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STEINHARDT,C.R. Wisconsin Public Service Corp.
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WCAPS 12874 + P-12875

SUBJECT: Forwards nonprietary WCAP-12874 & proprietary WCAP-12875, "Technical Justification for Eliminating Pressurizer Surge Line Rupture As Structural Design Basis For Kewaunee Nuclear Plant." WCAP-12875 withheld.

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August 2, 1991

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

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Response to NRC Bulletin No. 88-11

Reference:
1) US NRC Bulletin 88-11, "Pressurizer Surge Line Stratification", dated December 20, 1988 (received on January 3, 1989).

2) Letter from C. R. Steinhardt (WPSC) to US NRC Document Control Desk dated February 6, 1991.

3) Letter from C. R. Steinhardt (WPSC) to US NRC Document Control Dated May 24, 1989.

On December 20, 1988, the Nuclear Regulatory Commission (NRC) issued Bulletin No. 88-11 entitled, "Pressurizer Surge Line Stratification" (reference 1). The bulletin requested all licensees to establish and implement a program to confirm pressurizer surge line integrity. The purpose of this letter is to provide information regarding the status of activities taken by Wisconsin Public Service Corporation (WPSC) to resolve bulletin item 1.d of the Actions Requested section.

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In reference 2, WPSC submitted an update of the actions taken at the Kewaunee Nuclear Power Plant (KNPP) to resolve the requirements of the bulletin. Actions included: 1) a visual inspection (VT-3) of the surge line; 2) participation in the Westinghouse Owners Group (WOG) to generically evaluate the effects of stratification on surge line integrity; 3) a proactive monitoring program to obtain plant specific data for thermal stratification and line deflection; and 4) participation in the WOG program to perform a generic detailed analysis for plants with similar surge line configurations. In addition, the submittal also outlined WPSC's future plans to ensure that the KNPP pressurizer surge line stress and fatigue values are within the Code limits. In reference 2 it was stated that stress and fatigue requirements as delineated in Section III of the ASME Boiler and Pressure Vessel Code can be met for the design life of the KNPP, contingent on making modifications to whip restraint gaps (i.e. increasing the distance between the pressurizer surge line and the whip restraints) during the 1992 refueling outage. Ensuring that the stress and fatigue values are in compliance with the Code requirements would thereby satisfy requirement 1.d of the bulletin. To justify the whip restraint gap modifications, WPSC intended on utilizing leak-before-break (LBB) technology to demonstrate that any degradation of the surge line would develop as a detectable leak rather than a catastrophic failure. Modification of whip restraint gaps, as opposed to alternate methods of removing further conservatisms from the stratification analysis, was determined by WPSC and Westinghouse Electric Corporation to be the most technically justified and cost-effective means of satisfying the surge line stress and fatigue requirements.

Furthermore, WPSC investigated several other potential solutions to resolve the issues presented in the bulletin. These included elimination of arbitrary break points, opening restraint gaps under the existing rupture analysis, utilizing inelastic limits for restraints, and changing plant operating procedures to limit system ΔT (pressurizer temperature minus reactor coolant hot leg temperature). Each of these options is briefly discussed in the following paragraphs.

Current NRC guidance on postulation of rupture locations in fluid piping is specified in Branch Technical Position MEB 3-1. This requires the postulation of break points at intermediate locations where the maximum stress range as calculated by equation 10 and either equation 12 or 13 exceeds 2.4 S_m and also at locations where the cumulative usage factor exceeds 0.1. Westinghouse Electric Corporation calculated the usage factor due to striping, alone, to be 0.17 on all surge line piping which could possibly experience this phenomenon (i.e. horizontal sections of the surge line). Thus, elimination of arbitrary intermediate break points is not a viable option.

The original rupture analysis assumes that the gaps between the pressurizer surge line and restraints are analytically zero in the hot condition. Opening of the gaps beyond that required for normal heatup and cooldown will require that the resulting impact energy due to pipe whip be accounted for in the rupture analysis. Discussions with Westinghouse Electric Corporation, based upon a KNPP whip restraint analysis performed in October of 1990, indicate that the

existing whip restraint design can not withstand the additional impact loading from larger gaps even when utilizing plastic limits.

Low temperature overpressurization (LTOP) and reactor coolant pump seal integrity are two items that could be compromised by changing plant operations to limit system ΔT. In order to significantly reduce system ΔT , it would be necessary to switch operation from a steam bubble mode to water solid operation in the pressurizer. Results of the pressurizer surge line stress/fatigue analysis, along with planned future modifications of the whip restraint gaps which are justified by LBB, demonstrate that limiting system ΔT by changing plant operating procedures is not required and would unnecessarily impact plant operations.

Subsequent to submitting reference 2, several telephone conversations were held between cognizant NRC staff and WPSC personnel. During these conversations it was concluded that an acceptable approach to fulfilling Bulletin 88-11 requirements would be to open the gaps on the pressurizer surge line whip restraints during the KNPP 1992 refueling outage. The gaps would be open to the extent necessary to reduce the stress and fatigue induced by thermal stratification to an acceptable level, thereby resolving the requirements of the bulletin. The required surge line whip restraint gaps were determined by performing an analysis of the pressurizer surge line in the unrestrained condition. Stress and fatigue evaluations, accounting for global loadings from two configurations (i.e., before and after whip restraint gap modifications assumed to occur in 1992) have been completed for the KNPP surge line. The following results of these evaluations show that Equation 12 stress levels are acceptable for the post-modification configuration, and that the fatigue usage factor is within the ASME allowable for the design life of the plant.

	Analysis	Allowable
Equation 12 Stress (Ksi)	52.3	53.0
Fatigue usage factor	0.97	1.0

To further demonstrate the acceptability of the modified whip restraint gaps, detailed LBB and fatigue crack growth analysis of the Kewaunee surge line have been completed. The analysis utilized plant specific operating history and material properties, and included the effects of thermal stratification. The results of these analyses demonstrate compliance with revised General Design Criterion 4 (Appendix A to 10 CFR 50) for application of LBB to the Kewaunee surge line.

With the application of LBB, modifications to selected surge line restraints will ensure continued compliance with the stress and fatigue requirements of the applicable design codes. The LBB analysis demonstrates that the proposed modified whip restraints actually provides for a safer

configuration than the existing, in that stress levels and the fatigue usage factor will be lower. WPSC plans to complete the modifications during the 1992 KNPP refueling outage and is therefore transmitting the following attached reports for NRC review and approval.

1) WCAP-12875, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Kewaunee Nuclear Power Plant" (Proprietary).

2) WCAP-12874, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Kewaunee Nuclear Power Plant" (Non-Proprietary).

In order to allow the necessary time to plan and schedule the required activities, WPSC requests that the NRC staff complete their review and provide approval to the WPSC approach prior to February 1, 1992. Operation of the KNPP with the current restraint configuration is acceptable in the interim based on information provided in reference 3 and WCAP-12277, " Westinghouse Owners Group Bounding Evaluation for Pressurizer Surge Line Thermal Stratification", June 1989.

Also attached are a Westinghouse authorization letter, CAW-91-184, accompanying affidavit, Proprietary Information Notice, and Copyright Notice.

As WCAP-12875 contains information proprietary to Westinghouse Electric Corporation, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations.

Accordingly, it is requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to the copyright of propriety aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-91-184 and should be addressed to R.P. DiPiazza, Manager of Operating Plant Licensing Support, Westinghouse Electric Corporation, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Please feel free to contact a member of the WPSC staff if you have any questions regarding this submittal.

Sincerely,

C. R. Steinhardt
Senior Vice President-Nuclear Power

SLC/jac

Attach.

cc - Mr. Patrick Castleman, US NRC
US NRC, Region III

Subscribed and Sworn to
Before Me This 2nd Day
of August 1991

Notary Public, State of Wisconsin

My Commission Expires:
June 27, 1993

Attachment

to

Letter from C.R. Steinhardt (WPSC) to US NRC Document Control Desk

Dated August 2, 1991