the inspectors noted that RH, shutdown cooling suction isolation valve M01909 may be marginally capable of performing its design-basis function under degraded voltage conditions. The inspectors noted that M01909 test data reviewed by the licensee in September and again in December 1993, indicated the valve failed to meet minimum closing thrust requirements. Discussion with the licensee identified no action had been taken to address the potentially nonconforming condition.

The licensee apparently lost sight of the fact that the valve was potentially nonconforming in that the valve may not be able to perform its design-basis function, and that timely corrective action should have been taken to address the issue. The inspectors questioned the operability of the valve based on the marginal capability and the licensee's engineering evaluation. The licensee immediately initiated an operability evaluation where conservatism was removed from the switch setting calculations. It was concluded that the MOV would be operable. The inspectors concurred with the licensee's decision.

Failure to take corrective action to address a potentially nonconforming condition is contrary to the requirements of 10 CFR 50, Appendix B, Criterion XVI. This was identified as a violation (50-331/93019-05(DRS)).

3.8 Evaluation of Test Data and VOTES Traces

The inspectors reviewed a sample of traces from the Valve Operational Test Equipment System (VOTES) and found the traces to be appropriately marked and anomalies properly evaluated. The diagnostic equipment program appeared to be acceptable.

3.9 Periodic Verification of MOV Capability

The licensee planned to use static diagnostic testing to periodically verify MOV capability and will rely on information to be provided by the BWR Owner's Group to justify the periodic verification method. This issue will be reviewed during a future inspection.

3.10 MOV Failures, Corrective Actions and Trending

The NRC inspectors reviewed problem reports associated with recent MOV failures. The failures appeared to be properly diagnosed and corrective actions appeared effective. The licensee was trending MOV problems, parameters, and test data.

3.11 Associated Reviews

3.11.1 Maintenance

As determined during the previous MOV inspection, the licensee's lubrication frequency (36 months) was inconsistent with the manufacturer's recommendation (18 months). The licensee embarked upon an extensive program for evaluating the potential deterioration of the stem factor between stem lubrications. This was done by performing VOTES testing both before and after lubrication. Although the program was incomplete, data from 29 MOVs indicated that the original 36 month span was acceptable for MOVs at this plant which operate under the same conditions as the tested MOVs. The performance of such an extensive program to increase understanding of the way MOVs perform and to validate the use of a longer maintenance period was considered a strength.

The licensee was also participating in a AC motor test program. The program was established to review AC motor performance data. The DAEC participation in the test program was considered a strength.

3.11.2 Walkdown

The inspectors performed a general plant inspection as well as a detailed inspection of several MOVs. Valve stems appeared to be well lubricated and the exterior condition of the MOVs appeared to be acceptable. Housekeeping was also found to be reasonable.

3.11.3 Pressure Locking and Thermal Binding

The actions taken to address pressure locking and thermal binding were considered minimal. The licensee did not thoroughly evaluate the potential for pressure locking and thermal binding in MOVs at the DAEC.

More than ten NRC and industry generic communications on pressure locking and thermal binding have been issued since 1977. Included in these are General Electric Nuclear Service Information Letter (SIL) No. 368; NRC Information Notice 92-26; NRC Special Study on Pressure Locking and Thermal Binding of Gate Valves (AEOD/S92-07 dated December 1992); and NUREG-1275, Volume 9.

To date, the licensee's response to industry and NRC guidance in this area was to review records and determine that no previous plant failures had been identified in these areas. A more recent self-assessment in this area disclosed that more work was required but no firm plans had been established by the time of the inspection. Historic data was not considered justification for decisions concerning susceptibility to these problems because some of the conditions for making valves susceptible would be experienced only during an accident. The inspectors requested a response from the licensee addressing plans for performing a more comprehensive review of the potential for pressure locking and thermal binding in MOVs. This is considered an unresolved item (50-331/93019-06(DRS)).

3.11.4 Training

The training program for engineers and technicians performing work on MOVs appeared to be acceptable.

4.0 Licensee Self-Assessment

Overall, the self-assessments were adequate, but it appeared that the concerns identified were not fully appreciated. As part of one of the licensee's self-assessments, DAEC's Quality Assurance (QA) department pointed out a weakness in the plan or mechanism, despite the requirements of the GL 89-10 Program Plan, to accomplish the necessary investigation and documentation of MOV problems that end up becoming classified as MOV failures. The current vehicle used to meet the failure investigation and documentation requirements of the Program is the Deviation Report (DR) and/or the Corrective Maintenance Action Request (CMAR). The present level of detail documented in DRs and CMARs for some MOV failures did not support an effective follow-up investigation. DAEC was in the process of responding to this QA concern.

5.0 Unresolved Items

Unresolved items are matters about which more information was required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. Unresolved items disclosed during this inspection are discussed in Sections 3.3.2, 3.7.2 and 3.11.3 of this report.

6.0 Exit Meeting

The inspectors met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on December 9, 1993. The inspectors summarized the purpose and scope of the inspection and the findings. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.