

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No.: 50-213/93-15
Docket No.: 50-213
License No.: DPR-61
Licensee: Connecticut Yankee Atomic Power Company
P.O. Box 270
Hartford, Connecticut 06141-0270
Facility Name: Haddam Neck
Inspection At: Haddam, Connecticut
Inspection Conducted: July 26 -30, 1993, at Haddam, Connecticut
August 2 - 13, 1993, at King of Prussia, Pennsylvania

Inspectors:

Peter Drysdale
P. D. Drysdale, Senior Reactor Engineer,
Systems Section, EB, DRS

10/1/93
Date

Michael J. Buckley
M. J. Buckley, Reactor Engineer,
System Section, EB, DRS

Oct. 1, 1993
Date

Approved By:

P. K. Eapen
Dr. P. K. Eapen, Chief, Systems Section,
Engineering Branch, DRS

Oct. 1, 1993
Date

Areas Inspected: An announced inspection was conducted of the licensee's Generic Letter (GL) 89-10 program and related activities. MOV program commitments and enhancements identified during the Temporary Instruction 2515/109 team inspection in October 1992 were reviewed for progress. The results of completed MOV testing were reviewed to assess the licensee's implementation of MOV program requirements and to determine that the current test schedule provides for satisfactory completion of MOV testing by the commitment date of the 1995 refueling outage.

Results: The licensee's MOV program is being implemented in accordance with commitments made under their GL 89-10 Program, commitments in response to previous NRC inspections, and applicable regulatory requirements. Progress is being made on MOV design basis reviews and dynamic testing. Several MOV program areas and commitments are complete, including justifications for excluding certain MOVs from the GL 89-10 program, and establishing an MOV tracking and trending program. Other program areas are still being developed, such as completion of all MOV design basis calculations and resolving the effects of high temperatures on motor torque under a 10 CFR Part 21 notice from Limitorque. The licensee's schedule for the MOV program completion at Haddam Neck is by the end of the 1995 refueling outage. One unresolved item was identified, the failures of two safety-related MOVs to fully close when they were subjected to a differential pressure greater than that specified in the valves' original design specifications.

DETAILS

1.0 PURPOSE

The purpose of this inspection was to review the licensee's progress regarding motor-operated valve (MOV) program commitments made in response to NRC Inspection Report 50-213/92-81 and to review and verify the adequacy of the licensee's dynamic test data for MOVs. Licensee actions to resolve two previous violations and one unresolved item were also reviewed.

2.0 TEMPORARY INSTRUCTION 2515/109 INSPECTION FOLLOW-UP (92701, 92702)

The NRC conducted a team inspection in October 1992 (50-213/92-81), at the Haddam Neck Plant in accordance with Temporary Instruction 2515/109 to review the licensee's Generic Letter 89-10 program. That inspection identified several MOV program enhancements and commitments necessary to bring it into full accordance with the Generic Letter and its various Supplements.

During the October 1992 inspection, many details of the licensee's GL 89-10 program were in preliminary form and were not formally established in a comprehensive document or manual containing all program requirements. In December 1992, the licensee issued Revision 0 of the Motor Operated Valve Program Manual. Revision 1 to the program manual was issued in June 1993, and was still in effect during this inspection. The inspectors reviewed the MOV Program Manual and the Project Instructions (PIs) contained in it. The manual was organized into two major divisions: 1) administrative sections with overall responsibilities and technical requirements for the program, and 2) 17 specific PIs that provided guidance and instructions for engineering functions such as MOV and system calculations, evaluations, testing, and personnel qualifications for the GL 89-10 program. The manual was essentially complete in content and guidance for all program requirements such as design basis and test results reviews. Although the PIs were generally adequate, some PIs in the current manual appeared to be minimal in their level of detail and specificity. However, the next revision to the manual was in progress during this inspection. Lower tier implementing documents, such as test procedures, were also evolving with the next manual revision. The licensee's schedule was to issue Revision 2 by October 1993.

Table 1 of NRC inspection 50-213/92-81 listed the enhancements and commitments agreed upon by the licensee to further develop the MOV Program at Haddam Neck in accordance with Generic Letter 89-10. The inspectors reviewed the implementation of enhancements and commitments as described below.

2.1 MOV Program Commitment Items Completed: (Section numbers in parentheses refer to sections in Inspection Report 50-213/92-81)

Revise electrical calculations using locked rotor current instead of motor current at rated torque (Section 2.2).

The licensee developed PI-4, "AC and DC Motor Terminal Voltage Evaluation," with instructions for performing motor terminal voltage evaluations for AC and DC powered MOVs. The instruction establishes NU's position to use locked rotor amperes to determine motor terminal voltage in the calculations for evaluating MOV capabilities and stipulates that locked rotor amperes is to be used in these evaluations. This item is satisfactorily resolved.

Complete evaluation of test data for MOVs RH-MOV-33A & B in accordance with PI-MT10 (now PI-13) by March 1, 1993 (Section 2.5).

On March 1, 1993, NUSCO System Engineering completed calculation 89-092-912 ES to document the review and acceptability of dynamic test data from the 1990 tests of MOVs RH-MOV-33A & B. This evaluation indicated that the test data were reviewed in accordance with PI-MT10. The licensee subsequently issued PI-13, "Evaluation of Dynamic Test Results," on December 31, 1992, and replaced PI-MT10. PI-13 includes requirements to evaluate diagnostic test results for operability by comparing MOV parameters taken from test data (e.g., Thrust at CST, Thrust at Flow Cutoff, Motor Current, Maximum pullout thrust, etc.) to the data used in the design basis thrust calculations performed for each MOV under PI-9, "Determination of Stem Thrust Requirements." Dynamic tests were successfully completed on both valves RH-MOV-33A & B in June 1993, during the refueling outage. The test package for these MOVs contains test data evaluations specified by PI-13 which demonstrated the operability of the MOVs prior to their return to service. The results of these evaluations indicated that the data were evaluated in accordance with PI-13 and SE-93-607 which included additional acceptance criteria. This item is satisfactorily resolved.

Develop an MOV failure and performance trending program (Section 2.8).

The licensee issued PI-16, "MOV Tracking and Trending Program," on December 31, 1992. This instruction provides a basis and specific requirements for monitoring the MOV program and its administrative controls. It also establishes a tracking program for MOV maintenance, configurations, problems, and failures. For example, PI-16 requires reviews of the as-left valve data after each diagnostic test with its setup data. It also directs the use of MOV maintenance history to identify and analyze performance trends. MOV failure trending employs the Nuclear Plant Reliability Data System (NPRDS) to share industry-wide data and to generate a Component Failure Analysis Report every refueling cycle at Haddam Neck. MOV test data were acquired and entered into the trending program during the recent refueling outage.

Periodic verification of MOV capability and switch settings is also incorporated into PI-16. As-found testing is determined by the plant MOV Program Coordinator and will be based upon trending results. This item has been satisfactorily resolved.

2.2 MOV Program Commitment Items Not Yet Complete:

(Open) UNR 50-213/92-81-01: Complete evaluations and documentation of justifications for excluding 34 MOVs (Section 2.1).

During the 92-81 inspection, the licensee included 93 MOVs within the scope of Generic Letter 89-10, but indicated only 59 of these required evaluation and testing under GL 89-10 recommendations. A justification for excluding 34 MOVs from these recommendations was not documented or substantiated. The licensee subsequently developed PI-1, "MOV Program Scope Determination," with detailed instructions and criteria to determine which MOVs are to be included in the Northeast Utilities MOV program. Calculation 89-092-866-ES was completed on January 25, 1993, to determine specifically which MOVs were included in the program at Haddam Neck. The calculation identified a total of 119 MOVs at the Haddam Neck plant that were reviewed for applicability under the generic letter. This calculation also documented evaluations of each MOV's normal function, its abnormal and accident functions, and its position changeability. A total of 59 MOVs were selected to be in the scope of the Haddam Neck GL 89-10 program and subject to all of its recommendations. The remaining 60 MOVs were excluded from the program. The inspectors found these reviews acceptable and considered the documentation and MOV selections to be appropriate.

In March 1993, the licensee completed a "Rapid Plant Cooldown Study" and subsequently eliminated the active safety function of the primary RCS loop stop valves. This study was used to propose the removal of 7 MOVs from the GL 89-10 program since they no longer had an active safety function. In April 1993, the licensee also completed a PRA study and issued a "Revised Prioritization of CY MOVs." This study revised the PRA importance of 6 MOVs that had no active safety function to "low" and suggested their removal from the program. As of October 29, 1993, the licensee considered that a total of 45 MOVs were included in the GL 89-10 program.

The above justifications were used to remove 13 MOVs from the GL 89-10 program, but do not account for or justify removal of the 14 MOVs actually eliminated from the program. This item remains open (UNR 50-213/92-81-01).

Complete all design basis reviews by December 31, 1993 (Section 2.2). Complete MOV thrust calculations by the 1995 outage (Section 2.4).

About 70% of all Design Basis Reviews for MOVs have been completed. The remaining reviews will be completed prior to the final performance of dynamic testing of all MOVs in the program. Approximately 60% of all thrust calculations have been completed. The rest are scheduled for completion by 10/23/93 in order to be ready for the 1995 outage when all testing will be completed.

Evaluate high temperature effects on actuator motor torque when more information is available from Limitorque (Section 2.2).

In response to the Limitorque Part 21 Notice dated May 13, 1993, the licensee performed an initial evaluation of MOV motors considered susceptible to decreased torque from high ambient temperature effects (i.e., $> 180^{\circ}\text{C}$). The licensee reviewed post-accident temperatures at Haddam Neck and issued SE-93-485 on May 21, 1993, providing an initial basis for operability of GL 89-10 MOVs. Subsequent engineering analyses concluded that MOVs CH-MOV-292B & C should be modified with new motor gear sets, in part to compensate for this potential deficiency. These MOVs were modified during the 1993 refueling outage. The licensee later received preliminary test results from Limitorque, but they did not provide sufficient detail to identify specific MOV motors at Haddam Neck that are vulnerable to high temperatures and reduced torque. Additional licensee reviews were ongoing and plant specific information applicable to motors at Haddam Neck had not been obtained from Limitorque to complete the review at the time of this inspection. This item remains unresolved pending receipt of additional vendor information and the licensee's completion of their review (UNR 50-213/93-15-01).

Obtain diagnostic equipment to monitor Auma actuators to support testing during the 1995 outage (Section 2.3).

This item is being pursued with Auma and Nooney Controls and is still in progress. The use of VOTES diagnostic equipment for these actuators is being studied.

Obtain equations to be used for output capability of the Crane Teledyne and Auma actuators. Incorporate this information into the MOV program (Section 2.4).

Some information has been obtained and incorporated into PI-9 as a methodology for evaluating the various mechanical design parameters and control switch setpoints for Crane Teledyne actuators. Similar information for Auma actuators is not yet available. This item is still ongoing.

Develop detailed methods for evaluation of the results of dynamic testing, assessing load sensitive behavior, extrapolation of test results, and feedback of dynamic test results into original thrust calculations (Section 2.4).

The licensee has developed some methods to evaluate differential pressure test results for MOV operability and incorporated them in PI-13, "Evaluation of Dynamic Test Results," and into dynamic test procedures. In addition, further program improvements in MOV post-test operability reviews were identified during an NRC inspection at Millstone that were later incorporated at Haddam Neck in safety evaluation SE-93-607. Revision 0 to PI-13 has incorporated basic criteria to extrapolate MOV thrust and torque from partial d/p and flow tests. However, it does not provide details of how the extrapolations are to be performed. For example, PI-13 does not specify a need to include uncertainties in the extrapolations such as diagnostic and pressure measurement errors, or torque switch repeatability.

Revision 1 to PI-9 specifies design input parameters for MOV thrust calculations as follows:

Valve Factor

- 0.2 for parallel seat double disk gate valves
- 0.3 for wedge or sluice gate valves
- 1.1 for globe valves

Packing Load

1000 lbs/inch diam in 1/2 inch & 500 lb increments > 1000 lbs.

Stem Factor

Derived by formula using stem diameter, thread pitch and lead, and different friction coefficients for lubricated or unlubricated valve stems (0.15 or 0.20, respectively). Use of friction coefficients less than 0.15 is allowed if sufficient justification is available from the vendor or from industry test data and if maintenance practices are sufficient to maintain a stem lubrication cycle ≤ 24 months, threads are in good condition, and the MOV is in a temperature environment of $< 150^{\circ}\text{F}$.

The licensee is adjusting MOV valve factors based upon test results if necessary. Valve factors are revised upward if test results indicate they are actually greater than assumed by the initial thrust calculation. Valve factors are not revised if test results indicate the factors are less than originally assumed. No direct torque measurements have been obtained at Haddam Neck as of this inspection; however, the licensee stated that they will install test instruments (VOTES Torque Cell) to directly measure torque in MOVs at Haddam Neck and to determine their actual friction coefficients. The licensee believed that the stem friction coefficients at Haddam Neck were reasonable based upon test results at their other sites where torque was measured directly. Load sensitive behavior is currently determined during testing and is factored back into MOV thrust calculations. All test results and evaluations are independently reviewed.

The above methods are currently employed in post test operability evaluations in accordance with SE-93-607. However, the complete methodology is not fully developed and incorporated into the MOV Program Manual. Not all test results have been suitable for determining revised valve factors. The licensee was preparing the next revision to the program manual to incorporate all formal test evaluation methods and requirements into PI-11, PI-12, and PI-13.

Consider differential pressure testing MOV BA-MOV-366 during the 1993 outage (Section 2.5).

Valve BA-MOV-366 (Boric Acid Pumps supply to Charging Pumps isolation) was removed from the GL 89-10 program because its safety function does not require it to change positions under accident conditions. Also, its low risk importance to plant safety. Its low PRA risk was demonstrated by a recent PRA study on "Revised Prioritization of CY MOVs," completed in April 1993. The licensee originally placed BA-MOV-366 in the GL 89-10 program solely for PRA considerations that were primarily qualitative in nature. It was removed from the program after the Haddam Neck PRA analysis was better quantified and new risk priorities were defined to reflect significant changes in plant design and operation. The NRC does not consider that deleting a safety-related MOV from the MOV program is adequately justified solely on PRA considerations even though it has no active safety function. This item is not satisfactorily resolved.

Complete static and dynamic testing of MOVs by the 1995 outage (Section 2.5).

The MOV Program Manual Section 4.0 includes schedule requirements and references the NUSCO Engineering Department Program Plan for "Safety-Related MOV Testing and Surveillance Program (NRC Generic Letter 89-10)." This program plan includes the schedule for completion of MOV testing and identifies the 1995 refueling outage for completion of all MOV testing for GL 89-10.

Caution test personnel concerning the potential for overthrusting MOVs (Section 2.5).

The licensee revised Procedure PMP 9.8-105 to include these cautions in test procedures and some test procedures have been revised to include this caution. A formalized requirement will be incorporated into the program manual and additional test procedures in future revisions.

Address maintenance program weaknesses noted concerning MOV hydraulic lock and spring pack relaxation problems (Section 2.6).

The licensee has initiated efforts to further develop preventive and corrective maintenance procedures for MOVs. However, incorporating inspections for hydraulic lock and spring pack relaxation have not been fully addressed within the maintenance department.

Develop a program for periodic verification of MOV switch settings (Section 2.7).

Periodic reverifications of MOV capability and switch settings have not been fully developed in the MOV program in accordance with the intent of GL 89-10. PI-16, Section 3.4, requires as-found testing when warranted and indicated by performance trends; however, the program has not established the required periodic reverification testing for each MOV under the GL 89-10 program.

The "MOVATS Open/Close" issue is not defined for some MOVs which have never been tested using VOTES equipment (Section 2.10).

The licensee has not yet tested MOVs FW-MOV-35, FW-MOV-160, and SI-MOV-861C with VOTES equipment and has not resolved the Open/Close question regarding their last MOVATS test results.

2.3 Actions to Resolve MOV Pressure Locking and Thermal Binding

In September 1990, the licensee issued a final report on thermal binding and hydraulic lock of gate valves at Haddam Neck. An engineering contractor evaluated these conditions and analyzed the susceptibility of MOV gate valves to these problems based upon their functions during all normal and abnormal conditions. The contractor evaluated seventy-four MOVs and developed five priorities identifying MOV susceptibility and recommended corrective actions to prevent or mitigate pressure locking and thermal binding. Six MOVs with an accident mitigation function were assigned the highest priority (A) for resolution. Priority B through D MOVs are susceptible to hydraulic lock or thermal binding. However, the licensee considers that these valves do not have active safety functions. MOVs in Priority E were not susceptible to the concern. The licensee performed a reportability evaluation on July 19, 1990, to continue operation with the high priority valves in as-found condition.

The licensee stated that Priority A valves were required to be cycled during plant heatup and cooldown to prevent pressure locking. Plant operating procedures were changed to meet this requirement. The licensee reviewed the actuator thrust output required for each susceptible MOV to overcome forces induced from pressure locking or thermal binding and concluded that these MOVs had sufficient thrust to operate during pressure locking or thermal binding. However, the thrust calculations for GL 89-10 MOVs do not reflect the actual pressure locking or thermal binding forces that would be required to overcome.

The licensee has no current planned actions to modify any of the thirty-three MOVs in Priorities A - D. Pending a detailed NRC review of the pressure locking and thermal binding calculations and their conclusions, this item is unresolved (UNR 50-213/93-15-02).

3.0 REVIEW OF MOV DYNAMIC TEST RESULTS (2515/109)

There are currently a total of 47 MOVs in the GL 89-10 program at Haddam Neck out of a total of 119 MOVs in the plant. Not all MOVs can be tested at 100% design basis conditions. The inspectors concluded that the licensee has established sound technical bases to demonstrate why certain valves cannot be tested at design basis conditions. The licensee prepared and conducted a small number of dynamic tests during the 1993 refueling outage. Testing the MOVs at the highest dynamic conditions practicable was adequately justified in "Calculations of Expected Test Conditions," and was based upon the overall progress within the program just prior to the outage.

During the June 1993 refueling outage, twenty of the GL 89-10 MOVs were diagnostically tested under static system conditions. Eleven dynamic tests were also attempted; however, only five provided sufficient data to be credited as successful in both directions of valve motion. Three dynamic tests (SI-MOV-861B, C, & D) were declared invalid due to test equipment and data acquisition problems related to difficulty in placing strain gage detectors in acceptable locations on the valves and to signal reversals occurring during detector calibrations. In addition, two dynamic tests were aborted when valves CH-MOV-292B & C failed to fully close under high differential pressure conditions.

The inspectors reviewed the following MOV dynamic test packages:

1. ST 11.7-99; RH-MOV-33A & 33B; RHR to charging system cross connect valves
2. ST 11.7-105; CH-MOV-292B & 292C; Charging header isolation valves
3. ST 11.7-115; SI-MOV-871A, 871B, & 873; Core deluge valves

The test procedures within the above packages were reviewed for various attributes, including the test methodology and controls, specifications for initial system conditions, test limitations imposed by design basis reviews, necessary differential pressures and flows, and appropriate test acceptance criteria. The procedures reviewed were adequate in these areas. MOV and system parameters such as motor voltage, upstream and downstream pressure, suction flow, and ambient temperature were documented in pre- and post-test data sheets. Test procedures incorporated MOV assessments with calculations that included corrections for diagnostic test equipment inaccuracies, torque switch repeatability, and installed plant instrument elevations. VOTES diagnostic traces are included as part of the official data records in the test procedures as are all sensor calibration traces with their defined limits.

Specific test acceptance criteria in dynamic test procedures included requirements to:

- 1) Perform a calculation to assure that the extrapolated thrust at design basis d/p is demonstrated to be less than or equal to the dynamic thrust value at torque switch trip.

- 2) Review VOTES diagnostic traces to verify that a) no significant abnormalities exist in the traces; b) thrust at torque switch trip is \leq the defined maximum thrust at torque switch trip; and c) the test data verifies that the total force is \leq the total maximum thrust.

The inspectors considered that the test acceptance criteria were generally appropriate for dynamic testing with the exception of actual torque capability; however, direct torque measurements will be included in future MOV tests at Haddam Neck. Some of the test data were not acceptable for determining revised valve factors. Test procedures did incorporate basic operability criteria requiring the MOV to close and open against test d/p. Operability evaluations were performed after all diagnostic tests and prior to reactor plant operations when the MOVs were returned to service. The licensee indicated that valve stroke times measured during diagnostic tests were compared to the maximum stroke times specified by the ASME Code Section XI test program. A requirement to document these comparisons has not been incorporated into the program manual or into test procedures.

3.1 Failure of CH-MOV-292B & C During Dynamic Testing:

During the initial setup for recent dynamic testing of the charging system discharge header isolation valves CH-MOV-292B & C, both MOVs failed to complete a full stroke in the closed direction under high differential pressure (d/p) conditions. The valves were initially opened under static conditions. The charging pumps were subsequently started and flow was adjusted to approximately 400 gpm at 2600 psid. The MOVs were then closed, but the actuator torque switches opened before full valve closure was achieved. The torque switch setting on both MOVs was reached when the d/p across the valves was approximately 2675 psid and they had travelled approximately 85% of their full stroke distance. Both tests were aborted and no further dynamic tests were conducted on these MOVs.

The licensee initiated Plant Information Reports PIR#93-123 and PIR#93-124 to document these test failures and to initiate operability reviews. Non-conformance report NCR#CY-93-254 was initiated to evaluate the causes and corrective actions necessary. The licensee determined not to retest these valves under the same dynamic conditions but performed operability reviews to evaluate the acceptability of returning the valves to service. The NCR was dispositioned to use the MOVs "as-is" since the worst case d/p currently postulated for their automatic closure is 1376 psid under accident conditions. Both valves were statically tested in accordance with ASME Section XI prior to plant startup. Both valves remain normally open during plant operation to fulfill their primary safety function during charging to the primary coolant system.

In June 1986, the licensee responded to NRC Bulletin 85-03 indicating that MOVs CH-MOV-292B & C had been evaluated for both normal and abnormal events to determine their maximum expected operating differential pressure. Their design maximum d/p of 2200 psid was determined to be inadequate since the valves may have to operate either open or closed up to approximately 2900 psid. The licensee subsequently revised the plant's emergency operating procedures to require a manual valve manipulation upstream of CH-MOV-292B & C to isolate them from high pump pressure and to allow them to operate at less than 2200 psid. In 1990 and 1992, both MOVs were tested and successfully operated under dynamic conditions with their differential pressure at 2600 - 2700 psid. However, an overthrust condition occurred in both valves during these tests. A Notice of Violation (NOV) was issued during the October 1992 MOV inspection (described in para. 4.1 below), due to inappropriate resolution of NCRs resulting from the overthrust events. In response to this NOV, the licensee performed a stress analysis for these valves and evaluated the results of the overthrust for potential damage.

Both motor actuators were recently modified to increase their maximum output thrust to overcome a differential pressure of 2846 psid across the valves. However, the design maximum d/p for the valves remained at 2200 psid as previously established. It was not apparent to the inspector that the design change included an evaluation of the valves' ability to function properly beyond the manufacturer's specified maximum dynamic conditions. Recent design basis thrust calculations for these MOVs under PI-9 did not explicitly address any thrust limit that may exist due to a predetermined d/p limit for the valves. Special test procedure ST 11.7-100 was subsequently written for dynamic testing during the recent refueling outage and it approved the operation and test of CH-MOV-292B & C at a differential pressure greater than 2200 psid.

On June 12, 1993, during the initial setup steps in test ST-11.7-100, both MOVs CH-MOV-292B & C failed to stroke fully closed. They ceased to function when actuator motor torque reached the amount set on their torque switches. Final indicated flow was approximately 40 gpm. The differential pressure at that point was approximately 2675 psid, based on the charging pump pressure corresponding to 40 gpm on the pump curve. Failure to limit the differential pressure to the design basis maximum specified for these MOVs was formally changed on October 18, 1993, to an unresolved item pending further NRC review of the licensee's design changes and performance evaluations for CH-MOV-292B & C (UNR 50-213/93-15-03).

4.0 FOLLOW-UP TO PREVIOUS NRC CONCERNS (92702)

4.1 (Open) NOV 50-213/92-81-03: Criteria for Dispositioning NCRs:

In October of 1992, the licensee inappropriately dispositioned NCR 92-100 to evaluate the condition of MOVs CH-MOV-292B & C after they were subjected to a thrust that exceeded the allowable thrust for the valves' motor actuators. The licensee responded to this NOV indicating that it determined to use the MOVs "as-is" because the acceptable thrust was based

upon the MOV set point list value derived from an analysis of valve strength and did not explicitly address the actuator's structural limitations. The MOVs were considered operable because the torque switch limiter plate settings were not exceeded and, therefore, the actuators were not subjected to excessive torque.

Immediate corrective actions were taken to conduct operability/reportability evaluations on 9 other overthrust MOVs. These valves were accepted as-is based upon structural analyses. Thrust values were also corrected for the VOTES equipment inaccuracies and the underthrust problems reported in the Liberty Technology 10 CFR Part 21 notification of October 1992. These corrected values were then compared to the valve and actuator structural limits for acceptability.

Additional corrective steps were taken include issuing the MOV Program Manual by December 18, 1992, to provide specific guidance concerning testing of MOVs. Project Instructions PI-3, PI-9, PI-10, and PI-13 were specifically designated to provide sufficient administrative and technical guidance to avoid future violations and to assure proper resolution of NCRs related to testing MOVs.

The inspectors reviewed all four PIs listed above and concluded that PI-3, "MOV Structural Evaluation," and PI-10, "Static Testing" were adequate to ensure that technical guidance is available to guide the proper disposition of NCRs related to these subject areas. However, based upon the potentially inadequate test conditions identified in MOVs CH-MOV-292B & C in para. 3.1 above, it is not apparent that the design basis maximum differential pressure for MOVs have been adequately considered in PI-9, "Determination of Stem Thrust Requirements," or in PI-13, "Evaluation of Dynamic Test Results," to provide the necessary technical guidance required to evaluate MOV thrust limits imposed by the maximum valve differential pressure.

The inspectors noted that PI-11, "Determination of In-Situ Test Capability," requires that the dynamic test should simulate the design basis condition as determined in the design basis review performed by PI-2, "MOV System and Functional Design Basis Review." However, this PI also did not provide technical guidance for establishing a maximum thrust limit that would correspond to a design maximum differential pressure. Although these PIs addressed the specific NCRs related to actuator overthrust in 1990 and 1992, they do not appear to resolve the need to prevent further violations concerning an improper disposition of NCRs where valves or actuators exceed their design maximums during dynamic testing. Therefore, this item will remain open pending future NRC review of subsequent MOV Program Manual revisions and the licensee's resolution of UNR 50-213/93-15-03 described above.

4.2 (Closed) NOV 50-213/93-04-02; SOVs Not in the ASME Section XI Test Program at Haddam Neck:

In April 1993, NRC inspectors identified two charging pump suction solenoid-operated valves, CH-SOV-242 and CH-SOV-242B, that were required to be tested in accordance with ASME Code, Section XI, Article IWB-3413, but were not included in the licensee's Inservice Test Program. These valves were installed during the 1990 plant outage as an upgrade to the charging system to prevent single active failures from disabling the charging system following an event requiring safety injection. However, the valves were not put into the licensee's Section XI test program and no relief request was submitted to the NRC for these valves. The licensee responded to this violation indicating that a relief request had been initiated and that possible test methods would also be investigated. The licensee did procure acoustic test equipment to measure the stroke times for these SOVs on a trial basis, and later identified other test equipment that could measure stroke time with great precision. The licensee subsequently withdrew the relief request from Section XI testing and placed these valves in the Section XI test program. Controlled Routing was initiated to develop a new test procedure to accomplish stroke time testing of these SOVs. Based upon the above actions, this item is closed (NOV 50-213/93-04-02).

5.0 EXIT MEETING

The inspectors met with licensee personnel, denoted in Attachment 1 of this report, at the conclusion of the onsite inspection on July 30, 1993. At that time, the scope of the inspection and inspection results were summarized. A telephone conference between Region I and the licensee was held on August 13, 1993, to review the status of the findings as detailed in this report. A conference call was conducted on October 18, 1993, to discuss the failures of MOVs CH-MOV-292B & C. The inspection was formally closed during a conference call with licensee management on October 28, 1993. The licensee acknowledged the inspection findings as detailed in this report and had no additional comments regarding the inspection results.

ATTACHMENT 1

Persons Contacted

Northeast Nuclear Energy Company, Corporate and Station Personnel

- * D. Ray, Director, Connecticut Yankee
- * J. DeLawrence, ISI Supervisor
- * R. Eisner, Project Engineer
- C. Martin, ISI Engineer
- J. DiMarzo, System Engineer
- * C. Gladding, Manager, Connecticut Yankee Engineering
- * J. Stetz, Vice President, Connecticut Yankee
- * E. Annino, Senior Analyst

U. S. Nuclear Regulatory Commission

- * W. Raymond, Senior Resident Inspector, Haddam Neck
 - P. Habighorst, Resident Inspector, Haddam Neck
 - * P. Eapen, Section Chief, Region I (via telephone)
- * Denotes those present at the exit meeting conducted on July 30, 1993.