



Commonwealth Edison
 1400 Opus Place
 Downers Grove, Illinois 60515

January 8, 1991

Office of Nuclear Reactor Regulation
 U.S. Nuclear Regulatory Commission
 Washington, D.C. 20555

Attn: Document Control Desk

Subject: Zion Station Units 1 and 2
 Byron Station Units 1 and 2
 Braidwood Station Units 1 and 2
 Supplemental Response to NRC Bulletin 88-11
 Pressurizer Surge Line Thermal Stratification
 NRC Docket Nos. 50-295/304, 50-454/455,
 and 50-456/457

- References:
- (a) NRC Bulletin 88-11, dated December 20, 1988.
 - (b) M.H. Richter letter to U.S. NRC dated March 7, 1989.
 - (c) L.N. Olshan (NRC) letter to T.J. Kovach (CECo) dated May 18, 1989.
 - (d) M.H. Richter (CECo) letter to U.S. NRC dated May 31, 1989.

Dear Sir:

Reference (a) requests all addressees to establish and implement a program to ensure pressurizer surge line integrity with respect to thermal stratification and striping, and design basis loads. References (b) and (d) provided the Commonwealth Edison Company (CECo) initial response to this Bulletin. Additionally, Reference (d) indicated that CECo would notify the NRC upon completion of the remaining commitments associated with the Bulletin. Attachment I describes the actions taken by CECo to close those remaining commitments.

Please note that also attached are:

1. WCAP-12739/12740, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Bases for Byron and Braidwood Units 1 and 2 (Proprietary/Non-Proprietary).
2. WCAP-12743/12744, "Structural Evaluation of the Byron and Braidwood Units 1 and 2 Pressurizer Surge Lines, Considering the Effects of Thermal Stratification: (Proprietary/Non-Proprietary).

Also enclosed are a Westinghouse authorization letter, CAW-91-115, accompanying affidavit, Proprietary Information Notice and Copyright Notice.

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As Item 1 and 2 contain 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 respectfully 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 or proprietary aspects of the items listed above or the supporting Westinghouse Affidavit should reference CAW-91-115 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 address any questions you have regarding this response to this office.

Sincerely,



D.L. Taylor
Generic Issues Administrator

Attachments: 1) Supplemental Response to Bulletin 88-11
2) Westinghouse Authorization Letter, CAW 91-115
3) WCAP - 12743/12744
4) EMD - 066614
5) WCAP - 12739/12740

cc: A. Bert Davis-Regional Administrator, RIII, w/o attachments 2-5
Senior Resident Inspector - Z/BY/BW, w/o attachments 2-5
C. Patel-Project Manager, NRR
T. Hsia-Project Manager, NRR
R. Pulsifer-Project Manager, NRR

DT:lmw
ZNLD655/4

ATTACHMENT I

Supplemental Response to NRC Bulletin 88-11 Pressurizer Surge Line Thermal Stratification

Action Item 1a of NRC Bulletin 88-11 required a visual inspection of the pressurizer surge line for "gross discernable distress or structural damage" in the surge line and related support hardware. Walkdowns performed in accordance with the recommendations of Item 1a reported no discernable damage to the piping and support hardware for the pressurizer surge piping at Zion, Byron and Braidwood Stations.

Action Item 1b of the Bulletin set forth the time constraints for evaluation of the surge piping for those plants operating for over ten years (four months after receipt of the Bulletin) and those plants operating for less than ten years (one year after receipt of the Bulletin). The evaluations were to demonstrate FSAR compliance for the licensed life of the plants. Reference (c) extended the time constraint to May 31, 1989. Where analyses could not show that the surge line meets FSAR requirements, a justification for continued operation (JCO) was to be provided, or the plant was to be brought to cold shutdown.

Using a generic bounding analysis, the Westinghouse Owners Group (WOG) could not demonstrate FSAR compliance by the date given in Reference (c). In a meeting between the WOG and the NRC on April 11, 1989, it was agreed that a JCO in conjunction with the Westinghouse Topical Report (WCAP-12277/12278), which was submitted to the NRC in June of 1989, would meet the requirements of Item 1b. The JCO for Byron, Braidwood and Zion was provided as required, (see Reference (d)).

Based on the generic bounding analysis, FSAR compliance was not shown for the duration of the operating license. Action Item 1C provided direction in collecting plant specific data on thermal stratification, thermal striping and surge line deflections. The WOG implemented a program for generic detailed analysis addressing thermal stratification and striping in the pressurizer surge line in June of 1989. The program was based on the detailed analyses of various groups of plants. The plants were grouped based on two significant parameters affecting thermal stratification in the surge line: surge line geometry (i.e., pipe size, slope, RCS nozzle angle, presence of mid-line vertical riser) and plant operation (namely, water-solid versus steam bubble heatups and cooldowns).

A number of utilities, including CECO established monitoring systems involving the installation of temporary sensors in order to better quantify the effects of thermal stratification and striping on the surge line. The monitoring data was used in conjunction with plant procedures and historical records to develop thermal transient range sets and cycles that would apply to all plants within a particular group.

A generic detailed fatigue analysis was performed using assumed seismic OBE bending moments. The analysis demonstrates ASME Section III code compliance for Equation 12, Equation 13, thermal stress ratchet and cumulative usage factor for 15 plants, including Zion Units 1 and 2. The generic program does not provide specific information regarding support loads and piping specific information regarding support loads and piping displacements for individual plants, nor does it address the increased pressurizer nozzle loads due to stratification. The generic program report (WCAP-12639/12640) was issued in June of 1990. This report has been submitted by the WOG to the NRC for review.

Action Item 1d of the Bulletin requested the utility to update the existing stress and fatigue analyses to reflect the effects of thermal stratification and striping, within two years of the Bulletin. Detailed thermal stratification and striping fatigue analyses were performed for Byron, Braidwood, and Zion.

The detailed analysis for Byron and Braidwood Stations (WCAP-12743/12744, attached) incorporates the same techniques as used in the generic detailed analysis, but uses plant specific operating procedures and data. The detailed analysis results indicate the need to remove a vertical support on the surge line for all four units, in order to meet Code fatigue requirements. The analysis requires the support to be removed prior to the end of 1993.

For the Zion detailed analysis, the transient load definition, axial stratification profile, and analysis techniques are similar to those used in the generic detailed analysis. The analysis differs from the generic detailed analysis in deriving the various stratification levels and associated cycles. The generic detailed analysis uses monitoring data from a number of plants to define the levels of stratification and uses a statistical methodology in generating the number of cycles. The Zion analysis bases the various stratification levels on actual operating plateaus. Six cycles of insurge/outsurge stratification are assumed for each stratification level per heatup or cooldown. The analysis shows that the surge line meets FSAR requirements without modification to the support configuration. This is consistent with the generic detailed analysis results. Documentation of the Zion surge line thermal stratification evaluation is provided in EMD-066614, (attached).

The pressurizer nozzles, support loads, and pipe displacements have been reevaluated to ensure that the pipe whip/flailing restraints have sufficient gaps to accommodate the predicted pipe movement, and that the existing supports and pressurizer nozzle can bear the new loads associated with thermal stratification. Upon completion of the modification to remove one vertical rigid restraint on the surge line of each Byron and Braidwood surge line, the surge lines at Byron, and Braidwood will meet the applicable FSAR requirements for the licensed life of the plants. Zion Station currently meets the applicable FSAR requirements for the licensed life of the plant.

The current design basis requires the surge line to be evaluated for postulated pipe breaks. Zion analysis shows no new postulated break locations. Pipe rupture is not affected by the change in flailing restraint clearances.

A leak-before-break analysis was also performed for the Byron and Braidwood surge lines (WCAP-12739/12740, attached) that justifies the elimination of surge line pipe breaks from the structural design basis. Therefore, a detailed structural analysis of the pipe whip restraints was not performed for the stratified condition. The whip restraints were reviewed to ensure adequate clearance to accommodate the expected pipe displacements due to thermal stratification. The pipe rupture analysis incorporates the recommendations and criteria proposed in NUREG 1061 Volume 3.

This response, therefore, completes the action items and reporting requirements for Bulletin 88-11 for Zion, Byron and Braidwood Stations.

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