UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 20, 1981

TO ALL LICENSEES OF OPERATING PWR NUCLEAR POWER PLANTS

SUBJECT: THERMAL SHOCK TO REACTOR PRESSURE VESSELS (GENERIC LETTER 81-19)

For a number of years the NRC and industry have been studying the effects of thermal shock to reactor pressure vessels. Efforts have focused on the identification and characterization of thermal repressurization transient scenarios and their probabilities and on the development of material properties data and improved analytical tools for assessing vessel integrity. A number of on-going research programs are supportive of this effort and continue to provide information intended to quantify actual thermal/mechanical vessel behavior.

In the event of an overcooling system transient resulting in a cooldown of the reactor vessel, followed by repressurization of the pressure boundary above a critical level during the cooling period, vessel integrity could be jeopardized. The likelihood of a vessel cracking upon experiencing a thermal/repressurization transient depends upon (1) its material properties, which degrade with increased irradiation; (2) the severity of the thermal shock which is a function of the degree of mixing of primary water in the system and relatively cold water injected by the high pressure pumps making up part of the Emergency Core Cooling System; and (3) the magnitude of the pressure transient occurring during repressurization.

Earlier this year a number of analyses sponsored by the Commission research program were completed and results became available to the staff. These analyses were directed at providing a better understanding of the severity of overcooling transients which combine operational experience and expected reactor vessel material properties. In the same time frame, as a response to post-TMI requirements, the staff initiated its review of thermal/mechanical reports from licensees of Babcock and Wilcox (B&W) operating reactors intended to further evaluate the effect of high-pressure safety injection on vessel integrity for small-break loss-of-coolant accidents (Item II.K.2.13 of NUREG-0737, Clarification of TMI Action Requirements, November 1980). It was as a result of a review of these on-going efforts that the staff decided to accelerate its evaluation of possible thermal shock to reactor pressure vessels.

On March 31, 1981, the NRC staff met with the PWR Owners Group and representatives of NSSS vendors to discuss the effects of potential thermal shock to reactor pressure vessels by overcooling transients and the potential consequences of subsequent repressurization at relatively low temperature. A copy of the minutes of that meeting is enclosed for your information.

8106250094

This letter is to confirm the intent of the owners groups to perform a study of this concern including developing alternatives to protect the vessel by avoiding repressurization with cold water.

As indicated in the enclosed minutes of the meeting, we expect to receive a letter report from each of the owners groups summarizing their efforts not later than May 15, 1981. We expect that you are familiar with the activities of the appropriate owners group, actively participating in their discussions, and will provide a docketed response by May 22, 1981, identifying the specific actions you propose to take for your facility.

Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
Minutes of PWR Owners Groups
Meeting with NRC on March 31, 1981

cc w/encl:
Service Lists