June 12, 2001

Mr. R. P. Powers
Senior Vice President
Nuclear Generation Group
American Electric Power Company
500 Circle Drive
Buchanan, MI 49107-1395

SUBJECT: D. C. COOK NUCLEAR POWER PLANT -
NRC INSPECTION REPORT 50-315/01-05(DRS); 50-316/01-05(DRS)

Dear Mr. Powers:

On May 18, 2001, the NRC completed a special motor-operated valve program inspection at your D. C. Cook Nuclear Generating Plant, Units 1 and 2. The enclosed report documents the inspection findings which were discussed on May 18, 2001, with Mr. L. Weber and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of the close-out inspection of Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," we have determined that your motor-operated valve program and implementation at D. C. Cook are acceptable, and meet the intent of Generic Letter 89-10. Program documentation and test data provided an adequate basis to conclude that all Generic Letter 89-10 program motor-operated valves would perform the intended safety functions under design-basis conditions. Accordingly, we are closing the NRC review of your Generic Letter 89-10 program. With respect to Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," the majority of the program aspects were determined to be acceptable. However, a specific commitment to implement all three phases of the Joint Owners Group program on motor-operated valve periodic verification is needed to continue to rely on the Joint Owners Group program in response to Generic Letter 96-05.

Based on the results of this inspection, the inspectors identified one issue of very low safety significance (Green). This issue was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because the issue has been entered into your corrective action program, the NRC is treating this issue as Non-Cited Violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this Non-Cited Violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control

Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the D. C. Cook Nuclear Generating Plant.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/NRC/ADAMS/index.html (the Public Electronic Reading Room).

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

/RA/

John M. Jacobson, Chief
Mechanical Engineering Branch
Division of Reactor Safety

Docket Nos. 50-315; 50-316
License Nos. DPR-58; DPR-74

Enclosure: Inspection Report 50-315/01-05(DRS);
50-316/01-05(DRS)

cc w/encl: A. C. Bakken III, Site Vice President
J. Pollock, Plant Manager
M. Rencheck, Vice President, Nuclear Engineering
R. Whale, Michigan Public Service Commission
Michigan Department of Environmental Quality
Emergency Management Division
MI Department of State Police
D. Lochbaum, Union of Concerned Scientists

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-315; 50-316
License Nos:	DPR-58; DPR-74
Report No:	50-315/01-05(DRS); 50-316/01-05(DRS)
Licensee:	American Electric Power Company
Facility:	Donald C. Cook Nuclear Generating Plant
Location:	1 Cook Place Bridgman, MI 49106
Dates:	May 14 through 18, 2001
Inspectors:	A. Dunlop, Reactor Engineer, RIII T. Scarbrough, Senior Mechanical Engineer, NRR
Approved by:	John M. Jacobson, Chief Mechanical Engineering Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000315-01-05(DRS); IR 05000316-01-05(DRS), on 05/14-18/2001, American Electric Power Company, D. C. Cook Nuclear Generating Plant, Units 1 and 2. Motor-Operated Valve special inspection to close-out NRC's review of Generic Letter 89-10, "Safety-Related Motor-Operated Valve (MOV) Testing and Surveillance," and Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves."

The inspection was conducted by one regional reactor engineer and one senior mechanical engineer from the Office of Nuclear Reactor Regulation. The inspection identified one Green finding, which was also a Non-Cited Violation. The significance of most/all findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

- Green. The improperly set relief valves installed as part of a modification in two Unit 2 motor-operated valves was considered a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control."

  The licensee was able to show that the motor-operated valves would not have pressure locked since the installation of the modification by demonstrating that the valve bonnets were not completely filled with water, which would preclude pressure locking. Therefore, this finding was determined to be of very low safety significance. This issue was considered more than minor, because if it was left uncorrected, it could have impacted the function of these valves to provide a source of water for the emergency core cooling pumps during the recirculation phase of a design-basis accident (Section 4OA3.2).

- The inspectors determined the completed and ongoing actions by the licensee to verify the design-basis capability of safety-related motor-operated valves at D. C. Cook in response to Generic Letter 89-10 to be acceptable. Further, the licensee established an Engineering Action Plan to track long-term items identified during implementation of the Generic Letter 89-10 program. The inspectors concluded that the NRC staff's review of the Generic Letter 89-10 program at D. C. Cook can be closed (Section 4OA5.1).

- The inspectors concluded that the licensee needed to provide a specific commitment to implement all three phases of the Joint Owners Group program on motor-operated valve periodic verification to continue to rely on the Joint Owners Group program in response to Generic Letter 96-05. The inspectors determined the remaining aspects of the licensee's Generic Letter 96-05 program were acceptable (Section 4OA5.2).

Report Details

4. OTHER ACTIVITIES (OA)

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

4OA3 Event Follow-Up

.1 Licensee Event Reports

a. Inspection Scope

The inspectors reviewed the corrective actions associated with the following licensee event report.

b. Findings

(Closed) Licensee Event Report (LER) (50-315/99-031-00/01): Valves Required to Operate Post-Accident Could Fail to Open Due to Pressure Locking/Thermal Binding. Several valves associated with this LER were previously addressed in NRC Inspection Report 50-315/00-21; 50-316/00-21. Based on the conclusion documented in Section 4OA3.2 of this report, the actions necessary to resolve the recirculation sump valve issue for both units have been sufficiently completed to verify completion of the corrective actions. This LER is closed.

.2 Unresolved Items

a. Inspection Scope

The inspectors reviewed the corrective actions associated with the following unresolved item.

b. Findings

(Closed) Unresolved Item (50-316/00-21-02): This unresolved item concerned the safety significance of the potential pressure locking of the recirculation sump to residual heat removal/containment spray pump suction valves. During the extended shutdown, the licensee had determined based on the results of motor-operated valve (MOV) calculations, that the recirculation sump valves had the potential to pressure lock during a design-basis accident. The pressure locking would prevent the MOVs from opening and providing a water source to the emergency cooling water system pumps, which would be necessary to mitigate the accident during the recirculation phase. This issue was documented in the LER discussed above. Based on a review of the LER by NRR that was documented in NUREG-1728, Volume 2, “Assessment of Risk Significance Associated With Issues Identified at D.C. Cook Nuclear Power Plant (Appendices),” in the event in which these valves were to pressure lock, the safety significance as determined by the Significance Determination Process (SDP) would have been a Yellow finding.

As part of the corrective actions for the LER, the licensee installed an equalizing line modification on the recirculation sump valves, which would prevent the build-up of pressure in the valves' bonnet. The equalizing line connected the valve bonnet to the downstream piping. The line consisted of a relief valve and two manual isolation valves. Per the modification, the relief valves were to be set at 20 psig. During the Unit 1 startup inspection, the inspectors determined that the licensee failed to set the pressure for the relief valves for both units. Since the licensee was unable to determine the set pressure of the relief valves for the operating Unit 2 plant, an operability determination was completed to allow continued plant operation. The determination showed that the Unit 2 valves would not have pressure locked since the installation of the equalizing line modification by demonstrating that the recirculation sump valve bonnets were not completely filled with water. Without the valve bonnets filled with water, the potential for pressure locking was greatly reduced. To ensure continued operability, the licensee verified on a periodic basis that the valve bonnets were not full of water by draining water from the bonnets. This was normally accomplished after the valves were operated for testing.

The initial long-term corrective actions were based on calculations to show that these valves would have sufficient thrust capability to overcome the potential pressure locking scenario that the valves would be expected to see such that the relief valves previously installed would no longer need to be credited for Unit 2. Based on discussions with the inspectors concerning this action, the licensee concluded that the equalizing line modification with properly set relief valves would be the long-term corrective action for addressing the pressure locking concern for these valves. The relief valves were scheduled to be set during the upcoming fall refueling outage. Condition Report (CR) 01138012 was initiated to track completion of this action.

Although the licensee had operated Unit 2 for approximately 5 months with this design change installed, based on the determination discussed above that concluded the valves would not have pressure locked, the significance of this issue was reduced. Therefore, this finding was determined by the SDP to be of very low safety significance (Green) and within the licensee's response band. 10 CFR 50, Appendix B, Criterion III, "Design Control," required that design control measures be provided for verifying or checking the adequacy of design, such as a suitable test program. Contrary to the above, as o9f June 12, 2000, the licensee failed to verify the set points of the relief valves for the equalizing line design change when the system was required to be in service. This is considered a design control violation. However, because of the very low safety significance of the item and because the licensee has included this item in their corrective action program (CR 00321040), this violation is a Non-Cited Violation (NCV 50-316/01-05-01) in accordance with Section VI.A.1 of the NRC's Enforcement Policy. This issue was considered more than minor, because if it was left uncorrected, it could have impacted the safety function of these valves to provide a source of water for the emergency core cooling pumps during the recirculation phase of a design-basis accident. This unresolved item is closed.

4OA5 Other

.1 Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," Program Implementation (62708 [Temporary Instruction 2515/109])

a. Inspection Scope

This inspection activity evaluated the process for qualifying the design-basis capability of motor-operated valves (MOVs). The inspectors reviewed the GL 89-10 Program Valve Matrix to verify that all the MOVs had a positive design margin. The inspection concentrated on MOVs based on a combination of low margin, risk importance, or other unique valve characteristics. A valve sample that included several program closure methods used by the licensee was selected to verify design-basis capability. The inspectors reviewed thrust calculations, differential pressure calculations, set-up calculations, Electric Power Research Institute (EPRI) MOV Performance Prediction Methodology (PPM) engineering evaluations, and other design-basis documents for the following MOVs:

1-WMO-906	North Essential Service Water Pumps Discharge Cross-tie to Unit 2 [Henry Pratt symmetrical disc butterfly valve]
2-WMO-906	North Essential Service Water Pumps Discharge Cross-tie to Unit 1 [Henry Pratt symmetrical disc butterfly valve]
2-ICM-251	Boron Injection Tank Train 'B' Outlet Containment Isolation [Anchor-Darling double-disc gate valve]
2-IMO-128	Residual Heat Removal Hot Leg Isolation [Copes-Vulcan double-disc gate valve]
2-IMO-255	Boron Injection Tank Train 'A' Inlet Shutoff [Anchor-Darling double-disc gate valve]
2-IMO-256	Boron Injection Tank Train 'A' Inlet Shutoff [Anchor-Darling double-disc gate valve]
2-IMO-270	Safety Injection Pumps Discharge Crosstie Train 'B' Shutoff [Walworth flex wedge gate valve]
2-IMO-275	Safety Injection Pumps Discharge Crosstie Train 'B' Shutoff [Walworth flex wedge gate valve]
2-IMO-314	East Residual Heat Removal Pump PP-35E Discharge Cross-tie Shutoff [Walworth flex wedge gate valve]
2-IMO-315	East Residual Heat Removal and North Safety Injection to Reactor Coolant Loops #1 and #4 Hot Legs Shutoff [Walworth flex wedge gate valve]
2-IMO-324	West Residual Heat Removal Pump PP-35W Discharge Crosstie Shutoff [Anchor-Darling double-disc gate valve]
2-IMO-325	East Residual Heat Removal and North Safety Injection to Reactor Coolant Loops #1 and #4 Hot Legs Shutoff [Walworth flex wedge gate valve]
2-IMO-326	East Residual Heat Removal and North Safety Injection to Reactor Coolant Loops #1 and #4 Hot Legs Shutoff [Walworth flex wedge gate valve]
2-QCM-350	Reactor Coolant System Pump Seal Water Return Train 'B' Containment Isolation [Anchor-Darling flex wedge gate valve]

The inspectors also reviewed other licensee documentation used to justify program assumptions, such as stem friction coefficient and load sensitive behavior. Additional aspects reviewed included MOV program documentation, MOV tracking and trending program, a self-assessment, performance assurance field observations, and Engineering Action Plan 00-365, "MISC/MOV Engineering Action Plan," which addressed the long-term issues with respect to the MOV program. A sample of MOV condition reports were reviewed to verify that the threshold for identification of problems was at an appropriate level and the associated corrective actions were appropriate. The inspectors also reviewed the licensee's resolution of the pressure locking concern associated with the recirculation sump to residual heat removal/containment spray pumps suction valves. Further, the inspectors reviewed the specific concerns identified during the previous GL 89-10 program inspections (Inspection Reports 50-315/98020; 50-316/98020, 50-315/2000002; 50-316/2000002, and 50-315/00-21; 50-316/00-21).

b. Findings

Generic Letter 89-10 Program

The GL 89-10 program was described in procedure 12 EHP 5074 MOV.00.1, "Motor-Operated Valve Program," which defined the methodologies, procedures, and controls established to ensure the capability of the MOVs within the scope of GL 89-10 to perform their intended functions under all design-basis operating and accident conditions. In a letter dated December 15, 2000, the licensee notified the NRC that it had completed the implementation of the GL 89-10 program at D. C. Cook to verify the design-basis capability of its safety-related MOVs.

Program Scope

The GL 89-10 program consisted of 113 MOVs in each reactor unit, including 56 gate valves, 24 globe valves, and 33 butterfly valves. The licensee established the program scope using a five-question process (such as its safety-related status) and an expert panel review. The inspectors did not identify any concerns with the scope of the GL 89-10 program.

Design-Basis Capability

The licensee used the EPRI MOV PPM where applicable in establishing the design-basis operating requirements for its GL 89-10 MOVs. In determining the MOV operating requirements, the licensee addressed the conditions and limitations specified for the use of the EPRI MOV PPM in the NRC safety evaluation (dated March 15, 1996) and its supplement (dated February 20, 1997) accepting the methodology. Where the EPRI MOV PPM was not directly applicable to specific MOVs, the design-basis operating requirements for those MOVs were established using alternate methods. For example, the licensee justified the use of the EPRI MOV PPM as best available data for some MOVs. For some other MOVs, the licensee applied prototype data from a test facility to establish the operating requirements. In MOV Engineering Action Plan, a long-term action item was included to monitor industry information that might be applicable to the operating requirements for GL 89-10 MOVs evaluated by methods other than the EPRI MOV PPM.

The licensee used updated methodologies to determine the output capability of the MOVs within the scope of GL 89-10. In particular, the output capability of ac-powered MOVs was evaluated using the updated methodology in Limitorque Technical Update 98-01 or an alternative method originally based on motor testing conducted by Commonwealth Edison Company (ComEd). In response to concerns raised during previous inspections, the licensee provided additional support for its use of ComEd tests of 460 volt ac-motors to predict the performance of the 550/575 volt ac-motors installed at D.C. Cook. The evaluation reviewed the performance of 29 new and 17 rewound 550/575 volt ac-motors, which confirmed the use of its KCI/ComEd method for predicting the performance of the 550/575 volt ac-motors at D. C. Cook. The licensee re-evaluated (or was in the process of re-evaluating) the output capability and stroke time of most of its dc-powered GL 89-10 MOVs using a methodology recently developed by the Boiling Water Reactor Owners Group (BWROG). This was accomplished by comparing the results of the previous method for predicting the performance of dc-powered MOV motor actuators and the new BWROG methodology. The licensee initiated CR 01138015 to update the guidance for performing MOV calculations to reflect the new dc-powered MOV output methodology.

For the GL 89-10 program, a stem friction coefficient of 0.2 was assumed as the design value. Data obtained from static diagnostic testing of 70 MOVs at D. C. Cook was evaluated to support the 0.2 design assumption. The inspectors questioned the use of the same stem friction coefficient assumption for both gate and globe valves since noted differences had been seen at other plants. The licensee performed a preliminary comparison of the test data that supported combining the stem friction coefficient for gate and globe valves. An action item was included in the MOV Engineering Action Plan to perform a detailed evaluation on this issue as long-term action.

Load sensitive behavior (rate of loading) in the performance of an MOV can cause the thrust delivered by the motor actuator under dynamic conditions to be lower than the thrust delivered under static conditions at the same torque output. For closing valve strokes controlled by the torque switch, the licensee applied the recommendations of the EPRI MOV PPM for the random and bias portions of the uncertainty resulting from load sensitive behavior in its MOV calculations. Where actual MOV test data was used to determine the stem friction coefficient under static conditions, the licensee applied the recommendation of the EPRI MOV PPM for the potential increase in the stem friction coefficient under dynamic conditions as a result of load sensitive behavior. For opening valve strokes and closing valve strokes controlled by the limit switch, the 0.2 design value for stem friction coefficient was assumed to bound the potential increase in stem friction coefficient that might result from load sensitive behavior. As part of the long-term MOV program, the licensee would be monitoring the stem friction coefficient and, where available, load sensitive behavior for its GL 89-10 MOVs to ensure that its program assumptions remain valid.

The licensee assumed that the 0.2 design value for stem friction coefficient would bound the potential degradation of the stem lubricant with age and service. A stem lubrication interval of each refueling cycle was established for GL 89-10 MOVs to help minimize stem lubricant degradation. Where actual test data for a particular MOV was used to determine the stem friction coefficient, the licensee applied a five percent margin for potential stem lubricant degradation in the MOV setup calculation.

In its letter dated May 4, 2000, the licensee described the planned enhancements to the electrical distribution system at D. C. Cook to support the assumption of 93.8 percent grid voltage as the starting point for its MOV degraded voltage calculations. Most of those planned actions have been completed. The installation of the auto load tap change transformers was scheduled for the Unit 1 refueling outage in May 2002, and the Unit 2 refueling outage in spring 2003. These modifications will allow the second level undervoltage relay to be set consistent with the assumption of 93.8 percent as the starting point for the MOV actuator output calculations.

As part of completing the GL 89-10 program, the licensee identified the need for improvements to its training program for personnel involved with MOV activities. These ongoing MOV training improvements were included in the MOV Engineering Action Plan.

During a previous inspection, a significant number of MOVs in the GL 89-10 program were noted to have low margin in the capability to perform their safety functions. The licensee has scheduled a significant number of MOV modifications for the next refueling outages to improve capability margin of its GL 89-10 MOVs. A Margin Improvement Program was also established where GL 89-10 MOVs determined to have less than five percent margin in the design-basis capability were evaluated for further action. The margin improvement activities consider reduction in unnecessary conservatism in design assumptions, improvement of test techniques or equipment to reduce diagnostic uncertainty, and modification of the valve or motor actuator. In addition, a ten percent margin was applied where possible in specific MOV calculations. The inspectors did not identify any concerns during the review of the MOV calculations or the margin improvement plans.

MOV Performance Trending

As specified in the MOV Program procedure, the licensee will trend MOV test parameters to ensure that program assumptions remain valid. The specific parameters to be trended include as-found and as-left stem friction coefficients; MOV capability margin; motor current and voltage (or motor power); gate valve pullout force; running load for valve opening and closing strokes; and butterfly valve seating torque. An MOV evaluation report to identify performance trends will be prepared after each refueling outage or at least every two years through a review of MOV failure and deficiency data, diagnostic test results, and industry data. The licensee will obtain MOV failure and deficiency data from condition reports and job orders, including such items as number of valves tested, valve failures, valve modifications, valve preventative maintenance, and comparison to previous reports. An action item was included in the MOV Engineering Action Plan to prepare guidance for the implementation of its MOV trending activities.

Condition Reports

During the review of condition reports, the inspectors noted several cases where it was difficult to determine the resolution of the issue. For example, the failure of the auxiliary feedwater trip and throttle valve to stroke within its required time was documented on CR 00349005, however, no corrective actions were identified. After discussions with the licensee, it was determined the issue was resolved via a work order/job order, which was

not referenced in the CR. In another case, when 1-FMO-231 did not operate on several tries from control room as documented on CR 00339035, it did not appear that any corrective actions were taken as the referenced job order was rejected. The CR stated it was an operational line-up problem, which was not explained in the CR, nor was the licensee able to explain during the inspection. Subsequent to the inspection, the licensee stated there was a repetitive failure of the valve, which was documented on CR 00346053. The cause of the valve failure was hardened grease that prevented an electrical contactor in the valve breaker from functioning properly. These examples showed a need to ensure the issues were adequately resolved, and in cases where multiple documents were used to resolve the issue, there were adequate references to the additional documents.

Conclusion

The inspectors determined the completed and ongoing actions by the licensee to verify the design-basis capability of safety-related MOVs at D. C. Cook in response to GL 89-10 to be acceptable. Further, the licensee established an MOV Engineering Action Plan to track long-term items identified during implementation of the GL 89-10 program. The inspectors concluded that the NRC staff's review of the GL 89-10 program at D. C. Cook can be closed.

.2 Implementation of Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves"

a. Inspection Scope (TI 2515/140)

Generic Letter (GL) 96-05 requested licensees to establish programs to verify through periodic testing that safety-related MOVs were capable of performing their safety functions within the current licensing basis. Prior to the inspection, the licensee responded to the recommendations of GL 96-05 in letters to the NRC dated November 7, 1996, April 18, 1997, January 11, 2000, and December 15, 2000.

A three-phase MOV periodic verification program developed by the Joint Owners Group (JOG) was reviewed by the NRC staff and determined to be acceptable with certain conditions and limitations documented in a safety evaluation report (dated October 30, 1997). In its January 11, 2000, letter, the licensee discussed participating in the JOG program plan. This inspection evaluated whether D. C. Cook's program was committed to the JOG plan or whether the licensee intended to establish an alternative plan which was consistent with the licensee's commitments and with the recommendations of GL 96-05. The inspection was conducted through reviews of documentation and interviews with licensee personnel. The inspectors selected a sample of MOVs (see paragraph 4OA5.1.a.) considering dynamic test availability, valve type, and risk significance to evaluate program implementation.

b. Findings

Generic Letter 96-05 Program

In its letter dated December 15, 2000, the licensee provided a summary description of the MOV periodic verification program established at D.C. Cook in response to GL 96-05. The MOV Program procedure stated that the MOV periodic verification program will 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. The program will ensure that changes in required performance resulting from degradation can be properly identified and resolved.

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 also requested that licensees address safety-related MOVs that were 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) was not declared inoperable when the MOVs were in their non-safety position. The scope of the GL 96-05 program was the same as the scope of the GL 89-10 program. In its letter dated December 15, 2000, the licensee indicated that a preliminary review did not reveal any additional MOVs to be addressed as a result of this GL 96-05 recommendation. However, the licensee committed in its letter to confirm, prior to the next refueling outage for each reactor unit, that the population of the MOV periodic verification program was in accordance with the GL 96-05 recommendations.

GL 89-10 Long-Term Items

The MOV Engineering Action Plan was established to track the completion of long-term items that were identified during the completion of the GL 89-10 program. These long-term items included (1) obtaining information to address limitations and conditions for use of the EPRI MOV PPM in determining valve operating requirements specified in the NRC safety evaluation; (2) obtaining industry information regarding operating requirements for MOVs determined by methods other than the EPRI MOV PPM, such as where the EPRI MOV PPM could only be used as best available data; (3) implementing margin improvement activities for specific MOVs with a capability margin determined to be less than five percent; and (4) implementing a tracking and trending program for quantitative and qualitative aspects of MOV performance.

Design-Basis Assumptions

The MOV program procedure specified that the MOV periodic verification process provided assurance that the design inputs to the MOV calculations remain valid. As such, the licensee would address new information as it becomes available. Information sources included plant diagnostic tests, industry testing, NRC and vendor notices, JOG, and MOV Users Group. The inspectors found that the licensee was maintaining its design-basis assumptions up-to-date, including revision of its MOV calculations to reflect recent actuator output methodologies for ac-powered and dc-powered MOVs.

Joint Owners Group (JOG) Program on MOV Periodic Verification

In its letter dated December 15, 2000, the licensee stated that it was participating in the JOG program on MOV periodic verification established in response to GL 96-05. The JOG program consists of three phases: (1) interim static diagnostic testing with specific MOV test frequencies based on margin and risk significance; (2) repetitive dynamic diagnostic testing of a sample of MOVs over a five year period; and (3) long-term periodic verification testing based on the results of the dynamic test data.

The MOV Program procedure indicated that the licensee had completed Phase 1 of the JOG program, was participating in Phase 2 of the JOG program, and will evaluate and respond to the final recommendations in Phase 3 of the JOG program, when available and as applicable to the D. C. Cook MOV population. The inspectors determined that the licensee had not made a specific commitment to implement all three phases of the JOG program. The licensee stated that it would submit an update to its December 15, 2000, letter to provide a specific commitment to all three phases of the JOG program. As part of its GL 96-05 program, the licensee was addressing the conditions and limitations for the use of the JOG topical report on MOV periodic verification specified in the NRC safety evaluation.

As part of the JOG program, an interim static diagnostic testing program was established for GL 96-05 MOVs based on margin and risk significance. The licensee applied an initial MOV risk ranking in determining the MOVs' static diagnostic test intervals. In its letter dated December 15, 2000, the licensee committed to complete a final risk ranking using the Westinghouse Owners' Group (WOG) methodology by December 31, 2001, and to adjust the MOV test frequencies accordingly. The NRC staff reviewed and accepted the WOG methodology for risk ranking MOVs with certain conditions and limitations in a safety evaluation dated April 14, 1998. Based on plant-specific information, the licensee increased MOV capability verification for some MOVs beyond those recommended by the JOG program test matrix. For example, the power-operated relief valve (PORV) block valves were overhauled and tested every refueling cycle because of high ambient temperatures.

As part of its participation in Phase 2 of the JOG program, static and dynamic diagnostic tests were conducted on four butterfly valves (1-WMO-721, 723, 725, and 727). The licensee provided the test information to JOG and plans to conduct limited follow-up activities.

The MOV Program procedure described the evaluation of the applicability of the JOG program to the GL 96-05 MOVs. The procedure stated that MOVs sized and set using the EPRI MOV PPM were considered adequate to the end of plant life. The inspectors stated that although these MOVs may be considered to have high margin, they remain within the scope of the GL 96-05 program for periodic verification. For MOVs not applicable to the JOG program, the MOV program specified that a separate effort would be established for periodic verification for those MOVs, materials, and service conditions.

MOV Actuator Output

The licensee will monitor and maintain the output capability of its GL 96-05 MOVs by a combination of periodic testing and preventive maintenance. For example, “as found” and “as left” testing will be performed to determine changes in MOV performance between preventive maintenance intervals. The licensee will trend MOV output performance parameters such as thrust and torque delivered at control switch trip, stem factor (or stem friction coefficient), and motor inrush and running current. Periodic maintenance activities will be conducted, such as lubrication of valve stems of the GL 96-05 MOVs every refueling cycle.

The licensee updated its MOV calculations to resolve the industry-wide concerns regarding the output of ac-powered MOVs. The licensee applied the guidance for predicting the output of ac-powered MOVs provided in Limitorque Technical Update 98-01 or by the KCI/ComEd alternate method. Action items were established to modify numerous MOVs to reflect updated calculations for MOV operating requirements and actuator output.

The licensee had completed or was in the process of revising calculations for the prediction of the output of most dc-powered GL 96-05 MOVs. The revised calculations apply a methodology recently developed by the BWROG to resolve concerns regarding past industry guidance for predicting the output and stroke time of dc-powered MOVs. The licensee had not identified any capability issues resulting from the implementation of the updated methodology for dc-powered MOV output.

Conclusion

The inspectors concluded that the licensee needed to provide a specific commitment to implement all three phases of the JOG Program on MOV Periodic Verification to continue to rely on the JOG program in response to GL 96-05. Based on the review and above discussions, the inspectors determined the remaining aspects of the licensee’s GL 96-05 program to be acceptable.

4OA6 Management Meetings

Exit Meeting Summary

The inspector presented the inspection results to Mr. L. Weber and other members of licensee management and staff on May 18, 2001. The licensee acknowledged the information presented and did not identify any as proprietary.

KEY POINTS OF CONTACT

Licensee

M. Barfelz, Regulatory Affairs
E. Forbis, Engineering Supervisor Predictive/MOV/AOV
J. Forsythe, MOV Engineer
R. Gaston, Regulatory Affairs
J. Gebbie, Manager, Production Engineering
S. Greenlee, Director, Design Engineering & Regulatory Affairs
S. Lacey, Director, Plant Engineering
L. Lorati-Thurston, MOV Project Manager
J. Molden, Director, Maintenance
T. Noonan, Director, Performance Assurance
J. Pollock, Plant Manager
M. Rencheck, Vice President, Engineering
C. Swanner, MOV Engineering (MPR)
L. Weber, Manager, Operations

NRC

B. Bartlett, Senior Resident Inspector
J. Maynen, Resident Inspector
K. Coyne, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-316/01-05-01	NCV	Failure to Properly Set Relief Valves Installed in Unit 2 Motor-Operated Recirculation Sump Suction Isolation Valves During a Design Change

Closed

50-315/99031-00/01	LER	Valves Required to Operate Post-accident Could Fail to Open Due to Pressure Locking/Thermal Binding
50-316/00-21-02	URI	Operation of Unit 2 with an Inadequate Design Change for the Motor Operated Recirculation Sump Suction Isolation Valves
50-316/01-05-01	NCV	Failure to Properly Set Relief Valves Installed in Unit 2 Motor-Operated Recirculation Sump Suction Isolation Valves During a Design Change

LIST OF ACRONYMS USED

ac	Alternating Current
BWROG	Boiling Water Reactor Owners Group
CFR	Code of Federal Regulations
ComEd	Commonwealth Edison Company
CR	Condition Report
dc	Direct Current
DRS	Division of Reactor Safety
EPRI	Electric Power Research Institute
FIN	Finding
GL	Generic Letter
IMC	Inspection Manual Chapter
IR	Inspection Report
JO	Job Order
JOG	Joint Owners Group
KCI	Kiran Consulting Incorporated
LER	Licensee Event Report
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
OA	Other Activities
PARS	Publicly Available Records
PORV	Power-Operated Relief Valve
PPM	Performance Prediction Methodology
SDP	Significance Determination Process
URI	Unresolved Item
WOG	Westinghouse Owners' Group

LIST OF DOCUMENTS REVIEWED

4OA Other Activities

12-MHP-5021.001.034	Safety Valve Bench Testing	Revision 8
12-EHP-5074.MOV.001	Motor-Operated Valve Program	Revision 2
12-EHP-5074.MOV.002	Motor-Operated Valve Setpoint Control	Revision 0
PMI-5074	Motor-Operated Valve Program	Revision 0
	GL 89-10 Program Valve Matrix	May 7, 2001
	MOV Periodic Verification Data, Units 1 and 2	
EAP 00-365	MISC/MOV Engineering Action Plan	May 3, 2001
EAP 00-365	MISC/MOV Engineering Action Plan	May 17, 2001
DIT-B-00834-01	List of MOVs Modeled in the Cook Probabilistic Risk Assessment (PRA)	November 13, 2000
DIT-S-00821-01	Assessment of Operability for 2-ICM-305/306 Under Pressure Locking Conditions	November 24, 2000
1-E-N-AFW-MOV-001	Evaluation of Required Thrust, Stroke Time and Actuator Performance for 1-FMO-211/221/231/241	Revision 1
12-E-N-250D-MOV-001	DC Motor Operated Valve Stroke Time Prediction Validation	Revision 0
EVAL-2-E-N-600AC-MOV-001	Methodology for Calculating AC MOV Actuator Output Capability for Reliance 550 VAC and 575 VAC Motors Using the KCI/ComEd Method	Revision 0
MD-2-CVCS-010-N	Analysis of Thrust and Torque Limits for MOV 2-QCM-350	Revision 4
MD-12-CVCS-009-N	Differential Pressure Calculation - Valves 1/2-QCM-250 and QCM-350	Revision 1
MD-1-MSC-017-N	D.C. Cook Unit 1 GL 89-10 Scope	Revision 0
MD-2-MSC-053-N	D.C. Cook Unit 2 GL 89-10 Scope	Revision 1
MD-12-MSC-006-N	Rising/Rotating Stem Torque/Thrust Requirements Methodology for Motor Operated Globe Valves	Revision 3

MD-12-MSC-007-N	Required Stem Thrust for D.C. Cook GL 89-10 Balanced Globe Valves	Revision 4
MD-12-MSC-008-N	Summary of Instrument Errors Associated with Test Sensors and Methods	Revision 3
MD-12-MSC-009-N	Overview of the Basis for GL 89-10 MOV Torque/Thrust Requirements	Revision 1
MD-12-MSC-016-N	D.C. Cook GL 89-10 Unwedging Methodology	Revision 0
MD-12-MSC-020-N	Guidance for Addressing the Conditions and Limitations of the EPRI MOV Performance Prediction Program	Revision 1
MD-12-MSC-033-N	Pressure Locking/Thermal Binding Screening and Evaluation of Safety-Related Power Operated Gate Valves	Revision 2
MD-12-MSC-047-N	Methodology for the Preparation of DP, Parameter, and Inertia Calculations	Revision 1
MD-12-MSC-061-N	EPRI PPM Evaluation of 1/2-WMO-744, 1/2-WMO-903 and WMO-906	Revision 2
MD-12-MSC-066-N	Methodology for Development of Valve Matrix to Document Operability of Generic Letter 89-10 MOVs	Revision 1
MD- 1-NESW-019-N	Analysis of Thrust and Torque Limits for Motor-Operated Valve 1-WMO-906	Revision 1
MD- 2-NESW-022-N	Analysis of Thrust and Torque Limits for MOV 2-WMO-906	Revision 2
MD-12-NESW-027-N	Differential Pressure Calculation - NESW Valves 1/2-WMO-903 and WMO-906	Revision 2
MD-12-RCP-002-N	EPRI PPM Evaluation of 1/2-QCM-250 and 1/2-QCM-350	Revision 3
MD- 2-RH-013-N	Analysis of Thrust and Torque Limits for MOV 2-IMO-255 and 2-IMO-256	Revision 2
MD- 2-RH-016-N	Thrust and Torque Limits for Motor-Operated Valves 2-IMO-262 and 2-IMO-263	Revision 2
MD-02-RH-018-N	Analysis of Thrust and Torque Limits for 2-IMO-270/275	Revision 1

MD- 2-RH-022-N	Analysis of Thrust and Torque Limits for 2-IMO-314	Revision 2
MD- 2-RH-023-N	Analysis of Thrust and Torque Limits for Motor-Operated Valves 2-IMO-315/316/325/326	Revision 2
MD-02-RH-027-N	Analysis of Thrust and Torque Limits for MOV 2-IMO-324	Revision 0
MD-2-RH-103-N	PPM Calculation to Determine the Minimum Opening and Closing Thrusts for MOVs 2-ICM-250 and 2-ICM-251	Revision 0
MD-02-RH-114-N	Thrust and Torque Setup Calculations for 2-ICM-250 and 2-ICM-251	Revision 2
MD-2-RH-119-N	Analysis of Thrust and Torque Limits for MOV 2-ICM-305 and 2-ICM-306	Revision 2
MD-2-RH-195-N	Analysis of Thrust and Torque Limits for MOVs 2-ICM-129/2-IMO-128	Revision 3
MD-12-RH-004-N	EPRI PPM Evaluation for 1/2-ICM-129 and 1/2-IMO-128	Revision 1
MD-12-RH-040-N	Maximum Differential Pressure During Operation of RHR Valves 1-IMO-310, 1-IMO-312, 1-IMO-314, 1-IMO-320, 1-IMO-322, 1-IMO-324, 1-IMO-340, 1-IMO-350, 2-IMO-310, 2-IMO-312, 2-IMO-314, 2-IMO-320, 2-IMO-322, 2-IMO-324, 2-IMO-340, and 2-IMO-350	Revision 2
MD-12-RH-109-N	EPRI PPM Evaluation for 1/2-IMO-314 and 1/2-IMO-324	Revision 1
MD-12-RH-128-N	Maximum Differential Pressure During Operation of Safety Injection Pump Discharge Crosstie Valves 1-IMO-270, 1-IMO-275, 2-IMO-270 & 2-IMO-275	Revision 1
MD-12-RH-130-N	Differential Pressure Calculation for Valves 1/2-IMO-255, 1/2-IMO-256, 1/2-IMO-250, 1/2-IMO-251	Revision 2
MD-12-RH-132-N	Maximum Differential Pressure During Operation of Hot Leg Injection Valves 1-IMO-315, 1-IMO-325, 2-IMO-315, & 2-IMO-325	Revision 1

MD-12-RH-207-N	EPRI PPM Evaluation for 1/2-IMO-315 and 1/2-IMO-325	Revision 1
MD-12-RH-211-N	Maximum Differential Pressure During Operation of RHR Shutdown Cooling Suction Isolation Valves 1/2-IMO-128 & 1/2-ICM-129	Revision 2
MD-12-RH-112-N	EPRI PPM Evaluation for 1/2-IMO-255 and 1/2-IMO-256	Revision 0
MD-12-RH-137-N	Maximum Differential Pressure During Operation of Safety Injection Pump Minimum Flow Recirculation Valves 1-IMO-262, 2-IMO-262, 1-IMO-263 and 2-IMO-263	Revision 1
MD-12-RHR-904-N	Pressure Locking Evaluation for MOVs 1/2-ICM-305 and 1/2-ICM-306	Revision 0
MD-12-SI-001-N	EPRI PPM Evaluation for 1/2-IMO-262 and 1/2-IMO-263	Revision 2
MD-12-SI-004-N	EPRI PPM Evaluation for 1/2-IMO-270 and 1/2-IMO-275	Revision 1
SD-991001-006	Weak Link Review Criteria for GL 89-10 MOVs	Revision 1
FO-01-E-009	Performance Assurance Field Observation Review of MOV Engineering Action Plan No. 00-365	May 1, 2001
FO-01-E-016	Performance Assurance Field Observation Review of MOV Self Assessment Report No. SA-2000-ENP-002	May 4, 2001
SA-2000-ENP-002	Assessment Report of the Readiness for Closeout of NRC Generic Letter 89-10	December 19, 2000
AEP:NRC:0966AF	Licensee Letter to NRC: Units 1 and 2 Generic Letter (GL) 96-05 Periodic Verification of Design Basis Capability of Safety Related Motor-Operated Valves	November 7, 1996
AEP:NRC:0966AG	Licensee Letter to NRC: Generic Letter 96-05 Periodic Verification of Design Basis Capability of Safety Related MOV Verification Program/Follow-up Response	April 18, 1997

C0100-07	Licensee Letter to NRC: Actions Being Taken to Complete Generic Letter 89-10 and Generic Letter 96-05 Implementation	January 11, 2000
C0400-08	Licensee Letter to NRC: Revised Response to Generic Letter (GL) 95-07, “Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves”	April 3, 2000
C0500-06	Licensee Letter to NRC: Short Term and Planned Long Term Enhancements to the Electrical Distribution System	May 4, 2000
C1200-09	Licensee Letter to NRC: Completion of Generic Letter (GL) 89-10 Motor-Operated Valve (MOV) Program Implementation and Description of Generic Letter 96-05 MOV Periodic Verification Program	December 15, 2000
CR P-99-24925	1-IMO-305 and 1-IMO-306 Determined by Altran Calculation to Be Susceptible to Pressure Locking	October 8, 1999
CR 00321040	Test Data for Both 1/2-SV-344E and 1/2-SV-344W to Prove the Safety Is Set for 20 Psi Could Not Be Found	November 16, 2000
CR 00339035	Valve Did Not Open from Control Room	December 12, 2000
CR 00341089	Rotor 4 Limit Switch Setting May Have Not Been Set Correctly During ‘As-left’ VOTES Testing	December 6, 2000
CR 00346053	Valve Did Not Open from Control Room Switch	December 11, 2000
CR 00346065	Valve Would Not Operate in Closed Direction	December 11, 2000
CR 00349005	Trip and Throttle Valve for Turbine-Driven Auxiliary Feedwater Pump Exceeds its Maximum Stroke Time	December 14, 2000
CR 01023008	1-WMO-733 Leaks by Excessively	January 23, 2001
CR 01047036	Motor Heater Is Energized for 1-ICM-129	February 16, 2001
CR 01062001	1-IMO-220 Local Position Indicates 80 Percent Open When Valve Is Fully Open Electrically	March 2, 2001

CR 01138012*	Ensure Relief Valves 1/2-SV-344E and 1/2-SV-344W Are Set in Upcoming U2C13 Due to Pressure Locking Concerns	May 17, 2001
CR 01138015*	DC Motor Stroke Time Calculation Methodology 12-E-N-250D-MOV-001 Needs to Be Updated	May 18, 2001
JO 00322024	DCP-4705 1-SV-344E Investigate/Repair Safety Valve	November 23, 2000
JO 00322036	DCP-4705 1-SV-344W Investigate/Repair Safety Valve	November 23, 2000
OP-1-5143-57	Flow Diagram Emergency Core Cooling (RHR)	Revision 57
OP-1-5144-37	Flow Diagram Containment Spray Unit 1	Revision 37

*Condition reports written as a result of this inspection