U. S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET/REPORT NO.: 50-443/94-11

LICENSEE: North Atlantic Energy Service Corporation

FACILITY: Seabrook Station
Seabrook, New Hampshire 03874

DATES: May 23 - May 27, 1994

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Areas Inspected: An announced safety inspection was conducted of the licensee's motor-operated valve (MOV) program, developed in response to NRC Generic Letter 89-10 and related activities at Seabrook. The MOV Program plans and commitments identified in Table 1 of NRC Inspection Report 50-443/91-81 were reviewed for progress. Implementation of the licensee's MOV Program and MOV test results was evaluated.

Results: Two unresolved items and no violations were identified. The executive summary provides additional details.

SEABROOK MOV INSPECTION 94-11
EXECUTIVE SUMMARY

A review of design basis capability, motor-operated valve (MOV) sizing, switch settings, and test data was conducted. Four MOVs were selected to provide a cross-section based on valve type, differential pressure conditions, percentage of differential pressure testing relative to design-basis conditions, and probabilistic risk assessment (PRA) classification.

A North Atlantic engineering study concluded that none of the valves at Seabrook are expected to experience thermal binding or pressure locking, and that no action was required to alter any safety-related motor-operated gate valve. Pending the issuance of additional NRC generic communications and inspection guidance, this issue was left unresolved **(URI 50-443/94-11-01)**. North Atlantic has a relatively small group of experienced engineering personnel implementing their MOV Program. North Atlantic's schedule to complete the GL 89-10 program (beyond their original commitment of June 1994) is being reevaluated due to questions concerning the extent of dynamic testing and the associated grouping methodology, which are currently not consistent with Generic Letter 89-10, Supplement 6 **(URI 94-11-02)**. In one notable instance (safety injection valve SI-V-138), weaknesses were observed in documentation of dynamic testing findings, the evaluation of test data, and the timeliness of corrective actions for test anomalies.

Some progress has been made in addressing the 25 issues from the NRC's initial December 1991 MOV team inspection, although ten of those issues remain outstanding. Testing issues that have been adequately addressed included: establishing design control measures for diagnostic equipment error; documenting the methodology for the accuracy of control switch settings; confirming that the diagnostic system was providing reliable results; justifying the test results for thrust measurements at 80% degraded voltage; and generating a motor current acceptance criterion that supports functional requirements.

MOV testing issues that remain outstanding (from the December 1991 team inspection) include: clarifying the extent of differential pressure testing and grouping; developing acceptance criteria for diagnostic data to ensure operability under all conditions including degraded voltage; and justifying the frequency of periodic reverification. Outstanding issues in the area of MOV maintenance include: justifying the extension of the preventive maintenance and inspection periods; revising procedures and training modules to caution against inadvertently changing limit switch setpoints of Rotork operators; completing the evaluation of the hydraulic lock concerns identified in Limitorque Maintenance Updates 88-2 and 90-1; and revising operations procedures to ensure adequate control to preclude short stroking.

DETAILS

1.0 INTRODUCTION AND PURPOSE

On June 28, 1989, the NRC issued Generic Letter (GL) 89-10, requesting licensees to establish a program to ensure that switch settings for safety-related motor-operated valves (MOVs) were selected, set, and maintained properly. Six supplements to the generic letter have been issued to clarify the NRC request. NRC inspections of licensee actions implementing the provisions of the generic letter and its supplements have been conducted based on guidance provided in Temporary Instruction (TI) 2515/109, "Inspection Requirements for Generic Letter 89-10, Revision 1," which is divided into MOV Part 1, "Program Review," and Part 2, "Verification of Program Implementation."

The NRC had previously conducted a MOV Part 1 program inspection at Seabrook in December 1991, as documented in Inspection Report 50-443/91-81. The purpose of this current inspection was to review and update the licensee's progress regarding motor-operated valve program plans and commitments identified in Table 1 of NRC Inspection Report 50-443/91-81; and to review and verify the adequacy of the licensee's dynamic test data for MOVs in accordance with Part 2 of TI 2515/109, Revision 1.

2.0 INSPECTION FINDINGS - MOV PROGRAM IMPLEMENTATION

2.1 MOVs Sample Selected for Detailed Review

The licensee was requested to provide a matrix of dynamically tested MOVs that included the valve description, valve function, valve type, probabilistic risk assessment (PRA) priority, design-basis conditions, actual dynamic (differential pressure) test conditions, the relative percentage of design basis testing, and the differential test grouping. The following four gate valves were selected from this matrix to provide a cross-section sample based on valve type, differential pressure conditions, percentage of differential pressure testing relative to design basis conditions, and PRA classification:

CS-V-142	Charging System to Regenerative Heat Exchanger Isolation
CS-V-143	Regenerative Heat Exchanger Outlet to Letdown Heat Exchanger
RH-V-70	RHR Train "A" Common Supply to Hot Leg Recirculation
SI-V-138	Charging Pumps Supply to Reactor Coolant System Cold Legs

2.2 MOV Design Basis Reviews, Sizing, and Switch Settings

The inspectors reviewed ES1850.003, "Motor-Operated Valve Performance Monitoring," Rev. 1, dated April 11, 1994, and the licensee's documentation of design basis conditions for the sampled valves. The documentation of the licensee's determination of thrust and torque requirements for the sampled valves was also reviewed to verify the adequacy of the licensee's calculations for MOV sizing, and to verify that the switch settings are consistent with the expected design conditions for the operation of the selected sample of valves.

North Atlantic's method for determining thrust requirements for Westinghouse supplied gate valves used a thrust equation that was similar to the industry standard thrust equation, with the exception that it used a disc coefficient that combines the disc friction coefficient and the disc area factor. Westinghouse provided disc coefficient values for the closing direction that were typically in excess of 0.44. This relates to an equivalent valve factor of 0.52. The licensee used a minimum valve factor of 0.50 for Velan and Crane-Aloyco gate valves, and 1.10 for Velan globe valves. For the determination of actuator output thrust capability, a stem friction coefficient of 0.15 was assumed. The licensee relied on conservative design basis differential pressures to add margin to account for load sensitive behavior, in lieu of assuming a specific margin. North Atlantic's treatment of load sensitive behavior remains an open issue and is discussed further in Section 5.1 (Page 6). Minimum thrust requirements for setting of actuator torque switches were adjusted to account for diagnostic equipment inaccuracy and torque switch repeatability.

2.3 Design Basis Capability

The inspectors reviewed static test results, dynamic test packages, and post-test review packages for the four valves tabulated below.

VALVE NUMBER	VALVE TYPE	TEST CONDITIONS (psid)		% DESIGN BASIS		DYNAMIC VALVE FACTOR [1]		STEM FRICTION COEFFICIENT [2]		% LOAD [3] Sensitive Behavior
		Open	Close	Open	Close	Open	Close	Static	Dynamic	
CS-V-142	Westinghouse 3" / 2035# Gate Valve	2686	2686	97.7	97.7	0.53	0.23	NC [4]	NC	Limit Seated
CS-V-143	Westinghouse 3" / 2035# Gate Valve	2686	2686	97.7	97.7	0.39	0.18	NC	NC	Limit Seated
RH-V-70	Westinghouse 8" / 2500# Gate Valve	188	188	93.3	93.3	0.41	0.14	NC	NC	-16.2
SI-V-138	Westinghouse 4" / 2500# Gate Valve	2733	2733	99.4	458.3	0.43	0.44	NC	≈0.10	Limit Seated

Seabrook Unique Diagnostic System: INSTEAD/LVDT

Notes:

1. The dynamic valve factors listed were calculated by the licensee using an orifice diameter.
2. Stem Lubricant: FelPro N5000
3. A negative number indicates that the thrust observed at CST during the dynamic test was greater than the thrust observed at CST during the static test.
4. "N/C" = Not Calculated.

The dynamic test data were reviewed by the licensee using the vendor equation, the valves' orifice diameters, and the dynamic test conditions. Resultant disc coefficients were also converted to valve factors. This review indicated closing gate valve factors up to 0.44 and stem friction coefficient values as high as approximately 0.10 under dynamic test conditions. No significant load sensitive behavior was identified. Based on review of this data, no operability concerns were identified for the selected sample of valves.

2.4 MOV Testing

During review of Seabrook's test summary reports, the inspectors noted a case where closing SI-V-138 had a measured peak thrust of 18,676 lbf during a differential pressure test that was in excess of the SB-00 actuator's thrust rating of 14,000lbf. The actuator's torque rating of 250 ft-lb was also exceeded. Although the valve does not have a safety function in the closing direction, SI-V-138 is a limit switch-seated MOV that was tested at 2733 psid. This differential pressure is in excess of the worst-case conditions that this valve would experience during a closing stroke.

An MOV Diagnostic Testing Summary report, dated October 29, 1993, approximately one year after conduct of the dynamic test, stated that the actuator's torque rating was exceeded and that an inspection of the actuator housing had been performed. The valve's function was not impaired, and remained operable through the ensuing cycle. An internal inspection of the actuator was deferred to the current refueling outage, RFO-3. The inspectors concluded that, while the safety function of the valve was not affected, the disposition and evaluation of these test results represent an apparent program weakness, and their observations are summarized as follows:

- Licensee personnel stated that the actuator for SI-V-138 was visually inspected after the overthrust was discovered. This was also stated in the MOV Diagnostic Testing Summary report, but no corrective action completion date was documented in the report. Seabrook personnel were unable to provide documented evidence that the overthrust and overtorque condition was identified at the time of the testing, or that adequate corrective action was taken prior to returning the MOV to service. The inspectors considered the year delay in documenting the overthrust and overtorque condition as excessive.

- The licensee deferred action to inspect the SI-V-138 actuator internals and address the overtorque condition until the current RFO-3 refueling outage. Repetitive Task Sheet, "Limitorque MOV Inspection/Cable Meggar," completed May 24, 1994, and the associated inspection procedure were used to inspect the actuator drive train components for wear. The inspectors reviewed the work order and procedure and found no step that directed an inspection of the drive train components for wear or

cracking. Further, there were no notes indicating completion of this type of inspection in the comments section of the procedure or the work order. Licensee personnel responded by initiating a new work order to specifically inspect SI-V-138's internal components for wear, as specified by Limitorque for overtorque conditions.

- The thrust target range used to initially set up valve SI-V-138 does not include a maximum thrust limit associated with inertial forces that occur after the control switch stops motor operation. The licensee's position is that engineering personnel are expected to identify these types of nonconforming conditions during review of the test data. Section 4.0, "Acceptance Criteria," of Procedure ES1850.003 includes a step that requires engineering review, for any measured thrust and torque values outside the target range, before the valve can be returned to service. Because inertial limits were not part of the target range, this acceptance criterion would not be applied to measured peak thrust and torque. North Atlantic personnel stated that they were reviewing test data to identify load sensitive behavior, and that their target ranges would be revised to include thrust and torque limits associated with inertial loads.

Pending a complete engineering evaluation of this overthrust/overtorque condition for valve SI-V-138, an assessment of other valves in the GL 89-10 program for similar conditions, and associated program changes, this item remains unresolved and will be further reviewed along with the outstanding items discussed in Section 5.1.

3.0 LIMITORQUE MAINTENANCE UPDATE 92-2 AND INFORMATION NOTICE 93-37 "EYE-BOLTS WITH INDETERMINATE PROPERTIES INSTALLED IN LIMITORQUE VALVE OPERATOR HOUSING COVERS"

Limitorque Maintenance Update 92-2 had recommended removal of eye-bolts from SMB-00 and SMB-000 at the next scheduled maintenance and replacement, with SAE grade 5 housing cover bolts. The licensee stated that all eye-bolts installed in Limitorque Valve Operator covers would be removed by the end of the current outage. The inspectors reviewed the work request 94W001598 to determine if all Limitorque SMB-00 and SMB-000 valve actuators were included in the inspection and what type bolts would be used to replace the eye-bolts. The work request required all Limitorque actuators with SMB-00 and SMB-000 included in the GL 89-10 program to be inspected for eye-bolts and replaced with grade 5 housing cover bolts, as recommended by the Limitorque Update.

4.0 EVALUATION OF PRESSURE LOCKING AND THERMAL BINDING OF GATE VALVES

The inspectors reviewed the licensee's engineering evaluation of the potential for pressure locking and thermal binding of gate valves at Seabrook that was contained in Engineering Evaluation 93-33, "Thermal Binding and Pressure Locking of Safety-Related Gate Valves," dated June 21, 1993. This evaluation was performed in response to NRC Information Notice 92-26, "Pressure Locking of Motor-operated Flexible Wedge Gate Valves." The evaluation

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5.0 REVIEW OF TEMPORARY INSTRUCTION 2515/109 MOV PART 1 INSPECTION ITEMS

An NRC team inspection (50-443/91-81) at Seabrook Station in December 1991, was conducted in accordance with MOV Part 1 of TI 2515/109 to review the licensee's program, in response to Generic Letter (GL) 89-10. That inspection identified several MOV Program plans and commitments necessary to bring the program into full accordance with GL 89-10 and its supplements. Table 1 of Inspection Report 50-443/91-81 listed the plans and commitments agreed upon by the licensee to further develop the MOV Program at Seabrook in accordance with GL 89-10. The inspectors reviewed the implementation of enhancements and commitments, as described in Section 2.1 of this report.

5.1 MOV Program Commitment Items Updated (Section Numbers in Parentheses Refer to Sections in Inspection Report 50-443/91-81)

(Update) Continue Seismic Analysis of Generic Letter 89-10 MOVs (Section 2.2).[1]

During the NRC's December 1991 MOV Part 1 inspection, it was noted that the licensee was gathering valve "weak link" information for inclusion in their generic letter program. North Atlantic now has that information and has incorporated it into their program. However, the licensee's review of Westinghouse's weak link analysis methodology was ongoing and scheduled for completion in the fall of 1994.

(Update) Validate the Assumed Valve Factors or Friction Coefficients Using the Design Basis Test Results and Justify Use of 0.15 as the Stem Friction Coefficients by April 30, 1992 (Section 2.4)

The licensee's generic letter program methodology assumes a stem friction coefficient of 0.15 when determining an actuator's thrust output. During the Generic Letter 89-10 MOV Part 1 inspection, the licensee was requested to provide justification to support their assumption. This information was submitted to the NRC in New Hampshire Yankee letter NYN-92058, dated April 30, 1992. This letter cited many outside sources, but did not consider the results of site-specific data as part of this justification. Midway through their test program, the licensee started using torque-measuring strain gauges to support verification of their stem friction coefficient assumption. This issue was discussed with North Atlantic representatives who indicated that the stem friction coefficient data acquired thus far generally supports the program assumption, but that evaluation of the data is not complete.

(Update) Ensure that the Design Basis Test Results are Applied to MOVs that Cannot be Tested at the Design Basis Differential Pressure or Flow Conditions (Section 2.4)

The MOV Part 1 inspection found that the licensee did not include margin to account for rate of loading effects under high differential pressure and flow conditions. The licensee indicated that rate of loading would be taken into account by comparing the thrust delivered by the actuator during high pressure conditions to the thrust delivered during static conditions. The licensee also stated that the test results would be applied to MOVs that cannot be tested at worst-case differential pressure conditions.

As documented in Section 2.1, the inspectors noted that a specific margin was not set aside to account for load sensitive behavior. The licensee chose conservative differential pressures in the minimum required thrust calculations to provide excess margin in the MOV setup.

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[1] Section numbers in parentheses refer to sections in Inspection Report 50-443/91-81

The inspectors discussed this issue with North Atlantic personnel because this approach appeared inconsistent. In response, North Atlantic personnel stated that they were reviewing test data to identify load sensitive behavior, and that appropriate margins will be set aside to ensure adequate torque switch settings in the future.

(Update) Clarify the Commitment Regarding Full Differential Pressure Testing (Section 2.5)

During Inspection No. 50-443/91-81, the licensee's MOV Program description, "Station Operation Procedure," and ES1850.003, "Motor-operated Valve Performance Monitoring," Revision 00, Change 3, was reviewed to ascertain the licensee's plans for differential pressure testing. The program description identified that differential pressure testing would be performed whenever practical, and that a target of 20 percent of the safety-related MOVs to be differential pressure (dp) tested would be tested at full dp conditions. At the time of the MOV Part 1 inspection, North Atlantic had not developed the criteria for grouping or selecting the 20 percent of the MOVs for full dp testing. The report documents that the licensee agreed to provide the grouping, selection, and exclusion criteria to the NRC by March 1, 1992, and to include these criteria in the program description. The licensee also agreed to notify the NRC of any planned changes in current commitments and to establish adequate justification on site for NRC review as outlined in GL 89-10.

In a March 2, 1992, New Hampshire Yankee letter NYN-92024 to the NRC, the licensee provided information concerning grouping. Thirty-five separate MOV groups were developed incorporating all the 122 GL 89-10 Program valves. The licensee reviewed each group for differential pressure test feasibility. Where testing at or near design-basis conditions was determined to be feasible, at least one valve was selected from the group and was scheduled for testing prior to the June 28, 1994, GL 89-10 implementation completion date. The letter also identified six groups containing sixteen valves that were identified to be excluded from dp testing.

The licensee's program document originally identified that dynamic testing would be conducted where practicable. However, in their letter responding to the MOV Part 1 inspection request to clarify Seabrook's testing commitment, the licensee identified their intention to dynamically test a minimum of one MOV per group, even though other valves in the group may be practicable to test. The inspectors noted that this new commitment appeared to reduce the licensee's initial dynamic testing plans that were described in the MOV Program description in ES1850.003, Revision 00, Change 3, and reported in NRC Inspection Report 50-443/91-81. The inspectors were concerned that testing one valve in a group does not demonstrate consistency of test results.

The licensee's plan described in their March 2, 1992, letter is not consistent with either the Generic Letter 89-10 request to test each MOV under design basis differential pressure and flow conditions where practicable, or with the acceptable grouping alternative in Generic Letter 89-10, Supplement 6. Supplement 6 states, in part, that a minimum of 30% of the

group should be dynamically tested, with no less than two MOVs tested in small groups. Out of 35 groups, the licensee had 14 groups where one testable valve was tested, or less than 30% of the group was dynamically tested. The licensee agreed to review the guidance in Generic Letter 89-10, Supplement 6, and compare this guidance to their committed dynamic testing and grouping plans, and provide the NRC with the results of this review. This item is unresolved pending resolution of the inspectors' concerns that the licensee's dynamic testing plan is inadequate to demonstrate consistency of test results, and is not consistent with either guidance in Generic Letter 89-10 or Supplement 6 **(URI 50-443/94-11-02)**.

(Update) Develop Clear Guidance and Acceptance Criteria for Evaluating MOV Capability Using Diagnostic Data to Ensure Operability Under all Conditions Including Degraded Voltage (Section 2.5)

The MOV Part 1 inspection noted that adequate procedures had been established to obtain data for signature analysis, but acceptance criteria for the diagnostic data had not been established. During this inspection, the inspectors found that the licensee had revised their MOV Program description and Section 4.0 of Station Operation Procedure ES1850.003, "Motor-operated Valve Performance Monitoring," Revision 01, Change 3, dated April 11, 1994. The procedure included acceptance criteria for evaluating diagnostic test data. Section 4.2 established good controls to evaluate and document whether measured thrust and torque values were within their initial target ranges. However, Section 4.3, "Controls and Documentation for the Evaluation of Differential Pressure Testing Results" was not as detailed. The inspectors noted that dynamic test data may invalidate the original target range if the assumed minimum required thrust was not conservative. Evaluation of differential pressure testing results should be documented, including results of any required extrapolations, and nonconforming conditions should be resolved prior to returning the valve to service. After discussing this issue, licensee representatives agreed to revise and clarify their program documents and diagnostic procedures so that the evaluation of thrust and torque characteristics under dynamic loading conditions are evaluated, compared to design-basis values, and are documented to provide adequate margin prior to the valve being returned to service.

Section 4.3 also did not provide general guidance for identification of minimum acceptable margin. The licensee relied on the judgement and expertise of the MOV system engineer to make this determination on a case-by-case basis. Step 3.5.9.2 of ES1850.003 did address factors that should be considered when evaluating margin, including load sensitive behavior affects and actuator degradation due to wear or loss of lubrication. However, this section did not include specific minimum margins for these affects and did not address other concerns, such as diagnostic equipment uncertainties and torque switch repeatability, as recommended by Enclosure 1, Page 7, of Supplement 6 to GL 89-10. Licensee personnel agreed to review the guidance in Supplement 6 and revise their program as appropriate.

To determine the operability of an MOV, the licensee linearly extrapolated the thrust necessary to overcome differential pressure to design basis conditions. Until adequate justification is developed, the licensee's extrapolation methodology is considered the first stage of a two-stage approach, where the valves are set up using the best available data, as discussed in GL 89-10. The justification for the North Atlantic method of extrapolation will be reviewed during a future inspection.

(Update) Review the Priority 2 and 3 MOVs to Justify Frequency of Periodic Verification (Section 2.6)

The recommended diagnostic testing frequency for MOVs presented in GL 89-10 is a surveillance interval that does not exceed five years or three refueling outages, whichever is longer, unless a longer interval is justified. During this inspection, the licensee initiated change 2 to ES1850.003, "MOV Performance Monitoring Program," to update the required periodic testing frequency for diagnostic testing to a three refueling outage frequency, which is consistent with the recommendations of GL 89-10. When approved, this change would allow the MOV System Engineer to determine when an increased diagnostic testing surveillance frequency is necessary.

The NRC inspectors and the MOV Project Engineer discussed periodic dynamic testing of GL 89-10 MOVs to determine if and when North Atlantic would be doing this type testing. Although no dynamic testing on a periodic basis was scheduled at this time, it was perceived by the MOV Project Engineer that some dynamic testing on a periodic basis would be necessary. A determination had not been made as to what extent this would be performed, nor at what periodicity. This item will be reviewed by the NRC after the licensee's basis for the frequency of dynamic testing is established.

(Update) Revise the MOV Program and Provide Justification for Extension of the Preventive Maintenance and Inspection Period Beyond Recommendation (Section 2.7).

The Limitorque Corporation Bulletin SMBI-82D recommendation for MOV lubrication and inspection is at least every 18 months. North Atlantic's GL 89-10 program specifies that the preventive maintenance inspection frequency of once every other refueling outage is sufficient to ensure the operability of Seabrook Station's MOVs, based on failure history and on the comparison of as-found test data to initial calibration data. This issue was discussed with the MOV System Engineer to determine the method and data used to support this frequency. A Component Failure Analysis Report from the Nuclear Plant Reliability Data system was provided as part of the justification. The licensee's justification for increasing the lubrication and inspection frequency for MOVs in the GL-89-10 program has not been fully documented, therefore, this item remains incomplete.

(Update) Revise the Procedure for Adjustment of Rotork Operator and Training Module as Appropriate to Caution Against Inadvertently Changing Limit Switch Setpoints (Section 2.7)

During the MOV Part 1 inspection, the licensee committed to review and revise their procedures to include an appropriate caution when manually operating Rotork actuators are beyond the setpoint of the limit switch. This action was considered necessary because manual operation could reset the switch setting to a new position and affect MOV operation. The licensee also stated that training would be enhanced to ensure that maintenance and operations personnel were aware of the potential for inadvertently affecting the switch settings.

The NRC inspectors reviewed Rotork maintenance and testing procedures and lesson plans to determine if appropriate revisions had been made to caution maintenance and operations personnel about the possible resetting of limit switches when manually operating valves with Rotork actuators. Procedure LS0569.27, "Inspection/PM of Rotork Valve Actuator" and training module "Rotork MOV Testing" had not been revised to provide a caution regarding manual operation of Rotork actuators. The MOV System Engineer acknowledged this finding and planned to address this issue. This item remains open until a review of the revised procedures and training modules is complete.

During the review of the licensee's training modules, the inspectors noted that the definition of Priority 3 MOVs in the module titled, "Introduction to Valve Testing," was not consistent with the definition in the "MOV Valve Performance Monitoring" program procedure. The MOV Project Engineer stated that the engineers currently do not review the MOV training modules, but that this particular issue would be addressed. This is a weakness in communications between MOV system engineering and the training department.

(Update) Review and Resolve the Concerns Identified in Limitorque Maintenance Updates 88-2 and 90-1 (Section 2.10)

The MOV Part 1 inspection stated that the licensee's disposition of these Limitorque updates concerning hydraulic lock did not clearly indicate an adequate response. The 1990 update stated the Limitorque would modify all future springpack assembly shipments, and that the licensee was unable to confirm that the MOVs installed at the station were modified. The licensee was reviewing the matter.

North Atlantic had prepared a draft engineering report to address these Limitorque updates. The hydraulic lock issue was initially reviewed in response to INPO Significant Event Reports (SERs) 30-86 and 20-87. Based on a review of actuator serial numbers, the licensee determined that their actuators have the internal grease relief paths. In general, the actuator springpack have not been modified as described in Update 90-1. The draft report identified that a containment sump isolation valve, CBS-V-14, has potentially experienced hydraulic lock. This valve and the redundant valve, CBS-V-8, are having modified springpacks

installed during the current refueling outage, RFO-3. Because this is the only case of hydraulic lock that Seabrook has experienced, this preliminary report recommends using diagnostics to monitor springpack performance and replacing or modifying springpacks on an as needed basis. The adequacy of North Atlantic's actions will be reviewed once the draft report has been completed and approved.

(Update) Review Maintenance and Operation Procedures to Ensure Adequate Control for Switch Positioning to Preclude Short Stroking (Section 3.0)

Walkdowns conducted during Inspection No. 50-443/91-81 identified that several MOV control switches in the control room were fixed position switches, which did not return to neutral when released by the operator. A potential concern was identified that valves may be damaged due to excessive seating thrust generated during short stroking if manual operation is attempted with a control switch that is in the closed position. During this inspection period, the inspectors found that training had been developed and provided to make operations personnel aware of this potential maloperation. However, the planned actions to revise Station Operating Procedures and Operations Department Instructions provide precautions on the potential for short stroking MOVs had not been completed.

5.2 MOV Program Commitment Items Completed

(Completed) Justify the Exclusion of Priority 4 MOVs from the Program (Section 2.1)[2]

The licensee has considered Priority 4 valves for inclusion in the GL-89-10 program even though the definition of Priority 4 in ES1850.003, "MOV Performance Monitoring Program," Section 3.1.3, "Other MOVs That are Important to the Continuity of Power Generation," formally excludes them from the program. The licensee's review of the Priority 4 valves resulted in the addition of 1-FW-V-156 and 1-FW-V-163 to the program because these valves could be mispositioned when they are required to reopen to provide a backup emergency feedwater flowpath. The inspectors considered this an appropriate action, and no other concerns were identified. Therefore, this item is complete.

(Completed) Review the High Energy Line Break (HELB) Analysis to Verify That 1-CS-HCV-198 and 1-CS-HCV-190 May be Excluded from the GL Program (Section 2.1)

The licensee reviewed their HELB analysis and determined that 1-CS-HCV-189 and 1-CS-HCV-190 are not required to be in any position during this type of event. Containment isolation valves, 1-CS-V149 and 1-CS-V150, are designed to isolate letdown on receipt of a containment isolation signal or a HELB isolation protective signal. The design basis calculations for letdown isolation valves 1-CS-V149 and 1-CS-V150 consider the maximum

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[2] Section numbers in parentheses refer to sections in Inspection Report 50-443/91-81

differential pressure, with 1-CS-HCV-189 and 190 open for determination of torque switch settings. Therefore, the licensee concluded that 1-CS-HCV-189 and 1-CS-HCV-190 can be excluded from the GL-89-10 program. The inspectors concluded that the licensee's evaluation of this issue was adequate; therefore, this item is complete.

(Completed) Revise Terminal Voltage Calculations to Account for Accident Environmental Temperature on Cable Impedance. Evaluate Affect of High Ambient Temperature on Motor Performance and TOL Resistance and Include it in a Revision to the Degraded Voltage Calculation (Section 2.2)

The terminal voltage calculation was revised to adjust terminal voltage to account for accident temperature conditions on cable impedance, and the inclusion of thermal overload resistances.

On May 13, 1993, Limitorque Corporation issued a 10 CFR Part 21 Notification concerning the affects of elevated temperature on the starting torque of three-phase Reliance motors used with their valve actuators. The Notice indicated that typical locked rotor torque and locked rotor amperage would vary with motor temperature. The Limitorque evaluation provided tabulated data for use to determine actuator operability at motor temperatures between 25°C and 180°C. Limitorque Technical Update 93-03 provided additional guidance concerning the relationship between temperature and the rate of torque decrease.

North Atlantic completed an evaluation of Limitorque's Part 21 Notification that identified several MOVs with motors that require derating due to ambient temperature affects during design basis conditions. This evaluation concluded that all of the motors on Seabrook's derated safety-related Limitorque MOVs were adequately sized to perform their required functions under design basis conditions. North Atlantic also plans to revise the design basis calculations to consider the worst-case ambient temperature for each MOV during normal operation. The completed and planned actions to evaluate the temperature affects on MOV motors are adequate for determining MOV capability; therefore, this item is completed.

(Completed) Establish Design Control Measures for Diagnostic Equipment Error Analysis and Describe the Method for Determination of Overall Accuracy of Control Switch Settings (Section 2.3)

A controlled document was developed to detail the development of the diagnostic equipment error analysis. These error values are then applied to the engineering limits documented in Seabrook's setpoint document. Target limits for each MOV in the program are tabulated. These limits are used in the MOV test procedures.

(Completed) Enhance the Diagnostic Methods by Cross-Checking of the Data From Diverse Measurements (Section 2.3)

The licensee took actions to confirm that their diagnostic system was providing reliable results. This included: 1) the completion of an accuracy calculation for the diagnostic data acquisition system; 2) performing testing with a load cell system, taking simultaneous measurements and making data comparisons; 3) comparing motor current data to thrust data from strain gauges and load cells; 4) comparing strain gauge thrust data to springpack thrust data using a load cell comparison method; 5) comparing data from tandem thrust and torque strain gauges; and 6) performing repeatability studies.

(Closed) (URI 50-443/91-81-01) Justify Use of Westinghouse Test Results for Thrust Measurements at 80% Degraded Voltage (Section 2.4)

Although North Atlantic received revised information from Westinghouse, the actuators' capabilities were reanalyzed using Limitorque's allowance on application factor, and a revised degraded voltage calculation where the voltage improved. Based on these revisions, the original Westinghouse information was no longer needed. The licensee's revised methodology for determining output capability under degraded voltage was acceptable and this item is complete.

(Completed) Incorporate Information from Information Notice (IN) 91-58 on Offset Butterfly MOVs into the Generic Letter Program (Section 2.4)

A licensee review identified that the information in IN 91-58 was applicable to eight Primary Component Cooling Water valves. Diagnostic testing was conducted to confirm that the control switches are set adequately to account for their design configuration.

(Completed) Review and Revise the Control Circuit Design for RCV-323 to Change From Limit Switch Control to Torque Switch Control (Section 2.4)

Modification MMOD 92-521, "Refueling Outage 02 Motor-operated Valve Changes," changed the control circuit from limit switch control to torque switch control.

(Completed) Review and Revise the Torque Switch Balancing Procedure and Establish the Necessary Controls to Prevent Exceeding the Maximum Dial Setting (Section 2.4)

Station Operating Procedure LS0569.05, "Corrective Maintenance of Limitorque Valve Actuator, Type SMB-00," was revised to include a warning to ensure that maximum allowable dial settings are not exceeded when balancing the torque switch.

(Completed) Revise Drawing 1-NHY-250000 to Add the Thrust Setpoint for all MOVs in the Generic Letter Program (Section 2.4)

Seabrook's torque switch settings are controlled by Drawing 1-NHY-250000. A review of this drawing during the MOV Part 1 inspection revealed that, in most cases, torque switch dial settings rather than thrust values were specified. During this inspection period, the inspectors found that thrust setpoints were added to Revision 16 of 1-NHY-250000 by Modification MMOD 92-521.

(Closed) (URI 50-443/91-81-02) Verify that 25% Margin to the Nameplate Data for Thermal Overload Sizing is Adequate in All Cases (Section 2.4)

The MOV Part 1 inspection found that, in some instances, thermal overloads (TOLs) were sized using nameplate full load current plus a 25 percent margin. One example was found where the average measured current to an MOV was greater than 125 percent of nameplate full load current. During this inspection period, the inspectors found that North Atlantic had obtained measured full load current values so that the use of nameplate current was no longer used for TOL sizing.

(Completed) Review the Motor Current Acceptance Criterion of 130% of Full Load Current and Generate an Acceptance Value that Supports the Functional Requirements (Section 2.4)

The MOV Part 1 inspection identified that MOV Program Document, ES1850.003, "MOV Performance Monitoring Program," allowed monitoring of the motor current for actuator and motor replacement, certain maintenance activities, and specified 130 percent of the full load current for the acceptance criterion for assessing operability. The inspectors noted that this 130 percent criterion was outside the designed TOL trip setpoints. During this inspection period, the inspectors found that North Atlantic had obtained measured full load current values, and these values were used to generate consistent acceptance criterion for post-maintenance testing.

(Completed) Revise the PMT Requirements (Figure 10.3 in ES1850.003) to Ensure Diagnostic Testing After Significant MOV Maintenance Like Motor Replacement, Limit Switch Adjustment or Replacement (for limit-seated MOVs), and Valve Stem Packing Adjustment or Replacement (Section 2.7)

The post-maintenance test (PMT) requirements for static or dynamic testing are established by the responsible system engineer during the preparation of maintenance work requests for MOVs. Following MOV maintenance, a PMT is preformed in accordance with Licensee Procedure MA 3.5, with additional guidelines defined in the licensee program description. The licensee had updated ES1850.003, Figure 10.3, to include diagnostic testing, following motor replacement in Limitorque actuators, valve stem packing adjustments or replacement, and actuator limit switch adjustments or replacement for limit-seated MOVs. If the

"INSTEAD" diagnostic system cannot be used to measure valve stem thrust or torque after stem packing adjustment or replacement, the licensee requires motor current diagnostics at the Motor Control Center. These actions require diagnostic PMT for activities that could change operating characteristics of MOVs in the GL 89-10 program. This item is completed.

(Completed) Ensure the Effectiveness of Root Cause Analysis for MOV Failures (Section 2.8)

Inspection Report 50-443/91-81 concluded that procedures had been developed to perform MOV failure root cause analysis; however, additional attention was required to assure that the root causes of the failures or the deficiencies were adequately documented. This conclusion was based on the review of a draft root cause analysis of 27 lubrication deficiencies and a second analysis on RHR train "B" discharge cross connect valve V-21 that did not document the cause of the deficiencies or the failure.

The root cause analysis of the 27 lubrication deficiencies was completed after Inspection No. 50-443/91-81 and documented on a "Cause Determination and Failure Analysis Work Sheet." The causes, probable root causes, corrective actions, and actions recommended to prevent recurrence were documented in this completed root cause analysis. The root cause for the failure of RH-V-21 to open with the motor operator was not found during the initial investigation of its failure. After a similar problem occurred with the RHR train "A" discharge cross connect valve RH-V-22, the licensee determined that the cause was thermal binding. Administrative controls have been put in place that the licensee believes will preclude recurrence. The licensee's evaluation of the potential for pressure locking and thermal binding of safety-related motor-operated gate valves at Seabrook Station was described in Section 2.6.

The inspectors reviewed a sample of Station Information Reports, Operational Information Reports, and Cause Determination and Failure Analysis Work Sheets, and noted that the causes of the deficiencies or failures were documented. Therefore, this item is considered complete.

(Completed) Inspect the Grease Condition in ASV-176 Which had Grease Leakage from the Springpack Area and Review Orientation of the Actuator (Section 3.0)

Inspection Report 50-443/91-81 documented that during a walkdown of twelve accessible MOVs, a small oil leak was noted at the springpack area of AS-V-176 and oil was coming out of the external grease relief port. NRC Resident Inspection Report 92-09 reviewed this issue in May 1992. Based on a review of inservice test data and maintenance history, the resident inspectors determined that AS-V-176 was operable. The report documented that, in response to industry recommendations, the licensee's Technical Support staff implemented a surveillance program in January 1991. The program included inspection of the grease in safety-related motor-operated valves every other refueling outage and in non-safety-related motor-operated valves every third outage. The lubrication inspection instructions in Station

Operating Procedure LS0569.01, "Inspection and Testing of Limitorque Valve Actuators, Types SMB, SB, SBD, AND SMC," Revision 1, was reviewed and no concerns were identified. Based on the above reviews, this item is considered complete.

6.0 GL 89-10 PROGRAM COMPLETION SCHEDULE

In GL 89-10, the NRC requested that licensees complete all actions initiated to satisfy the generic letter recommendations by June 28, 1994, or three refueling outages after December 28, 1989, whichever is later. Inspection Report 50-443/91-81 identified that the licensee's schedule was to complete this action by the end of the third refueling outage that was ongoing at the end of this inspection on May 27, 1994. The inspectors discussed the status of North Atlantic's GL 89-10 program, and the licensee indicated that GL 89-10 MOV efforts were under review due to questions concerning the adequacy of program plans for differential pressure testing, detailed in Section 4.1.

7.0 EXIT MEETING

The scope and purpose of the inspection were discussed at an entrance meeting conducted on May 23, 1994.

During the course of the inspection, the inspectors' findings were discussed with the licensee representatives listed below. An exit was conducted on May 27, 1994, at which time the preliminary findings were presented. The licensee acknowledged the findings and conclusions, with no exceptions taken. Further, the bases for the preliminary conclusions did not involve proprietary information, nor was any such information discussed or expected to be included as part of the written inspection report.

Persons Contacted

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*B. Benchel	Mechanical Engineering Manager
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*G. Kotkowski	Electrical Engineering Supervisor
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*P. Searforce	MOV System Manager
*G. Sessler	Sr. Project Engineer
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*J. Sobotka	NRC Coordinator

United States Nuclear Regulatory Commission

A. Cerne	Senior Resident Inspectors
R. Laura	Resident Inspectors

* Denotes those personnel attending the exit meeting on May 27, 1994.