U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-266/94004(DRS); No. 50-301/94004(DRS)

Docket Nos.: 50-266; 50-301 Licenses No. DPR-24; No. DPR-27

Licensee: Wisconsin Electric Power Company
231 West Michigan Street - P379
Milwaukee, WI 53201

Facility Name: Point Beach Nuclear Plant - Units 1 and 2

Inspection At: Two Rivers, Wisconsin

Inspection Conducted: February 22 through March 11, 1994

Inspectors:

M. P. Huber — Date 3-29-94

J. F. Smith — Date 3/29/94

W. D. Pegg — Date 3-29-94

Approved By:

J. M. Jacobson, Chief
Materials & Processes Section — Date 3-29-94

Inspection Summary

Inspection conducted February 22 through March 11, 1994 (Report Nos. 50-266/94004(DRS); 50-301/94004(DRS)).

Areas Inspected: Announced safety issues inspection of the licensee's response to Generic Letter (GL) 89-10, "Safety-Related MOV Testing and Surveillance" in accordance with the guidance of Temporary Instruction 2515/109.

Results: The licensee has developed a program which is generally consistent with the guidance of GL 89-10. One inspection followup item was identified (Section 3.8).

The licensee demonstrated a strong commitment to their MOV program as demonstrated by the involved engineering staff and the aggressive response to potentially nonconforming conditions.

Weaknesses in the GL 89-10 program implementation were apparent as evidenced by the slow development of program procedures that were necessary to close-out the GL 89-10 effort and the excessive programmatic and isolated errors made in implementing the program.

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DETAILS

1.0 Persons Contacted

Wisconsin Electric Power Company (WEPCo)

R. Grigg, Vice President, Customer Operations
T. Koehler, Manager, Site Engineering
F. Cayia, Production Manager
B. Fromm, Senior Engineer, System and Component Engineering
J. Kirchen, Site Engineering
F. Mueller, Mechanical Evaluation
F. Padovano, Licensing
K. Rathgaber, Project Engineer, Mechanical Engineering
J. Roberts, Component Engineer, Mechanical Engineering
J. Schroeder, Systems Engineering

U. S. Nuclear Regulatory Commission (NRC)

J. Gadzala, Resident Inspector

The personnel listed above attended the exit interview on March 11, 1994. The inspectors also contacted other licensee personnel during the inspection.

2.0 Licensee Action on Previous Inspection Findings (92701)

(Closed) Open Item 50-266/92021-01(DRS); 50-301/92021-01(DRS): Justification for grouping motor-operated valves (MOV). The licensee took exception to the Generic Letter (GL) guidance regarding differential pressure (DP) and full flow testing of MOVs whenever practicable. Four valves that were practicable to DP test will not be tested, using the grouping methodology instead to justify operability. Results from DP tests of other valves in the group were applied to the four non-tested valves. The methodology was consistent with the considerations described in the draft GL 89-10, Supplement 6 "Information on Schedule and Grouping, and Staff Responses to Additional Public Questions" which described acceptable methods for grouping MOVs to reduce DP test scope. This item was closed.

(Closed) Unresolved Item 50-266/92021-02; 50-301/92021-02: Use of non-conservative assumptions for determining degraded voltage and MOV switch settings. Non-conservative assumptions were removed from the licensee's degraded voltage calculations. Recalculated voltages were confirmed to be correct. Other non-conservative assumptions were removed from the thrust equation, used to calculate MOV capability. Additional incorrect assumptions and errors were noted in the new calculations (see Section 3.4.1); however, there were no operability concerns when the equations were corrected. This item was closed.

(Open) Unresolved Item 50-266/92021-03; 50-301/92021-03: Direct evaluation of overall diagnostic system accuracy. The licensee performed a physical test of the system and concluded the overall accuracy was +/- 5%. However, this item will remain open due to other issues related to the diagnostic equipment identified in Section 3.6.

(Closed) Deviation 50-266/92008-02; 50-301/92008-02: Lack of operability sign-offs on procedures. This deviation was discussed in Inspection Report (IR) 92-008, Action Item 5, which resulted in changes in 66 procedures. This item was closed.

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

This Phase 2 inspection verified the licensee's GL 89-10 program implementation by examining a cross-section of the Point Beach MOV population. The following MOVs were reviewed during this inspection.

2 CC 738B	Residual Heat Removal (RHR) B Heat Exchanger (HX) Cooling Water Supply Isolation
1 RC 515	Unit 1 Power Operated Relief Valve (PORV) Isolation
2 RC 516	Unit 2 PORV Isolation
2 SI 860B	Unit 2 A Containment Spray Pump Isolation
1 SI 866B	Safety Injection (SI) Supply to Hot Leg Isolation
2 SI 878A	SI Loop B Isolation
2 SI 878B	SI Loop B Isolation
0 SW 2816	Auxiliary and Service Building Service Water (SW) Isolation
2 SW 2907	Containment Vent Coolers SW Isolation

3.1 Program Procedures

Procedures and guidance for performing the design basis reviews, thrust calculations and stem thrust band calculations were in draft form during the inspection and available for review. The procedures and guidance were generally consistent with GL 89-10 recommendations and the licensee's program implementation. However, the inspectors concluded that the procedures and guidance had not been completed in a timely manner. Although there was no operability problems due to a lack of written program guidance and the actual program implementation was generally acceptable, the lack of progress made towards fully developed written and approved procedures and guidance was considered a weakness.

3.2 Program Scope

The scope of the program appeared to be adequate with respect to inclusion of the necessary MOVs. The program included 118 safety-related MOVs.

Since the last inspection, four safety-related MOVs were added to the program and six others were removed from the program. An internal engineering review performed to resolve issues raised by Information Notice (IN) 92-17 determined that valves 1(2)-CV-815 and 1(2)-CC-313

should have been included in the GL 89-10 program. The licensee determined that valves 1(2)-RH-700, 1(2)-RH-701, and 1(2)-RH-720 were not called upon in the emergency operating procedures and were not needed to respond to licensing basis accidents. These valves were electrically locked out at the motor control centers to prevent inadvertent operation. The inspectors reviewed licensing basis documentation such as the Emergency Operating Procedures (EOP) and the Final Safety Analysis Report (FSAR) to verify that these valves were not called upon in design basis accidents. The inspectors found no condition that required operation of these valves and concluded that their removal from the program was acceptable.

3.3 Design Basis Reviews

3.3.1 Differential Pressure and Flow Requirements

A number of DP calculations were reviewed to determine if the DPs used in MOV calculations were appropriate. The calculations considered possible system configurations during normal conditions, accident conditions, and mispositioning events. The limiting conditions for valve opening and closing differential pressures were appropriately determined and were adequately documented. Other pertinent factors, such as flowrates and temperatures were also documented.

A listing of the documents reviewed, such as the FSAR, Technical Specifications, and EOPs was provided and the source documents for bounding conditions were referenced. However, the inspectors noted that in calculation N-93-67, some of the referenced documents and sections were loosely related, and at times apparently unrelated, to the conditions described in the calculation. It appeared that there was a break in communication between corporate engineering and the site staff. The licensee was resolving the problems with the calculation. Aside from the apparent disconnect, the inspectors had no significant concerns with the calculations.

3.3.2 Degraded Voltage Calculations

During the Part 1 inspection, the degraded voltage calculations were found to be performed using non-conservative assumptions. Calculations were redone prior to this inspection. The licensee's current method for determining degraded voltage at the MOV motor terminals was reviewed and no discrepancies were identified. These calculations included changes in motor current resulting from elevated motor temperatures discussed in Limitorque potential Part 21 dated May 13, 1993.

The degraded voltage calculations were performed assuming the worst case grid voltage (for AC motors) and the minimum battery voltage (for DC motors) as the starting points. Cable temperatures used in the calculations reflected the ambient temperature at the time of use (when performing its safety function). The maximum current was based on the locked rotor current adjusted for degraded voltage and temperature.

Terminal voltages for a selected sample of MOVs were independently calculated by the inspectors and compared with the licensee's results. The figures were comparable and the licensee's results were conservative in each case.

3.4 Design Basis Capability

3.4.1 MOV Switch Settings

MOV capability to operate under design-basis conditions was evaluated by calculating the available thrust using the standard Limitorque equation. Mean seat diameter and various valve factors (determined from dynamic testing) were used. The minimum and maximum values making up the stem thrust band included margins for dp thrust requirement changes (error associated with changing system conditions and wear), stem factor changes, and load sensitive behavior as appropriate. Information from Limitorque Technical Update 93-03 regarding motor torque losses at elevated temperatures was incorporated into the thrust band calculations.

Some problems were identified in the capability calculations. The inspectors questioned the licensee's use of motor stall torque instead of rated motor torque. The licensee confirmed the inspectors position and immediately corrected the input data. The licensee reviewed thrust band calculations after correcting for the stall torque error and confirmed that the MOVs in the plant were still operable with the current torque switch settings. Errors associated with torque switch repeatability and diagnostic equipment accuracy, however, were not accounted for in the calculations. Although thrust margin was available to provide for these errors, evaluation and documentation of its adequacy was necessary. The licensee committed to account for these errors and to perform this evaluation.

The stem thrust band calculations were performed using a stem friction coefficient of 0.15 and a five percent allowance for stem lubrication degradation. The licensee indicated that the 0.15 stem friction coefficient bounded all of the test data, some of which included as-found diagnostic tests, and that the actual degradation was virtually undetectable, but had not yet formally documented this position. The area of MOV switch settings will be reviewed during a future inspection due to the errors made in the stem thrust band calculations and the need for documented justification for a stem friction coefficient of 0.15.

During the course of the inspection, the licensee was evaluating information regarding the valve factor of the PORV block valves and their operability. DP test data from another plant was applied to the valves at the Point Beach plant because DP/flow testing will not be performed. The valve factor from the DP tests at the other plant was larger than the one used to calculate the torque switch setting for the valves at Point Beach. The more conservative valve factor was applied to the torque switch setting calculation and did not pose an operability

problem. The licensee's response to a potentially nonconforming condition was aggressive and considered a strength.

3.4.2 Differential Pressure Testing Scope

The licensee planned to DP/flow test 92 of the 118 MOVs in the program. Eighty-eight DP/flow tests were completed with the four remaining tests scheduled to be performed prior to the end of June 1994. Test procedures with adequate acceptance criteria were used to perform testing.

Since the licensee's methodology incorporated the test results in the final design documents, all data from testing was fedback into the MOV calculations. Test data was also incorporated into the design-basis calculations for other valves that would not be DP tested. The inspectors reviewed justifications provided for not testing motor-operated valves under differential pressure and flow. The justifications appeared acceptable.

3.5 MOV Brakes

The licensee performed an acceptable evaluation of the operability of brakes on safety related valves. Sixteen of the twenty MOVs with brakes required individual engineering justification to ensure that they would release on start-up with degraded voltage. The inspectors found no irregularities in these evaluations.

3.6 Evaluation of Test Data and Diagnostic Traces

The inspectors reviewed procedures and dynamic and static test results for the selected valves.

The licensee uses a diagnostic system which was developed and patented by plant personnel. It consists principally of a series of load cells inserted between the operator and the valve yoke. Calibration of the system was performed by applying a known load to the load cells in a snubber test rig and reading the results from the diagnostic system. The elements which apply the load to the cells were cantilevered from a large I-beam. Review of the test data showed a form of hysteresis in which the indicated load was influenced by the direction of load change. Although this may have been an effect from flexing of the test apparatus, the inspectors did not consider this correlation to be objectively evident. Further review of the adequacy of the licensee's diagnostic equipment error will be performed during a future inspection.

3.7 Schedule

The licensee planned to complete all testing and analysis within the schedule proposed by the GL (June 28, 1994). This included all program procedures and calculations. It appeared that the licensee would meet the scheduled end date.

3.8 Periodic Verification of MOV Capability

Design basis capability of MOVs will be reverified at a five year interval with static diagnostic tests except in cases where valve maintenance performed may affect the thrust required to close or open a valve against design differential pressure. No additional full dp testing was planned. The licensee stated that the use of diagnostics to ensure that each MOV in the program was capable of performing its safety function would be justified. The licensee planned to prepare a report outlining the justification for applying static test results to periodic verification of MOV capability. This was considered an inspection followup item (50-266/94004-01(DRS); 50-301/94004-01(DRS)).

3.9 MOV Failures, Corrective Actions and Trending

The inspectors reviewed MOV failure data from the past four years. The problems appeared to have been appropriately evaluated and corrective actions appeared to have been effective. There was no indication of recurring problems and the overall number of MOV failures was relatively low. The inspectors reviewed the tracking database for corrective actions and determined that corrective actions, including those arising from industry notifications, were appropriately documented and tracked.

The MOV component engineer recorded MOV performance parameters during MOV check outs and compared them with previous data to determine if there were any signs of degradation. The component engineer overlaid current signatures with previous signatures to determine if there were any significant anomalies in the MOV traces. Maintenance Instruction (MI) 5.1.17 will be developed to provide instructions for reviewing and evaluating the MOV performance related parameters.

In the GL 89-10 program, it was the responsibility of the NPRDS group to track the overall MOV trends to identify generic program problems. The inspectors noted that a valve failure had not been documented by the NPRDS group. The failure of 2 SI-896A to fully close under full DP conditions had been appropriately documented in Condition Report 93-330 and the corrective actions were documented and tracked in the corrective action database; however, the NPRDS group failed to incorporate this failure into its trending program. The licensee was notified of this discrepancy.

3.10 Associated Programmatic Reviews

3.10.1 Maintenance

The overall condition of safety-related motor operators and valves in the program was good as demonstrated by infrequent corrective maintenance and a low failure rate. This was supported by the MOV testing data. The MOV component engineer's close involvement in corrective maintenance, preventive maintenance, post maintenance testing (PMT), static testing, and dp testing was considered to be a positive aspect of the program.

Maintenance procedures involving the adjustment of torque and limit switches; the removal and installation of Limitorque operators; the disassembly, inspection, repair, and assembly of various limitorque operators; and MOV troubleshooting were generally well written and complete. The inspectors identified, however, that the maintenance procedures did not direct technicians to document instances of overthrusting or notify appropriate personnel to evaluate the impact of overthrusting events. This condition was self-identified during an internal engineering review of IN 92-17 and was discussed with the licensee staff. The licensee committed to develop appropriate guidance for initiating and performing overthrusting evaluations.

The scheduling of preventive maintenance activities was jointly handled by the component engineer and the maintenance planner. Preventive maintenance activities were performed on schedule. Licensee staff were developing a component maintenance program (CMP) to consolidate information about the preventive and corrective maintenance of various components, including motor-operated valves. The MOV CMP was expected to be completed within several months.

The lubrication frequency of MOVs was based on the service of individual valves. High cycle valves were scheduled to be lubricated annually, while low cycle valves were scheduled to be lubricated on a five year frequency during the MOV check out. For the low cycle valves, the lubrication frequency exceeded the manufacturer's (Limitorque) recommended frequency for stem lubrication of 18 months. The inspectors informed the licensee staff that the stem friction coefficients used in thrust calculations should correlate to observed lubrication conditions at the end of the lubrication intervals and that the differences in lubrication frequency from the manufacturer's recommended frequency should be documented and justified based on these observations. The inspectors also noted that any degradation observed over that interval must be accounted for in the calculations with adjustments made to the lubrication frequency, as necessary.

3.10.2 Walkdown

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

3.10.3 Pressure Locking and Thermal Binding

The licensee's progress in dealing with pressure locking and thermal binding was considered acceptable. The licensee performed evaluations for pressure locking and thermal binding on each safety related MOV in the program. A review of this work disclosed two questionable areas: The identification of 500 psig as a criterion below which valves were not susceptible to pressure locking and of 350 Degrees F as a criterion below which thermal binding will not occur. These are not recognized criteria. Pressure locking can occur any time the bonnet pressure

exceeds the ability of the operator to overcome it and no lower limit has been objectively established to demonstrate freedom from thermal binding. However,the problem is academic because neither criteria was used as a sole basis for determining susceptibility to pressure locking or thermal binding. However, both should be reconsidered as criteria in future evaluations.

Pressure locking in susceptible MOVs was avoided at Point Beach by several different methods. These included drilling the disks on the upstream side, venting the bonnet to the upstream side of the disk through a normally open manual gate valve and venting to the upstream side of the disk through a 60 psid lift check valve. No MOVs were identified as being susceptible to thermal binding.

Participation in the recent NRC Public Workshop on Gate Valve Pressure Locking and Thermal Binding provided the licensee with insights into the problems that were not previously considered and additional work in these areas was planned. Additional work may be required as information becomes available. This area will be the subject of future inspections.

3.10.4 Training

Engineering personnel at Point Beach were knowledgeable in the area of MOVs. Overall, it appeared that the engineers were involved and cognizant of what was necessary to maintain MOV operability. Training was initiated to ensure that additional engineering personnel were trained in MOV activities. However, training did not address stem factors and valve factor analysis and identifying test data indicative of changes in these factors. No additional training was planned in this area. Instead, one or more procedures were to be written to cover this engineering evaluation and to provide guidance in the subsequent decisions to be made concerning the implications of anomalous test data. These procedures will be reviewed during a future inspection.

The training program for personnel performing maintenance and routine segments of diagnostic testing was acceptable. Extending the participation in these classes to selected engineering and management personnel was considered appropriate to improve the understanding of associated issues.

4.0 Licensee Self-Assessment

The licensee conducted self-assessments of their MOV program. Various issues such as the lack of torque switch repeatability in stem thrust calculations, no documented justification for linear extrapolation, periodic justification, and the lack of a requirement for evaluating potentially overstressed MOVs were identified by the licensee. Not all of the issues identified during this inspection were found by the licensee but their self-assessment was still considered a critical look at the MOV program and program implementation.

5.0 Inspection Followup Items

Inspection followup items were matters which have been discussed with the licensee, which will be reviewed further by the inspectors, and which involve some action on the part of the NRC or licensee or both. An inspection followup item disclosed during this inspection was discussed in Paragraph 3.8.

6.0 Exit Meeting

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on March 11, 1994. The inspectors summarized the purpose and scope of the inspection and the findings. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed during the inspection. The licensee did not identify any such documents or processes as proprietary.

ATTACHMENT 1

POINT BEACH VALVE DATA

VALVE NUMBER	VALVE SIZE AND MANUFACTURER	TEST CONDITIONS	DYNAMIC VALVE FACTOR	LOAD SENSITIVE BEHAVIOR*
2-CC-738B RESIDUAL HEAT REMOVAL B HEAT EXCHANGER COOLING WATER SUPPLY ISOLATION	10" VELAN FLEXIBLE WEDGE GATE VALVE	100 psid (c) 100 psid (o)	0.85	0.0
1-RC-515 UNIT 1 POWER OPERATED RELIEF VALVE (PORV) BLOCK VALVE	3" VELAN FLEXIBLE WEDGE GATE VALVE	STATIC TEST ONLY	UNAVAILABLE	0.0
2-RC-516 UNIT 2 PORV BLOCK VALVE	3" VELAN FLEXIBLE WEDGE GATE VALVE	STATIC TEST ONLY	UNAVAILABLE	0.0
2-SI-860B UNIT 2 CONTAINMENT SPRAY PUMP A ISOLATION	6X4X6 DOUBLE DISC WEDGE GATE VALVE	STATIC TEST ONLY	UNAVAILABLE	0.0
1-SI-866B SAFETY INJECTION (SI) SUPPLY TO HOT LEG ISOLATION	4" DARLING DOUBLE DISC WEDGE GATE VALVE	1680 psid (c) 1680 psid (o)	0.35	0.0
2-SI-878A SI LOOP B ISOLATION	2" VELAN GLOBE VALVE	1680 psid (c) 1680 psid (o)	1.0	0.0
2-SI-878B SI LOOP B ISOLATION	2" VELAN GLOBE VALVE	1680 psid (c) 1680 psid (o)	1.0	0.0
0-SW-2816 AUXILIARY AND SERVICE BUILDING SERVICE WATER (SW) ISOLATION	6" POWELL SOLID WEDGE GATE VALVE	75 psid (c) 75 psid (o)	0.55	0.0
2-SW-2907 CONTAINMENT VENT COOLERS SW ISOLATION	12" POWELL SOLID WEDGE GATE VALVE	75 psid (c) 75 psid (o)	0.55	0.0

* Use of 0.0% load sensitive behavior for non-tested valves will be evaluated in a future inspection.

The stem lubricant used was Lubriplate 6300 AA.

c - Closed direction

o - Open direction