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April 23, 1999

Public/Service

10 CFR 50.54(f)

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U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, D.C. 20555-0001

Ladies/Gentlemen:

Docket 50-305 Operating License DPR-43 Kewaunee Nuclear Power Plant Response to RAI (NRC TAC NO. M97059)

References: 1)

NRC Generic Letter 96-05: Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves

2) NRC Request for Additional Information Regarding Generic Letter 96-05 Program at Kewaunee Nuclear Power Plant (TAC No. M97059)

This letter is Wisconsin Public Service Corporation's (WPSC) response to the request for additional information (RAI) contained in Reference 2.

Attachment 1 to this letter provides a discussion of WPSC's actions to address the various issues discussed in the RAI. As requested, the attachment also briefly describes WPSC's plans to incorporate motor control center (MCC) testing into our long-term periodic verification program. Lastly, the attachment describes WPSC's plans for ensuring adequate AC and DC MOV output capability with respect to recent Limitorque guidance and other output degradation potential.

If you have any questions or need additional information, please contact me or a member of my staff.

Sincerely,

Charles a. School

Mark L. Marchi Vice President-Nuclear

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TML Attach. cc - US NRC Region III US NRC Senior Resident Inspector

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ATTACHMENT 1

Letter from M. L. Marchi (WPSC)

То

Document Control Desk (NRC)

Dated

April 23, 1999

Re: NRC Request for Additional Information on MOV Periodic Verification Program (TAC NO. M97059)

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For clarification, WPSC's responses are preceded by the NRC's requests as received.

NRC REQUEST:

1. In a letter dated January 4, 1996, the NRC staff concluded that the licensee of the Kewaunee Nuclear Power Plant (Kewaunee) had satisfactorily addressed its commitments to implement a motor-operated valve (MOV) program in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." Therefore, the NRC staff closed its review of the GL 89-10 program at Kewaunee based on a letter dated October 24, 1995, from the licensee and the results of an inspection of the licensee's MOV program documented in NRC Inspection Report (IR) 50-305/95006 (dated June 15, 1995). In the January 4, 1996, letter, the NRC staff indicated that the licensee is expected to (1) review applicable information following completion of the NRC staff's evaluation of the Electric Power Research Institute (EPRI) MOV Performance Prediction Methodology (PPM), including consideration of extrapolation of test data, evaluation of unwedging loads, and application of parasitic loads; (2) review the staff's conditions and limitations for use of the EPRI Aloyco split-wedge gate valve model; and (3) carefully review the potential design-basis safety functions prior to removing any valves from the program scope in response to GL 89-10, Supplement 7, "Valve Mispositioning in Pressurized Water Reactors." In IR 95006, the NRC staff identified that the licensee committed to perform additional testing to justify its stem friction coefficient assumptions. The licensee should discuss its actions to address the above long-term aspects of its MOV program at Kewaunee.

WPSC RESPONSE:

EPRI Performance Prediction Methodology

Wisconsin Public Service Corporation (WPSC) completed it's review of the Nuclear Regulatory Commission's (NRC) safety evaluation report (SER) of the Electric Power Research Institute (EPRI) Motor-Operated Valve (MOV) Performance Prediction Methodology (PPM). From the SER, WPSC concluded the NRC's two primary concerns regard the licensee's use of the models provided in the PPM and the licensee's consideration of the conditions and limitations for use of the models. WPSC does not use the models but acknowledges the value of additional lessons learned from the work performed by EPRI as it relates to the industry.

WPSC's considerations towards test data extrapolation, unwedging load evaluations, and application of parasitic loads revealed that conservative analysis results are maintained. WPSC reviewed the EPRI report to determine EPRI's threshold requirements for design basis differential pressure and absolute values of differential pressure that must be satisfied when applying in-situ test friction coefficients to the EPRI computer model. WPSC has determined that our dynamic test conditions meet both guidelines with the exception of two valves. These valves were tested at approximately

20% of their design basis differential pressure, which was the highest achievable differential pressure. Two other valves in the same grouping were tested at approximately 80% of their design basis differential pressure. The data acquired on the two valves tested at the higher differential pressure provided information supporting the acceptability of the lower differential pressure tests. In addition, the actuators for the valves tested at the lower differential pressure have been upgraded in response to IN 96-048, Supplement 1, by providing 99% close torque switch bypass and increasing the overall gear ratio to improve actuator output capability.

WPSC's review of EPRI's hand calculation to predict unwedging loads determined it to be bounding when compared to actual test data. WPSC has reviewed the unwedging loads under dynamic conditions, for valves that were previously seated statically, and have found that the unwedging loads remain relatively constant or decrease for the flexible wedge gate valves. Dynamic unwedging loads for solid wedge gate valves are less consistent, with some decreasing, however most exhibit increased unwedging loads. Kewaunee adds an additional 25% to the solid wedge gate valve static unwedging torque measurement prior to comparing it to the degraded voltage torque capability. This provides margin for a potential increase in unwedging thrust requirements. Kewaunee also performs an extrapolation of design basis unseating torque and compares this calculated requirement to the degraded voltage torque capability. This is part of the dynamic test acceptance criteria for all valves having a safety function to open.

Current procedures at Kewaunee back-out running loads, which include potential parasitic loads observed in the static stroke signatures prior to performing valve factor determination. Kewaunee is in the process of incorporating the Joint Owners Group (JOG) Valve factor methodology, as specified in the JOG test specification, into plant procedures. The JOG method excludes only the load observed near the valve full open position when the differential pressure is essentially zero. Review of past dynamic test data supports the contention that this approach tends to add additional conservatism. Exclusion of the parasitic thrust component, observed in the static thrust trace, from the differential thrust component results in a more realistic valve factor conclusion. Similar to EPRI's findings, Kewaunee's review has identified instances where the presence of parasitic loads are apparent in both static and their associated dynamic traces.

EPRI Aloyco Split-Wedge Gate Valve Model

WPSC has reviewed the Supplement to the EPRI PPM Safety Evaluation (SE) to address conditions and limitations for use of the Aloyco split-wedge gate valve model. As with the main PPM computer code, WPSC is not applying this model. Although each of the conditions/limitations within the SE are directed to model users, WPSC reviewed it for applicability to Kewaunee. Since Kewaunee has four such valves within the scope of the MOV Program, WPSC reviewed the set-up of the valves and concluded adequate margin exists. We are also in the process of reviewing the JOG Feedback Notice (FN-01) which discusses the apparent valve factor degradation of these types of valves.



Kewaunee will continue to monitor and evaluate new industry information that becomes available with respect to these valve types. Kewaunee understands there was limited data acquired in the development of the EPRI model and also understands the limitations imposed on use of the model. If future circumstances prompt Kewaunee to implement the hand calculation model it will be implemented with consideration of all conditions and limitations.

Removal of Valves From Program Scope

WPSC's evaluation of the information contained within GL 89-10, Supplement 7, was performed in accordance with Kewaunee's Operational Experience Assessment (OEA) Program. OEA 89-175, Supplement 7, addressed the GL 89-10 mispositioning issue. In accordance with the guidance in the January 4, 1996 letter, each of the valves considered for removal from the program were rigorously reviewed to ensure the valve did not have a design basis active safety function. Recommendation for removal was based upon the valves being classified as not being required to re-position to mitigate the consequences of a design basis accident.

Validation of Stem Friction Coefficient Assumptions

Since the GL 89-10 close-out inspection in 1995, testing has been performed on 52 MOVs which provides data to justify Kewaunee's assumed stem friction coefficient of 0.15. By performing as-found testing prior to maintenance, Kewaunee has determined that friction coefficients average 0.103. For greater than 95% of the valves, the 0.15 assumption bounds the as-found values. None of the remaining, approximately 5%, valves have friction coefficients greater than 0.155. The remaining valves also have yet to be changed from an anti-seize type lubricant to a calcium complex EP grease. These valves have additional margin applied and are set-up to account for the additional stem friction.

Stem friction coefficient data was also examined for dynamic testing. None of the dynamic tests exhibited a friction coefficient greater than 0.15 and all were bounded by the rate-of-loading allowance given to the valve.

Consistent with the EPRI "Separate Effects Stem-to-Stem Nut Lubrication Test Program," Kewaunee's data shows that friction coefficient decreases with the number of strokes on a valve. WPSC has also determined that when changing lubricants, (ie. Fel-Pro N5000 to Nebula EP grease) it takes several strokes in order to "work" the lubricant into the stem thread interfaces. These facts help account for the satisfactory as-found test results after lubrication intervals as specified by Kewaunee's preventive maintenance program.





2. The licensee should briefly describe its plans for the use of test data from the motor control center (MCC) including (1) correlation of new MCC test data to existing direct force measurements; (2) interpretation of changes in MCC test data to changes in MOV thrust and torque performance; (3) consideration of system inaccuracies and sensitivities to MOV degradation for both output and operating performance requirements; and (4) validation of MOV operability using MCC test data.

WPSC RESPONSE:

In Kewaunee's 180-day response to GL 96-05, dated March 17, 1997, we indicated that "evaluation of the benefits and disadvantages of new technologies using Motor Control Center testing will continue." Due to Kewaunee's limited scope of Program valves and lack of excessive operating margins we had determined that the benefit of MCC testing would not be great enough to warrant both purchase of a test system and development of the knowledge, to adequately administer a MCC test program.

Since then, in an effort to upgrade our diagnostic test capabilities, we have purchased the Crane-MOVATS Universal Diagnostic System (UDS). This system has the hardware capability to acquire the 3 phase voltage and current data required for MCC testing. A major capital investment in the software technology to interpret this data was then made when Kewaunee also purchased the MC² software platform. The MC² system has been validated by the vendor using laboratory dynamometer tests, in-plant dynamometer tests, Idaho National Engineering and Environmental Lab (INEEL) actuator torque-cell testing, and in-situ testing in parallel with MC² data acquisition. Kewaunee took receipt of the diagnostic system in September of 1998.

Since receipt, Kewaunee has acquired power traces to serve as baseline signatures, and as part of valve stroke timing checks. Kewaunee is currently working on setting up lesson plans to train selected Kewaunee personnel on the recently purchased software.

Kewaunee intends to continue motor power data collection at each preventive maintenance interval as well as during at-the-valve testing to correlate Torque/Thrust Cell data to the motor torque model algorithm output. These baseline tests will be used to establish signature characteristics to be used for trending. At this time Kewaunee does not intend to extend frequencies or eliminate at-the-valve testing. With proper evaluations, increased knowledge and experience gained in MCC based testing, Kewaunee may consider such action in the future. The purpose of MCC testing at Kewaunee will be to periodically verify margin, provide an additional trending tool, and provide early detection of degradations.



NRC REQUEST:

3. The JOG program focuses on the potential age-related increase in the thrust or torque required to operate valves under their design-basis conditions. In the NRC safety evaluation dated October 30, 1997, on the JOG program, the NRC staff specified that licensees are responsible for addressing the thrust or torque delivered by the MOV motor actuator and its potential degradation. The licensee should describe the plan at Kewaunee for ensuring adequate ac and dc MOV motor actuator output capability, including consideration of recent guidance in Limitorque Technical Update 98-01 and its Supplement 1.

WPSC RESPONSE:

WPSC re-calculated the degraded voltage limits using pullout efficiency and an application factor of 0.9 for all MOVs within the scope of the Kewaunee MOV Program. The calculations were used as a screening tool to determine the scope of our evaluation using the current data and the as-left actuator settings. Each valve was evaluated to ensure capability by review of Operating Condition Evaluations, Degraded Voltage Calculations (which included consideration of the most recent ambient temperature profiles per Kewaunee's Environmental Qualification Plan), as well as diagnostic test data. Although all valves were shown to be operable, modifications were initiated on four valves to re-gear the actuators in order to increase actuator capability and provide the valves with long-term reliability and increased margin.

The answer to long-term MOV reliability lies in increases in actuator margins. To date Kewaunee has shown our operating margins are acceptable with minimal modifications. For long-term considerations, Kewaunee will review the current margins and perform plant modifications as deemed necessary to provide additional margin. Valve weak links will be reviewed and recalculated as required by actuator improvements and valve modifications will be performed where necessary. Kewaunee's implementation of aspects of the JOG requirements will continue. Furthermore, regardless of risk, adequate margin will be established for each program valve, ensuring operability until the next periodic test.