Wisconsin Electric
POWER COMPANY

Point Beach Nuclear Plant
6610 Nuclear Rd., Two Rivers, WI 54241

(414) 755-2321

NPL 97-0090

March 17, 1997

Document Control Desk
US NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, DC 20555

Ladies/Gentlemen:

DOCKETS 50-266 AND 50-301
RESPONSE TO NRC GENERIC LETTER 96-05
PERIODIC VERIFICATION OF DESIGN-BASIS CAPABILITY
OF SAFETY-RELATED MOTOR-OPERATED VALVES
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

NRC Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves," was issued on September 18, 1996. The letter required all holders of operating licenses to establish a program to review their current program to verify on a periodic basis that safety-related motor-operated valves (MOVs) continue to be capable of performing their safety functions within the current licensing bases. This generic letter required two responses. Within 60 days of September 18, 1996, a written response was required to be submitted to the NRC indicating whether the licensee would implement the requested action and a schedule for implementation. Within 180 days of the generic letter's issuance, a written summary was required to be submitted to the NRC of the licensee's periodic verification program.

On November 18, 1996, Wisconsin Electric Power Company (WEPCO) submitted the 60-day response for Point Beach Nuclear Plant (PBNP) Units 1 and 2. In this response, we committed to review our MOV periodic verification program. This program was accepted by the NRC during our Generic Letter 89-10 closeout inspection (NRC Inspection Reports 50-266/95007 and 50-301/95007). This letter and its attachment fulfills the 180-day required response to GL 96-05. The attachment summarizes our periodic verification program. It also lists the additional programmatic commitments that are documented in the aforementioned NRC inspection report.

If you have any questions or require any additional information, please contact us.

Sincerely,

R.L. Reimer for

Douglas F. Johnson
Manager, Regulatory Services
& Licensing

A073

Subscribed and sworn to before me
this 17th day of March 1997

Notary Public, State of Wisconsin

My Commission expires 10/26/2000

Attachment
cc: NRC Resident Inspector
NRC Regional Administrator

General Program Information

The PBNP MOV program encompasses 164 motor-operated valves (including actuators). Of these 164 MOVs, 124 are safety-related. For analysis purposes, the MOVs were divided into 40 groups based on valve and actuator type, manufacturer, model, and differential pressure testing. Design basis criteria was compiled for each valve to configure the MOV to ensure its safety function will be performed. The design basis and the configuration calculations developed for each valve included available actuator torque (including degraded supply voltage), a valve weak link analysis, the motor operator rating, inertia, the maximum spring pack load, packing friction, unwedging load, system conditions for valve operation (pressure differential, piston effect), the susceptibility to thermal binding and pressure locking, diagnostic equipment error, torque switch accuracy, rate of loading observed, a lubrication degradation factor, and differential pressure testing results.

Monitoring and Maintenance

Static and differential pressure testing, probabilistic safety assessment aspects, MOV margin, and plant experience with known valve degradation are used to develop the PBNP MOV periodic verification schedule of PBNP's MOV program. The majority of MOVs are tested under static system conditions at least every 5 years. MOVs which are normally operated under a high differential pressure and/or are located in a harsh environment are tested under differential pressure conditions at least every 5 years. Our experience is that MOVs cycled under high differential pressures and/or are located in a harsh environment experience valve internal wear and/or actuator degradation. For this reason, routine differential pressure tests are necessary to trend degradation.

An MOV preventive maintenance program was developed based on condition monitoring. MOV diagnostic tests are performed on a 5- or 10-year frequency and are referred to as "checkouts" at PBNP. Safety-related valves are tested every 5 years. The diagnostic test monitors limit switch actuations, motor current, torque switch actuation, stem thrust, and spring pack motion during full stroke of the valve. Testing is performed under static system conditions or under differential pressure conditions depending on four factors. The first factor is the system conditions the valve is exposed to. If the valve is cycled under differential pressure, high flow or the medium flowing through the valve is dirty, the valve has a higher probability of wearing and is tested under differential pressure conditions. A second factor is the environment the MOV is located in. Mounting in high temperature or unprotected areas accelerate the degradation of MOV components, especially the lubricants. Margin is another factor in determining testing conditions and frequency. Margin is defined as the MOV capability compared with the MOV output requirement. The final factor considered is the safety significance of the MOV. During preventive maintenance testing, the MOV is visually inspected to the extent possible. The inspection includes wiring condition, leaks (operator grease, body-to-bonnet joint, packing), equipment material condition (rust, unusual wear, missing or loose fasteners, grease in the spring pack housing). During cycling of the MOV, special attention is directed at identifying any signs of possible degradation such as noise or smoothness of operation. If necessary, the stem and stem nut are cleaned and relubricated.

An "as-found" test is initially performed. The results of this test are compared with the previous "as-left" data to determine if degradation has occurred. Operability and target ranges are defined for each MOV. If the "as-found" condition of an MOV is outside the target or operability ranges, a condition report is initiated that may warrant performance of an operability evaluation. Repeatability between the "as-left" and "as-found" test parameters demonstrates proper preventive maintenance activities and the frequency of these activities.

MOV actuators are rebuilt on a time directed preventive maintenance schedule. Based on condition monitoring and operating experience a 5-, 10- or 15-year actuator rebuild frequency was developed. In general, MOVs located in high temperature environments are rebuilt on a 5-year frequency; MOVs cycled during quarterly testing are rebuilt on a 10-year schedule; and MOVs that are infrequently cycled are rebuilt on a 15-year schedule. Actuator rebuilds are performed to restore the component to a "like new" condition. The actuator is disassembled, thoroughly cleaned, inspected, and restored using replacement parts as necessary.

MOV checkouts are also performed as post-maintenance testing. A checkout is always performed after an actuator rebuild. Checkouts following an actuator rebuild or when work has disturbed the spring pack, include a "K factor" test. A "K factor" test determines the relationship between spring pack deflection and force on the spring pack. This information is used to determine stem nut torque. Checkouts may also be performed after work that could affect the operation of the MOV (packing adjustments, valve internal work). Following valve internal work, the MOV is cycled under differential pressure conditions. At PBNP, a differential pressure test is considered adequate at differential pressures that are at least 60% of the design basis differential pressure.

In addition to actuator checkouts and rebuilds, MOVs are monitored through the inservice testing program. Inservice tests (ITs) aid in verifying proper MOV operation by monitoring valve position indication and timing during full valve stroking. ITs verify leak tightness of valves required to shut and isolate flow. MOV functions are also verified during other PBNP testing such as periodic checks, Operations refueling tests, and Technical Specification tests.

Preventive maintenance testing is periodically performed to verify each MOV is capable of performing its safety-related function. Critical design parameters are monitored to check that the MOV meets its design basis calculations. For gate and globe valves, the critical design parameters are valve actuator gear train force transmission, stem/stem nut coefficient of friction, and valve factor (valve internal frictions). For butterfly valves, the critical design parameters are valve actuator gear train force transmission, HBC (90°) gear train force transmission, and valve stem bushing coefficient of friction.

Preventive and corrective maintenance activities are documented via a work order. Each work order package contains pertinent diagnostic test data, unusual or degraded conditions found during testing, actuator rebuilding, and valve work. MOV diagnostic signatures (graphs) and pertinent data are stored electronically for trending purposes. Following preventive or corrective maintenance activities, an operability test is conducted that typically consists of an inservice test

Preventive maintenance activities are adjusted primarily based on plant operating experience and industry experience. MOVs are subjected to a number of age related degradation modes which depend on environmental influences and degradation mechanisms indigenous to the MOV's design. Vibration, heat, dirt, moisture, and radiation are the most common environmental influences. Degradation of motor actuator and valve internal parts (gears, bearings, guides, switches, etc.) as a result of wear, erosion, and corrosion is the primary aging concern for MOVs at PBNP. Actuator degradation is trended through the periodic checkouts performed under static system conditions and by rebuilds. Valve degradation is trended through the periodic checkouts performed under differential pressure conditions and other tests that detect leakage and the ability of a valve to perform its function through stroke testing. At the present time, a specific age margin is not included in determining the set-up ranges for MOVs, however, the minimum margin that currently exists at PBNP is 38%. The margin is determined by comparing actuator capability to the required load including uncertainties. This 38% minimum margin includes an age specific factor.

Lubrication is another important concern for MOVs. The gradual loss of low pressure sealing force (seals and o-rings) could lead to a loss of grease. Vibration, heat, radiation, and foreign material also influence lubrication degradation. During actuator rebuilds, the removed grease is examined visually and by hand to help determine degradation rates. Grease hardness and color are the primary indicators which are evaluated. Vendor recommendations, industry experience and plant experience are used to determine MOV lubrication practices. A lubrication degradation factor is included in determining the set-up ranges for MOVs.

Aside from age-related degradation, maintenance errors are a prime contributor to MOV failures. At PBNP, condition reports and work orders are used to correct such errors. MOV program effectiveness is measured using the number of corrective maintenance work orders. The ratio of the number of unplanned corrective maintenance activities to the number of MOVs maintained in the program is used to develop an index which is tracked; unplanned corrective maintenance activities are followed by a root cause analysis. The results of these root cause analyses are used to update the program, procedures and personnel knowledge of MOVs. Industry operating experience is also used as an input into updating the program.

Commitments

NRC Inspection Reports 50-266/95007 (DRS) and 50-301/95007 (DRS), dated July 13, 1995, document our commitments in response to the GL 89-10 closeout inspection items. As documented in this report, the following commitments were made and will be completed within five years of that inspection report:

1. We will diagnostically test 26 valves under differential pressure conditions to evaluate our assumptions regarding age degradation. This item is currently in progress. In addition, we will establish a specific age-related degradation margin.

2. We will review NRC and industry valve performance degradation, and specifically, the EPRI MOV performance prediction program. Applicable information from the EPRI program will be incorporated into our MOV program.

3. We will collect and trend further static and dynamic periodic results to validate the valve factor study and rate of loading assumptions and prediction methodology.