



Franklin Research Center
A Division of The Franklin Institute

March 18, 1981

Dr. Paul G. Shewmon
Professor and Chairman of
Metallurgical Engineering Department
Ohio State University
Columbus, Ohio

re: GRS Document: "Structure-Dynamic Analysis of the PWR RPV Flange
Connection During ATWS Emergency Failure"

Dear Dr. Shewmon:

As per request by Mr. T. McCreless, I have reviewed the Subject Report. Comments pertaining to points raised by you are summarized in the following.

The objective of the subject analysis was to evaluate the state of stress in the vessel in general with specific emphasis on the computation of vessel closure bolt prestressing needed to keep the flange in contact and under compression during ATWS pressure transient (to avoid leakage through the vessel head joint at the flanges).

Manufacturer of the vessel had determined a vessel closure bolt prestress based upon consideration of other than ATWS transients.

The analysis performed for ATWS conditions established that the manufacturer's specified reactor vessel closure bolt prestress would not be sufficient to provide a leak tight closure. It was further found that vessel closure bolt prestress sufficient to keep the closure leak tight could be applied, such that neither the bolts nor the vessel would be overstressed (in terms of the ASME Section III allowable stresses) during ATWS and no leak would occur.

Your observation that the Subject Report does not provide basis for conclusions in the Abstract is correct. The second and third sentences of the fourth (4) paragraph of the Abstract refer to the conditions found in the RPV as designed by the manufacturer. The fourth (4) sentences of the fourth (4) paragraph of the Abstract applies to the results based on new, higher bolt prestress. I believe some points have been lost or misplaced during various translations. The original report was in English (Franklin Research Center (FRC)), translated to German (by FRC) for submission to GRS, modified by GRS for publication (in German) and finally translated back to English (by Techtran) where a "bolt" became a "screw," etc.

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Dr. Paul G. Shewmon
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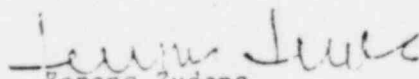
- 2 -

March 18, 1981

As to the possibility of using head lift-off as a depressurization means, blowdown through the circular gap resulting from various levels of lift-off's could be calculated by one-dimensional blowdown codes. It would be of interest to know how much lift-off is required to balance the pressure rise during ATWS. Similar analysis was done for Fort St. Vrain where it was shown that, even if the vessel would develop complete circumferential crack, blowdown of helium would reduce the pressure and the prestress system (axial tendons) would eventually close the gap.

Although the GRS report did not address this issue, it is likely that various proportions of the RPV design are such that prior to failure elsewhere, bolts would be stretched enough to break the closure seal (this is, if the estimated ATWS overpressure is exceeded). Whether the bolts would retain enough elastic energy to reclose the gap depends on the specific details of a particular design.

Very truly yours,



Leon S. Zudans
Senior Vice President, Engineering

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cc: Mr. T. McCreless
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