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Franklin Research Center
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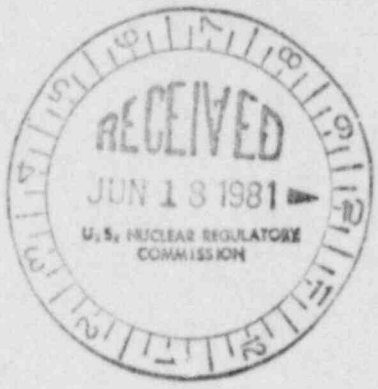

re: ACRS Subcommittee Meeting on Metal Components,
May 19, 1981, Washington, D.C.

1) Indian Point 2, Reactor Pressure Vessel Flooding

2) Component Support Fracture Toughness - A-12,
Stress Crossion Cracking of High Strength Bolting

3) Overcooling of RPV, Pressurized Thermal Shock

Dear Professor Shewmon:

1) With respect to Indian Point 2, Reactor Pressure Vessel (RPV) flooding, the thermal stress analysis performed by EG&G is conservative for the vessel wall (due to the assumption of an infinite film coefficient on the inside surface of the vessel, neglect of insulation on the outside and due to the use of fairly high film coefficient on the outside of the vessel). Accordingly, the fatigue damage accumulated in the vessel wall during flooding event should be very conservatively estimated by this analysis. For the instrument penetration model, EG&G analysis is not as conservative as the one for the vessel because outside surface film coefficients were adjusted to correspond to actual heat transfer regime (however, still conservative since insulation was neglected). Also, the modeling of instrument penetration with only two (2) elements through the thickness is not adequate for computation of credible peak stress at the point where outside surface of the vessel intersects with the outside surface of the penetration. Neglect of stress concentration factor at this location therefore is not justified (even with double extrapolation indicated in the report). Other conservatisms utilized in the analysis, however, are sufficiently strong to conclude that the Indian Point 2 RPV flooding did not accumulate more than a negligible additional fatigue damage to the penetration.

2) Component Support Fracture Toughness (A-12) has potentially significant impact if the solution to the problem is to be achieved in a short term. Since a major LOCA loading is the main source of the high stresses in supports and since the probability of such LOCA appears to be in the diminishing mode, the industries request for additional time to develop a data base and to prepare alternative evaluation methods has merit (it was said that industry had been given time before with no positive results).

I believe that a more serious issue is the stress corrosion cracking of high strength bolting. Independent of what criteria for bolting evaluation are established, bad field experience (as presented by Mr. Sellers, NRC) indicates something is not being done right. Probably the industry is using high strength bolts to accommodate increased loading in plants designed for lower loads (space limitations not allowing for redesign) and not paying adequate care to the bolt prestress imposed at the installation. AIF proposes bolting service experience survey (design and failure history). I believe that such a survey would provide in service experience which can be used to fine-tune the acceptance criteria. I believe in general that bolts requiring significant prestress should not be made of material for which one can not demonstrate with high degree of confidence that the time to rupture in the service environment is longer than the reactor design life. Or, alternatively, there should be inspection and replacement required at time periods shorter than the time to rupture at given preload. I believe this topic merits staffs separate attention.

3) Overcooling transients resulting in pressurized thermal shock to the RPV have been analyzed with conservative assumptions (one dimensional, with an infinite crack in the cylinder) leading to 400°F cooling in 20 minutes. Actual Rancho Seco Transient trace shows 310°F cooldown in sixty (60) minutes. Such cooldown rates, in the presence of the anticipated accumulated fluence, can lead to RPV failure. It appears that a potentially serious problem exist. More homework is needed by the industry and the NRC to sharpen the understanding of the potential problem and to get better idea on margins in specific plants (best estimate analysis). It may be prudent to examine and restrict some Plant Operating Procedures in order to reduce the likelihood of occurrence of such overcooling transients.

Very truly yours,

Zenons Zudans
Senior Vice President, Engineering

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cc: A. Igne
ACRS