U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No.: 50-397/93-23

Docket No.: 50-397

License No.: NPF-21

Licensee: Washington Public Power Supply System
P. O. Box 968
3000 George Washington Way
Richland, Washington

Facility Name: WNP-2

Inspection at: WNP-2 Site near Richland, Washington

Inspection conducted: September 20 through 24, 1993

Inspectors: C. Myers, Reactor Inspector, Region V

Accompanying Personnel: A. Trusty, Consultant, Idaho National Engineering Laboratory

Approved by: W. P. Ang — 10-27-93
W. P. Ang, Chief, Engineering Section — Date Signed

Inspection Summary

Inspection during the period September 20 - 24, 1993 (Report No. 50-397/93-23

Areas Inspected:

A special announced inspection of the implementation of the licensee's program to meet commitments to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," was conducted during the week of September 20 through 24, 1993. Temporary Instruction 2515/109 was used as guidance during the inspection.

Safety Issues Management System (SIMS) Item:

SIMS Issue Number GL 89-10 was updated to reflect this TI 2525/109 Part 2 inspection.

Results:

General Conclusions and Specific Findings:

- The licensee's program was generally effective in establishing assurance of design basis capability for the sampled MOVs.
- The licensee was implementing a program consistent with their commitments to Generic Letter 89-10.
- The lack of review and feedback of valve group test results was a program weakness.
- Measurement inaccuracy was not applied to evaluation of dynamic test data.
- Quality Assurance was involved in the program implementation and overview.
- Dynamic testing was performed under degraded voltage where possible.

Significant Safety Matters:

None.

Summary of Violation or Deviations:

Two violations were identified. One violation concerned inadequate test acceptance criteria and untimely data evaluation. The other violation concerned a failure to initiate a problem evaluation report (PER).

Open Items Summary:

New Open Items:

93-23-01	VIOLATION	Untimely Test Data Evaluation
93-23-02	VIOLATION	Failure to Write a PER
93-23-03	FOLLOWUP	Applicability of MOVATS ER-5.2
93-23-04	FOLLOWUP	Pressure Locking and Thermal Binding

Previous Open Items:

91-16-08	FOLLOWUP: OPEN	Periodic Verification

Details

1.0 PERSONS CONTACTED

Washington Public Power Supply System

*S. Berry, MOV Engineer
*S. Cueto, Maintenance Engineer
*M. Eades, Licensing Engineer
*B. Evans, Maintenance Engineer
*J. Fellman, Design Engineer
*M. Flasch, Director of Engineering
*M. Grindel, Power Systems Supervisor
*P. Harness, Mechanical Design Engineering Manager
*T. Hoyle, Valve Programs Lead Engineer
*R. Koenig, Design Engineering Manager
*V. Parrish, Assistant Managing Director, Operations
*M. Reis, Technical Programs Manager
*G. Smith, Operations Division Manager / Acting Plant Manager
*G. Sorensen, Regulatory Programs Manager
*S. Washington, Nuclear Safety Engineering Manager
*R. Webring, Technical Division Manager

Others

*T. Scarbrough, NRC, Office of Nuclear Reactor Regulation
*S. Sanchez, NRC, Resident Inspector

The inspectors also held discussions with other licensee and contractor personnel during the course of the inspection.

*Denotes those attending the exit meeting.

2.0 GENERIC LETTER (GL) 89-10 "SAFETY-RELATED MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE" (TI 2515/109)

On June 28, 1989, the NRC issued Generic Letter (GL) 89-10 which requested licensees to establish a program to ensure that switch settings for safety-related motor-operated valves (MOVs) were selected, set, and maintained properly. Five supplements to the generic letter have been subsequently issued. NRC inspections of licensee actions implementing commitments to GL 89-10 have been conducted based on guidance provided in Temporary Instruction (TI) 2515/109, "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." TI 2515/109 is divided into Part 1, "Program Review," and Part 2, "Verification of Program Implementation." The Part 1 program review at WNP-2 was documented in NRC Inspection Report 91-16. The current inspection was conducted using Part 2 of TI 2515/109.

The inspection consisted of a detailed review of the licensee's documentation of their GL 89-10 activities for selected MOVs. The inspectors selected a sample of MOVs from an information matrix provided by the licensee. The inspectors selected MOVs that appeared to have marginal actuator capacity and

thrust settings compared to calculated requirements. The sampled MOVs included a variety of valve and actuator sizes. The selected MOVs included examples of testing under various differential pressure conditions.

For each MOV selected, the inspectors reviewed the design basis calculation of design flow, temperature, and the maximum expected differential pressure (MEDP), the sizing and switch setting calculations, the diagnostic test data, and the diagnostic signatures obtained using MOVATS (Motor Operator Valve Analysis and Test System, ITI-MOVATS) Version 3000 software.

The licensee's program applied to 143 MOVs. The following MOVs were selected for review:

FPC-V-172, Fuel Pool Cooling
LPCS-V-005, Low Pressure Core Spray
RCC-V-021, Reactor Core Cooling
RCIC-V-031, Reactor Core Isolation Cooling

The selected MOVs were all gate valves with Limitorque actuators. No globe or butterfly valves were selected. The sample MOVs were configured as shown below:

	Actuator	Closure Control	Valve Type
FPC-V-172	SMB-00	Torque	8" - 150 psi Velan
LPCS-V-5	SB-3	Torque	12"- 900 psi Velan
RCC-V-21	SMB-0	Torque	10"- 150 psi Velan
RCIC-V-31	SMB-00	Torque	8" - 150 psi Velan

A summary of the test data for the sampled valves is provided in Attachment 1.

The inspectors concluded that the implementation of the licensee's MOV program was adequate for the sampled MOVs. Generally, the program appeared to implement the licensee's commitments to the generic letter.

2.1 Design-Basis Reviews

The inspectors reviewed the following licensee documents: "Motor Operated Valve Program Plan, Rev. 2, dated August 10, 1993; "WNP-2 Engineering Standard Motor Operated Valve Design Basis Review," MES-9, Rev. 0, dated May 12, 1992; design basis review calculations for the selected MOVs.

The inspectors found that the licensee had determined maximum expected differential pressure (MEDP), line pressure, design flow conditions, fluid temperature, and other design basis parameters for each of the selected valves. The design basis calculations for each of the sampled valves appeared to adequately evaluate the design basis conditions consistent with licensee commitments in response to GL 89-10.

2.1.a Pressure Locking and Thermal Binding

The inspectors found that the licensee's design basis review did not include evaluation of the potential for pressure locking and thermal binding. The licensee had previously evaluated the potential for pressure locking and thermal binding in response to an industry report and identified 17 safety related gate valves that were considered to be susceptible.

The inspectors reviewed technical assessment 92-17, dated September 7, 1993, prepared by the licensee's Nuclear Safety Engineering organization. This self-assessment of the licensee's MOV program identified inadequacies in the extent of the licensee's evaluation and corrective actions for pressure locking. In response to the identified program weaknesses, the licensee contracted an independent evaluation of the issue.

The licensee committed to complete their evaluation for pressure locking and thermal binding by December 31, 1993. The licensee indicated that resolution of any identified problems resulting from their evaluation would be integrated into the plant schedule after that date. This item will be open pending review of the licensee's completed evaluation of the potential for pressure locking and thermal binding. (93-23-04:OPEN)

2.2 MOV Sizing and Switch Setting

The inspectors reviewed licensee procedure MES-10, "Motor Operated Valve Sizing and Switch Settings," and individual thrust calculations for the sampled valves.

The inspectors found that the licensee used a computer program ("MOVE" - B&W Nuclear Service Company) to calculate the minimum required thrust (MRT) for valve operation under worst case design basis conditions. According to the licensee, the MOVE software assumed a stem friction coefficient of 0.2 and a valve factor of 0.3 for gate valves and 1.1 for globe valves.

In their original setpoint method, the licensee had established their minimum required thrust setpoint for setting the torque switch by adding a 10% margin above the calculated MRT using the MOVE program.

The inspectors found that the licensee has since revised their setpoint method to incorporate increased margin for uncertainty in their assumptions for gate valve factor, lubrication degradation and load sensitive behavior. The licensee recalculated the MRT based on a valve factor of 0.5 for gate valves. The licensee used the revised MRT to establish "recommended" minimum thrust setpoints by adding a 15-25% margin for stem lubrication degradation and 30% to account for load sensitive behavior (also known as "rate of loading"). The licensee calculated an allowance for stem lubrication degradation as the ratio of stem factors for coefficients of friction of 0.20 and 0.15. The licensee considered the increased margin in their recommended minimum thrust setpoints to be additional conservatism in their setpoint method.

The inspectors found that the licensee had revised the setpoint calculations for all MOVs in their program. The licensee was in the process of updating the Master Data Sheet for each of the MOVs to specify the new setpoints. However, as part of their setpoint change process, the inspectors found that the licensee had not reviewed the interim operability of MOVs which had been adjusted based on the old setpoint method. The inspectors considered that this program weakness contributed to the violation identified in Paragraph 2.3.d.

The inspectors reviewed licensee procedure PPM 10.25.132, "Thrust Adjustment and Diagnostic Analysis of Motor Operated Valves," Rev 3. The licensee used this procedure to set the torque switch during static baseline testing of the MOV. The inspectors noted that the procedure adjusted the setpoint to account for measurement error including instrument inaccuracy and torque switch repeatability. The inspectors noted that the procedure had been revised to incorporate the vendor recommended values for torque switch repeatability identified in Limitorque Maintenance Update 92-2. Plant Event Report (PER) 293-0309 had been initiated to evaluate the Maintenance Update 92-2 for existing setpoints and to implement any necessary corrective actions. The inspectors found the licensee actions to be adequate.

The licensee used the torque switch to control the seating of gate and globe MOVs. Butterfly valves were limit seated. The torque switch was bypassed for 90 to 95 percent of the closing valve stroke. The torque switch was completely bypassed in the open direction using a jumper wire to allow full motor capability. An inspector concern with the licensee's use of 95% bypassing of the torque switch is discussed in Paragraph 2.3.a.

The inspectors noted that the licensee reviewed Limitorque's Potential 10 CFR 21 condition, "Reliance 3 Phase A.C. Actuator Motors (Starting Torque at Elevated Temperature)", dated May 13, 1993, which addressed the effect of elevated temperature on the output of AC motors. The licensee issued PER 293-658 to initiate the necessary corrective actions. Further the valves were prioritized and ranked according to their safety significance. Approximately six MOVs were evaluated and torque losses were identified for RCIC-MO-63 and RWCU-MO-1. The licensee performed an interim operability determination for these valves and planned to replace the operator for RWCU-MO-001 during the R9 refueling outage. In addition, the licensee applied the Limitorque temperature derating to all AC motors regardless of manufacture. The inspectors found the licensee actions to be adequate.

2.2.a Calculation Method

The inspectors found that the licensee had established specific procedures for conducting calculations within their GL 89-10 program. The licensee's calculations for the sampled valves appeared to be adequate. The inspectors independently calculated the minimum thrust for opening and closing the valves. No significant errors were identified by the inspectors.

The inspectors noted the following features of the licensee's current calculation method.

(1) Valve Factor Assumption (VF) - (Valve factor was defined as the ratio of the stem thrust to the differential pressure force acting on the valve disk.) The licensee assumed a valve factor of 0.5 for all gate valves and 1.1 for globe valves. The licensee used the mean seat area of the valve in their calculation of valve factors.

(2) Stem Friction Coefficient Assumption (COF) - In calculating actuator output thrust capability, the licensee assumed a stem friction coefficient of 0.2.

(3) Load Sensitive Behavior Assumption (LSB) - A thrust margin of 30% was incorporated in the thrust setpoint calculations to address possible MOV load sensitive behavior (also known as "rate of loading"). The thrust margin was a percentage in excess of the minimum calculated required thrust. The licensee developed a criteria for their LSB margin which was the ratio of the stem factors for COFs of 0.15 and 0.20. (Stem factor was a calculated parameter derived from the stem screw dimensions and an assumed COF.)

(4) Minimum Thrust Setpoint - The licensee adjusted the minimum required thrust setpoint specified in the master data sheets to account for the measurement error including diagnostic equipment inaccuracy and torque switch repeatability.

(5) Stem Lubrication Degradation - The licensee had included a thrust margin in the setpoint calculation to account for stem lubrication degradation between periodic verification testing.

(6) Motor Control Logic - The licensee bypassed the torque switch for 90-95% of the closing stroke and 100% of the opening stroke.

2.2.b. Lack of Generic Review of Test Data

The inspectors found that the licensee did not review the adequacy of their calculational assumptions for similar untested valves as part of their evaluation of test data following each refueling outage. The licensee indicated that feedback of valve group test data to revise their calculations will be conducted as part of their final data reconciliation evaluation at the conclusion of their test schedule. The inspectors were concerned that consistently non-conservative test results would not be promptly identified. Furthermore, the implications of the valve group test results on MOVs which would not be practicable to test, but which used the same setpoint calculation method, would not be evaluated in a timely manner. The inspectors considered this lack of timely review and feedback of valve group test results to validate calculational assumptions for untested valves to be a program weakness. This weakness is further discussed in Paragraph 2.3.d.

2.2.c. Lack of Testing at Design Basis Flow Rates

The inspectors reviewed a summary of all GL 89-10 testing performed by the licensee and noted that a majority of the differential pressure tests did not achieve maximum expected flow (MEF) conditions. Further, the percentage of MEF attained during testing was sometimes much less than the percentage of the maximum expected differential pressure (MEDP). The inspectors were concerned that testing under low flow conditions may not be conservative. The licensee did not include a consideration of flow rate in the test acceptance criteria or their calculations. The inspectors emphasized that the licensee should justify all testing performed at less than design basis differential pressure and flow. The licensee committed to established adequate justification for their treatment of flow effects. The inspectors found the licensee proposed actions to be adequate.

2.3 Testing and Data Analysis

The inspectors reviewed licensee procedure PPM 8.4.73, "MOV Design Basis Testing Evaluation," Rev. 0, dated June 16, 1992. The licensee used this procedure to evaluate the diagnostic data obtained during testing. During review of the dynamic tests of the sampled valves, the inspectors noted that torque and thrust measurements were obtained at flow cut off and control switch trip, and at running, unseating, and maximum loads. This allowed parameters, such as stem factor and stem friction coefficient, to be calculated at more than one point of the valve stroke. The stem friction coefficient was increased by 0.05 to simulate a higher friction factor than may be expected at the end of the lubrication interval. This value was compared to the assumed stem friction coefficient of 0.20. Where torque was not measured directly, the stem factor was calculated by determining torque from a spring pack calibration curve and then dividing by the measured thrust. The inspectors found the licensee's data evaluation to be adequate.

In their calculation of required setpoints, the licensee assumed that the torque at torque switch trip remained constant. The inspectors found that the licensee's data evaluation included evaluation of the effect of rate of loading on the torque at torque switch trip. The licensee established a linear relationship based on the measured spring pack displacements at torque switch trip under static testing and differential pressure test conditions. The licensee used this linear relationship to extrapolate a reduction in torque under worst case differential pressure conditions. The inspectors found the licensee's extrapolation method to be conservative.

2.3.a Thermal Growth Effects

The licensee had not evaluated the effects of thermal growth of the valve stem in establishing the maximum torque switch bypass setting at 95% closed. In conversations with licensee personnel, the inspectors noted that the switch settings of some MOVs with high temperature design basis conditions were adjusted under ambient conditions. For example the steam admission valves for the auxiliary feedwater turbine driven pumps were adjusted during cold

shutdown conditions but operate under hot steam temperatures in service. The inspectors were concerned that differential thermal expansion of the valve stem could result in seat contact while the torque switch was bypassed resulting in a stall condition and potential overthrusting. In response to the inspectors' concern the licensee reviewed the effects of thermal growth on susceptible valves and determined that a worst case stem growth of 0.116 inch could result. The licensee concluded that their maximum torque switch bypass setting of 95% closed was adequate to accommodate the growth without premature seat contact.

The licensee acknowledged the inspectors' concern and stated that they would revise their setpoint method to included consideration of the effects of thermal growth of the valve stem. The inspectors found the licensee's proposed actions to be adequate.

2.3.b. Changes in Diagnostic Equipment

For design basis testing conducted during the R6 refueling outage in April, 1991, the licensee used the MOVATS 3000 system as its primary diagnostic system with the MOVATS thrust measuring device (TMD) which measured spring pack displacement as the basis for thrust determination.

For design basis testing conducted after R6, the licensee continued to use the MOVATS Data Acquisition Module, but changed to the use of transducers which measure thrust and torque directly. The licensee utilized the MOVATS torque Thrust cell (TTC) as the primary transducer. When access did not permit the use of the TTC, other transducers were used including the MOVATS stem strain ring (SSR) and strain gages. The strain gages were mounted on either the valve stem or the valve yoke as access allowed. The strain gages were calibrated in-situ. TMD data continued to be used in cases where strain gage data was unavailable.

The licensee used MOVATS Engineering Report ER-5.2, Revision 0, "Limitorque Actuator Open vs. Closed TMD Data Analysis Procedure" to adjust TMD static test thrust data for measurement error. ER-5.2 identified increased thrust measurement error attributable to directional effects and rate of loading. However, the inspectors found that the licensee did not consider that ER-5.2 was applicable to TMD thrust data obtained during dynamic testing. The licensee applied no measurement error adjustment to the differential pressure test thrust data from R6. The inspectors found that the licensee had not adequately justified their assumption of no measurement error for dynamic test thrust data. The licensee stated that all testing which relied solely on the TMD for thrust determination would be repeated using direct thrust measurement devices. The adequacy of the licensee's assumption of no measurement error using TMD thrust measurement will be an open item pending inspector review of the application of MOVATS ER-5.2 to dynamic test data. (93-23-03:OPEN)

2.3.c. Timeliness of Data Review

The inspectors reviewed the licensee's dynamic test procedures. The inspectors observed that the test acceptance criteria stated that a valve would be considered operable provided the valve stroked during the test pending an engineering evaluation of the test data. The licensee's current practice was to complete the engineering evaluation of the MOVs prior to plant start-up. The inspectors were concerned that certain MOVs, required to be operable before startup, could be returned to service upon completion of the dynamic test procedure without engineering evaluation of the test data. Through discussions with licensee personnel, the inspectors found that for testing performed during refueling outage R6, the time for completion of the engineering review had not been specified.

In their letter dated September 16, 1991, the licensee identified that they had performed in-situ dynamic differential pressure testing of 22 MOVs during the R6 refueling outage. The licensee further reported that "...This testing indicated that margin, in terms of thrust was available for the valves tested as set by our current program..." During this inspection the inspectors found that the licensee had not performed an extrapolation of the data obtained during testing a less than design basis differential pressure as part of the licensee's engineering evaluation of the refueling outage R6 test data.

The inspectors reviewed the licensee's "Motor Operated Valve Program Plan," Revision 1, dated April 4, 1991. The Program Plan provided that the licensee's testing in response to Generic Letter 89-10 would demonstrate that the MOVs would perform satisfactorily under worst case design basis conditions. The Program Plan required that valves that were not practical to test under full design basis conditions would be qualified by using extrapolations to full design basis conditions.

The licensee stated that the data had been qualitatively evaluated for some margin above test conditions. However, the licensee had not performed a quantitative determination of design basis capability from the test data. Licensee personnel stated that an informal extrapolation had been performed by engineering at that time. The MOVs had been returned to service at the completion of the R6 refueling outage in September 1991 without a documented evaluation that the test results demonstrated the required design basis capability. The inspectors found the lack of appropriate acceptance criteria to demonstrate design basis capability and the untimely evaluation of R6 test data to be an apparent violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control" (ENF 93-23-01).

The licensee stated that due to emerging uncertainty in the accuracy of TMD thrust measurements, they had considered the R6 test data to be unreliable and decided to repeat the differential pressure testing later in their program using alternate methods to measure thrust. However, the inspectors were concerned that the R6 test data may indicate MOVs with inadequate design basis capability requiring prompt corrective action. In response to the inspectors' concern, the licensee identified that they had initiated a review of the R6 test data on September 16, 1993 to evaluate the design basis capability of each of the MOVs tested during the R6 outage. The licensee completed their

review during the inspection. The licensee extrapolated the spring pack displacement (SPD) measured during testing to the design condition. The extrapolated SPD to overcome differential pressure was compared to the SPD at torque switch trip to determine margin. No operability concerns were identified as a result of the licensee's review.

In response to the inspectors' concern, prior to further differential pressure testing, the licensee committed to establish administrative controls to assure adequate data review prior to returning the MOV to service. The licensee stated that sufficient data review would be performed to provide reasonable assurance of valve operability for the mode or operating condition. In addition, the licensee identified that following the R6 refueling outage, their data evaluation procedure had been revised to include extrapolation of test results to design basis conditions. The inspectors found the licensee actions and commitments to be adequate.

Further, the licensee committed to submit a revision to their September 16, 1991 letter to clarify the extent of the engineering evaluation performed at the time of the R6 testing. The inspectors found the proposed licensee action to be adequate to clarify the previous submittal.

2.3.d. Design-Basis Capability

The inspectors reviewed the MOV data sheets, the baseline static test results and differential pressure test results for the selected valves. The valves were tested under the following conditions:

VALVE	MEDP	TEST D/P (Close)	TEST D/P (%MEDP)
FPC-MO-172	162 psid	121 psid	76%
LPCS-MO-005	411 psid	469 psid	114%
RCC-MO-021	121 psid	144 psid	119%
RCIC-MO-031	57.2 psid	unavailable	unavailable

The inspectors reviewed the dynamic test data using the industry standard equation, the valve's mean seat diameter and the dynamic test conditions for the selected MOVs. The valve factors in the closing direction ranged from 0.34 to 0.67. In the opening direction, valve factors ranged from 0.46 to a 1.35 (see Attachment 1). Stem friction coefficient values were observed in the range from .074 to 0.17. Load sensitive behavior was observed as high as 12.5%.

The inspectors reviewed the test results for 38 MOVs which the licensee provided in advance of the inspection. The review identified five MOVs which displayed a higher valve factor than the assumed valve factor of 0.5.

However, the inspectors found that the actual as left torque switch setting for each of the MOVs appeared to be adequate.

In addition, the inspectors noted that approximately 30 of the MOVs were set using the original setpoint requirements based on a 0.30 valve factor plus the addition of 10% to account for all uncertainties. The inspectors noted that the torque switch settings for MOVs RHR-MO-16A and 17A only marginally met the original minimum setpoint requirements. The inspectors noted that revised minimum thrust setpoints based on a 0.50 valve factor were approximately 50% greater than the existing torque switch settings. According to the licensee, hardware changes for these valves were required to meet the new setpoint requirements. The licensee planned to make these modifications during the next outage.

The inspectors observed that RHR-MO-16A and 17A had been tested under differential pressure during the R6 refueling outage in April 1991. The inspectors reviewed the test results from that testing and found that both valves appeared to display high valve factors during the dynamic testing. Due to the marginal capability of these valves, the inspectors were concerned that the interim operability may not be adequately justified until modifications were implemented.

To address the inspectors concern, the licensee performed an operability evaluation of the existing switch settings. In the operability evaluation, the licensee used a valve factor of 0.4, a stem friction coefficient of 0.15, and the actual packing load of 650 lbs. The licensee justified the use of a 0.15 stem friction coefficient based on a measured stem friction coefficient of 0.08. The licensee indicated that neither published EPRI valve factor data nor plant specific test data for 16 inch Velan valves was available. The inspectors found the licensee's justification to be adequate. However, the inspectors were concerned that the interim operability assessment had not been performed when the thrust setpoint had been revised. This weakness in the licensee's setpoint change process was previously discussed in Paragraph 2.2.

Plant Procedure Number 1.3.12, "Problem Evaluation Request" (PER), Paragraph 6.1, required any person who observes an actual problem or perceives a potentially significant problem to initiate a PER. Paragraph 2.1.1. defines a "problem" as follows:

> A physical or performance characteristic of a system, component or part which does not conform to the requirements of design documents, applicable standards, procurement documents, or regulatory requirements for the item.

The inspectors found that a PER had not been initiated to identify that the actual torque switch setting of 22390 lb. thrust for motor operated valve RHR-V-16A did not meet the minimum thrust setpoint requirement of 39770 lb. specified in the revised design calculation for the MOV. As a result, the basis for the continued operability of the MOV was not evaluated and documented. This failure to follow procedures is an apparent violation of 10

CFR Part 50, Criterion V, "Instructions, Procedures and Drawings". (ENF 93-23-02)

2.3.e. Independent Review

The inspectors noted that the licensee had performed an independent review of the diagnostic traces including a qualitative assessment of the trace characteristics. However, this review was not required by procedure as part of the licensee's GL 89-10 program. In addition, the licensee had not identified any methods for resolution of potential conflicts between the original test analysis and the subsequent test review. The licensee committed to incorporate their independent review activities within their data evaluation procedures. The inspectors found the proposed licensee actions to be adequate.

2.3.f. Extrapolation of Test Data

The inspectors reviewed licensee procedure PPM 8.4.73, "MOV Design Basis Testing Evaluation," Rev. 0, dated June 16, 1992. The licensee used this procedure to evaluate the diagnostic data obtained during testing. To determine design basis capability from testing at less than design basis conditions, the licensee extrapolated the measured thrust necessary to overcome differential pressure from test conditions to design basis conditions. The licensee calculated an apparent valve factor for both the open and closing direction using the thrust and differential pressure measured during the test. Using the apparent valve factor, the licensee calculated the thrust required at design basis differential pressure. The licensee then determined if the thrust setting was adequate to meet the extrapolated thrust required for design basis conditions.

In addition, calculations were performed to determine available torque margins under design basis conditions using a degraded stem factor.

The inspectors noted that instrument inaccuracies were not included in the determination of the apparent valve factor. The licensee stated that PPM 8.4.73 was being revised to include measurement error in the determination of apparent valve factors. The licensee stated that previous test data would be reevaluated to assure the adequacy of the existing settings. The inspectors did not identify any operability concerns related to the licensee's omission of the instrument accuracy

The licensee had not yet justified their method of extrapolating MOV performance to design basis conditions. The licensee was not testing at multiple differential pressures. The licensee planned to justify its method of extrapolation within their schedule for the completion of their GL 89-10 program.

2.4 Periodic Verification of MOV Capability

The licensee planned to perform periodic verification of MOV capability every third refueling outage as recommended by GL 89-10. However, the licensee had not yet established a program for the periodic verification. The licensee planned to use static testing only, for periodic verification. The licensee stated that they would justify the adequacy of their periodic verification program. The lack of development of periodic verification was previously identified as an open program item. This item will remain open. (91-16-08:OPEN)

2.5 Schedule

The inspectors reviewed the licensee's schedule for completion of their GL 89-10 testing. The inspectors found the licensee's test progress to be consistent with their extended schedule. According to the licensee, the R6 valves will be retested. The licensee considered that all repeat testing could be completed within the their extended schedule. The inspectors found the licensee's progress to be adequate.

2.5.a Schedule Extension

In a letter dated August 31, 1993, the licensee notified the NRC that they intended to extend their schedule for verifying the design-basis capability of certain MOVs to the completion of refueling outage R10, which was planned for April 1995. The licensee had previously committed to complete their GL 89-10 program by June 1994. During this inspection, the inspectors reviewed the licensee's justification for their schedule extension. The inspectors discussed the safety significance, the valve type and size, design-basis conditions, and available margin for each of the affected MOVs in the licensee's program.

In their August 31, 1993 letter, the licensee had identified 38 MOVs (37 gate valves and 1 globe valve) that would be affected by the extended schedule. The inspectors found that the licensee had completed the testing of two MOVs in advance of their extended schedule. The licensee stated that no further testing would be required for those two valves. Therefore, according to the licensee, only 36 valves remain affected by the schedule extension.

For the 35 gate valves affected by the schedule extension, the licensee demonstrated that the torque switch setting for each had been analyzed and adjusted based on an approximate 0.5 valve factor (in most cases) and some margin for load sensitive behavior. The licensee identified that all of the gate valves had a maximum expected differential pressure (MEDP) less than 162 psid with most below 75 psid. The one globe valve (RHR-V-23) had an MEPD of 303 psid.

The inspectors reviewed the results of the licensee's probablistic risk assessment (PRA) study which showed that only two of the affected MOVs (RHR-V-023 and RCIC-V-010) were significant to core damage risk. The licensee also

reviewed the safety significance of each MOV in areas other than core damage frequency. The licensee considered that two of the affected MOVs (RCC-V-21 and RCC-V-40) had medium safety significance. The licensee categorized the remaining MOVs as having low safety significance. The inspectors reviewed the licensee's categorization of the safety significance of the MOVs. The inspectors did not identify any concerns.

The inspectors found that the licensee had analyzed and adjusted the torque switch of MOV RHR-V-23 (a six-inch Anchor Darling globe valve) assuming a 1.1 valve factor, 30% margin for load sensitive behavior and 20% margin for stem factor degradation. The licensee had tested RHR-V-023 at 85% MEDP during refueling outage R6 and demonstrated that significant torque margin existed. However the licensee planned to repeat the baseline static testing and dynamic testing with additional diagnostic instrumentation during 1994 refueling outage R9.

Similarly, the licensee had adjusted the torque switch setting for MOV RCIC-V-010 (an eight-inch Velan flexible-wedge gate valve with an MEDP of less than 40 psid) to exceed a minimum setpoint based on a 0.5 valve factor. The actuator thrust output at torque switch trip was measured using a stem strain gage during static baseline testing.

The licensee identified that MOV RCC-V-21 and MOV RCC-V-40 (ten-inch Velan flexible wedge gate valves with 121 psid MEDP) were currently adjusted to setpoints based on 0.3 valve factor. The inspectors found that the actual thrust settings for these valves were close to the minimum setpoints. The inspectors considered the existing settings to be marginal. However, the licensee stated that the torque switch settings for these MOVs would be adjusted to increase their margin during refueling outage R9 in April, 1994. The inspectors found the licensee's planned actions to be adequate.

The inspectors concluded, with NRR consultation, that the licensee had adequately addressed the safety significance of the MOVs with an extended GL 89-10 schedule. The inspectors found that the licensee had prioritized baseline testing of affected MOVs with marginal capability to assure that they would be adjusted using the best available test information by June 1994. The inspectors concluded that the licensee had adequately justified the extension of their schedule to complete their program to demonstrate MOV design basis capability by April 1995.

2.6 QA Involvement

The inspectors reviewed the licensee's technical assessment 92-17, dated September 7, 1993, performed by the licensee's Nuclear Safety Engineering group as a self assessment of their MOV program. The inspectors found the audit to be comprehensive with substantive findings.

The inspectors concluded that the licensee was implementing their GL 89-10 program through the testing and design control measures established by their quality assurance program. The inspectors found the self assessment of the licensee's program to be comprehensive.

Two violations were identified in Paragraph 2.3.c and 2.3.d.

3.0 EXIT MEETING

An exit meeting was conducted on September 24, 1993. During this meeting, the inspectors reviewed the scope and findings of the inspection. The licensee acknowledged the inspectors' findings. The licensee did not identify as proprietary any information provided to or reviewed by the inspector.

Additional information requested during the inspection was supplied by the licensee after the exit meeting. The inspectors reviewed the additional information in the NRC office at Walnut Creek during the week ending 10/1/93. No additional findings resulted from the inspectors' review.

Attachment 1

WNP-2 GATE VALVE DATA

VALVE NUMBER	VALVE TYPE	TEST CONDITIONS	DYNAMIC VALVE FACTOR *	STEM FRICTION COEFFICIENT	LOAD SENSITIVE BEHAVIOR
FPC-MO-172	8"-150 psi Velan Flex Wedge Gate	121 psid (close) 107 psid (open)	0.34 (close) 0.45 (open)	.074	.149
LPCS-MO-005	12"-900 psi Velan Flex Wedge Gate	469 psid (close) 388 psid (open)	0.67(close) 1.26 (open)	0.17	12.5%
RCC-MO-021	10"-150 psi Velan Flex Wedge Gate	144 psid (close) 120 psid (open)	0.46 (close) 1.35 (open)	0.11	10.5%
RCIC-M0-031	8"-150 psi Velan Flex Wedge Gate	unavailable 84 psid (open)	unavailable 0.45 (open)	0.18	unavailable

* The dynamic valve factors listed were calculated by the licensee using a mean seat diameter.