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SUBJECT: Submits 120-day response to GL 96-06, "Assurance of Equipment Operability & Containment Integrity During DBA Conditions."

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WISCONSIN PUBLIC SERVICE CORPORATION

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January 28, 1997

10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Wisconsin Public Service Corporation's (WPSC's) 120-Day Response to Generic Letter 96-06

References:

1) Generic Letter 96-06: "ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY DURING DESIGN-BASIS ACCIDENT CONDITIONS," dated September 30, 1996

2) Letter from M.L. Marchi (WPSC) to the Document Control Desk (NRC) dated October 30, 1996

3) Letter from C.R. Steinhardt (WPSC) to the Document Control Desk (NRC) dated May 5, 1989

4) Letter from M.A. Ring (NRC) to K.H. Evers (WPSC) dated June 15, 1990

Reference 1 requested all licensees evaluate their plants to determine if they are susceptible to:

1. Water hammer in the piping system supplying water to the containment fan coil units (FCUs) following a design basis loss of coolant accident (LOCA) or main steam line break (MSLB) in containment coincident with a loss of offsite power (LOOP),

2. The formation of two phase flow in the containment FCUs or associated piping following a design basis LOCA or MSLB, and

3. The potential to over-pressurize isolated components and piping that penetrate containment following a design basis LOCA or MSLB inside containment.

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The reference also requested Licensees provide the Nuclear Regulatory Commission (NRC) with a 30-day and a 120-day response to these concerns.

The attachment to this letter provides Wisconsin Public Service Corporation's (WPSC's) 120-day response to these issues, a schedule for completing the assessment, and a schedule for implementing corrective actions when, and if, they are determined to be necessary. WPSC is also following industry initiatives to address the issues identified in Generic Letter 96-06. If these initiatives develop a safer or more efficient method of resolving these concerns, than outlined in this letter, we will reassess our planned resolutions. WPSC will notify the NRC of significant changes in our approach.

Sincerely,

C. R. Steinhardt
Senior Vice President - Nuclear Power

TJW

Attach.

cc - US NRC Region III
US NRC Senior Resident Inspector

Subscribed and Sworn to
Before Me This 28th Day
of January 1997

Jeanine M. Ferris
Notary Public, State of Wisconsin

My Commission Expires:
June 13, 1999

ATTACHMENT

Letter from C. R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

January 28, 1997

RE: Generic Letter 96-06

Water Hammer

Wisconsin Public Service Corporation (WPSC) has completed the evaluation of the containment fan coil units (FCUs) to determine which conditions described in the Generic Letter lead to the most severe water hammer loads. A loss of all offsite power (LOOP) coincident with a large break loss of coolant accident (LOCA) results in the most severe water hammer loads for Kewaunee's FCUs. Although the FCU subjected to the most severe loads has been evaluated, the second level review of the evaluation has not been complete. Prior to the plant's restart from the current outage, the calculation will receive a second level review and the assumptions made in the calculation will be verified.

The preliminary evaluation has determined the FCU and its associated service water piping will remain operable following a design basis earthquake and a concurrent water hammer event. The operability assessment was performed in accordance with references 2, 3, and 4. Therefore, no modifications are required to return the plant to service following the 1996 refueling outage to address this issue. Although not required to ensure operability of the system, one minor modification was made to provide a larger factor of safety by reinforcing the high stress point in a service water line.

In order to determine what actions would be required in the long term to address this issue, WPSC personnel researched Kewaunee's design basis and NRC generic documents. Specifically, WPSC personnel were looking for guidance on the required load combinations that needed to be considered with a water hammer event and allowable stress levels.

Water hammer was first identified as unresolved safety issue (USI) A-1 in NUREG 0371, "Task Action Plans for Generic Activities (Category A)," in 1978. Since Kewaunee's operating licenses predates this document, it was not identified as a significant design consideration during plant construction. The resolution of USI A-1 is summarized in NUREG 0933, "A Prioritization of Generic Safety Issues," in 1985. USI A-1 was resolved by issuing NUREG 0927, "Evaluation of Water Hammer Occurrences in Nuclear Power Plants," and revising sections of the Standard Review Plan (SRP). Although NUREG 0933 states, "Thus this USI affects all future plants only," the work completed to close the USI for future plants can be used as guidance to address the current issue.

NUREG 0927 discusses the potential for water hammer to occur in open loop service water systems due to column separation. Section 3.4 of the NUREG identifies potential solutions to address the safety concern. The fourth bullet states that one possible solution is to design the system such that it will "maintain its function following a postulated water hammer event." As a result of findings from NUREG 0927, paragraph IV.2.b of section 9.2.1 "STATION SERVICE WATER" of the SRP was revised to include similar wording. However, neither NUREG 0927 nor section 9.2.1 of the SRP define functional.

Appendix A to section 9.3.3 "ASME CODE CLASS 1, 2, AND 3 COMPONENTS, COMPONENT SUPPORTS, AND CORE SUPPORT STRUCTURES" of the SRP was reviewed to obtain additional guidance on load combinations that should be considered, acceptable service stress limits, and the definition of functional. Note 4 to Table 1 of Appendix A was added as a result of NUREG 0927 to explicitly address water hammer loads. However, the note does not explicitly state load combinations or acceptable service stress limits for water hammer events. The note only states that water hammer must be considered in the development of the design specifications.

Appendix A further states:

> Since the combination of loading and the selection of applicable design and service stress limits appropriate to each load combination and the proper consideration of operability is beyond the scope of the Code; and the treatment of functional capability, including collapse and deflection limits is not adequately treated by the Code for all situations, such factors must be evaluated by designers and appropriate information developed for inclusion in the Design Specification or other referenced documents.

Table II of Appendix A defines Component and Support Functional Capability as:

> Ability of a component including its support to deliver rated flow and retain dimensional stability when the design and service loads, and their resulting stresses and strains, are at the prescribed levels.

From a review of these documents the following becomes apparent:

1. The required loading combinations and acceptable stress limits for operability are beyond the scope of the ASME Code.

2. It is the responsibility of the designer/owner to identify the potential load combination and stress limits for water hammer.

3. The established stress limits must ensure the functionality of the system.

4. Kewaunee's design predates the identification of USI A-1, the SRP, and the plant was built to ANSI B31.1, not section III of the ASME Code, the information contained in the SRP and the ASME code can not be directly applied to the Kewaunee Plant. However, it can be used as guidance to resolve this issue.

WPSC's assessment of these documents has determined the combination from a water hammer event and a design basis earthquake must not result in a loss of function to the containment FCUs. In the past, functionality has been assured by maintaining the operability of the piping system. Operability, which as stated in the SRP, is beyond the scope of the ASME code and by similarity ANSI B31.1. Therefore, alternate documents were reviewed to determine how functionality can be assured in the long term. Kewaunee's response to IE Bulletin 79-14 identified acceptable stress levels which provide assurance of system operability (references 3 and 4). Maintaining the stresses in these systems below the operability criteria described in references 3 and 4 will ensure their functionality in the long term. Therefore, WPSC proposes operability criteria described in references 3 and 4 be used in the long term resolution of this issue.

To date WPSC has performed a quantitative analysis of the containment FCU susceptible to the most severe water hammer and a qualitative analysis of the remaining three containment FCUs. These analysis have determined that there is no functionality concern. However, we will continue to watch industry activities to address this issue and will notify the NRC of any significant changes in our approach.

Two Phase Flow

To evaluate this issue, WPSC reviewed its design basis, performed a flow test of the SW system, and reevaluated the containment pressure and temperature response assuming all 4 FCUs were inoperable. Our evaluation determined the following:

1. When design basis fouling factors (0.001) and service water flows (900 gam) are assumed, the temperature of the water leaving the FCUs will be between 207°F and 215°F, which correspond to service water inlet temperatures of 66°F and 85°F, respectively. Therefore, under design basis conditions, two phase flow will not occur in the FCUs. However, during periods of high service water temperature, some flashing may occur outside containment near the service water standpipe. Although some two phase flow may occur, it is our judgement that this will not have a significant affect on FCU performance due to the relatively low temperatures of the water.

2. When design basis fouling factors and actual service water flow rates, measured in the post LOCA configuration (approximately 1350 gam), are assumed, the temperature of the water leaving the FCUs is 193°F, assuming an inlet water temperatures of 85°F. Therefore, flashing will not occur.

3. If the fouling factors are conservatively assumed to be 0, concurrent with actual service water flow rates and 85°F service water, the water leaving the FCUs will be 259°F. Under these assumptions, flashing will occur near the exit of the FCUs.

4. One internal containment spray pump provides adequate heat removal to prevent the containment from exceeding its design basis temperature and pressure. Although design basis limits will not be exceeded, containment temperature and pressure will remain high for an extended period of time if no credit is taken for the FCUs.

5. Kewaunee's Technical Specifications require one train of containment spray to be operable during plant operation.

6. The evaluation using one containment spray train also demonstrated that approximately 10 minutes after accident initiation, flashing will no longer occur in or near the FCUs. At this time containment temperature is low enough such that two phase flow would only occur outside containment near the service water standpipe.

7. Two phase flow in the service water standpipe is not a concern because sufficient quenching flow exist to subcool the water.

From the above, it can be determined that under design basis conditions, two phase flow is not a significant design concern for the containment FCUs. However, if conditions beyond those described in the USAR are to be assumed, as appears required by reference 1, then two phase flow becomes a significant design consideration. Furthermore, since one train of internal containment spray is sufficient to prevent containment from exceeding design basis limits, this condition has minimal safety significance.

To address the concern of two phase flow under worse case assumptions, WPSC is currently planning to implement physical changes to the plant or provide analysis that demonstrates the existing configuration is acceptable. The physical change or analysis will be completed prior to the end of the current outage.

Over Pressurization of Isolated Piping

WPSC has reviewed the design of the containment penetrations and found 11 penetrations susceptible to pressurization during a loss of coolant accident or steam line break. Two of these 11 penetrations may require modification to prevent them from over pressurizing following a design basis accident. The operability of the remaining penetrations can be assured by evaluation, changes to operating procedures, and changes to system line-ups. The proposed modifications and operating changes will be completed prior to the end of our current outage.

WPSC will continue to follow the EPRI effort on this issue. We support the development of a standard strained based approach to analyze susceptible penetrations. When an acceptable method of analyzing this condition is developed, WPSC will reevaluate our current commitments and notify the NRC of any significant changes.