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

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MEMORANDUM FOR: Themis P. Speis, Assistant Director for Reactor Safety, DSI

FROM: Brian W. Sheron, Acting Chief, Reactor Systems Branch, DSI

SUBJECT: FEED AND BLEED CAPABILITY IN CE PLANTS BOTH WITH AND WITHOUT PORVs

The purpose of this memorandum is to inform you of some recent new information regarding the ability of CE plants both with and without PORVs to perform a successful feed and bleed mode of decay heat removal.

Plants with PORVs

In summer, 1979, CE submitted CEN-114 which provided, among other things, an analysis of feed and bleed capability in CE plants with PORVs. The plant analyzed, while not specifically stated, was Calvert Cliffs. This analysis showed that using an evaluation model (CE's choice, not ours!) if the operators opened both PORVs* within 10 minutes after loss of all feedwater, the plant could be depressurized sufficiently for the low head HPI pumps to be able to inject. This analysis showed that core uncovery was predicted and the peak cladding temperature reached was 2040°F.

Recently, it came to my attention that the PORV control in the Calvert Cliffs control room has only two positions: Closed and Automatic. I called CE and inquired what assumptions they made in their analyses regarding the operator's ability to open the PORVs. They confirmed that the PORVs cannot be opened from the main control panel. However, if the operator goes behind the panel and removes two control modules, the PORVs will automatically open. I do not know if this is a generic problem with CE plants, or others. However, I question whether Calvert Cliffs operators have been properly trained to perform this maneuver in a short period of time following a loss of all feedwater. Thus, the ability of operators to implement feed and bleed capability in CE plants like Calvert Cliffs and any others with this problem is questionable.

On the surface, it appears that modification to the PORV such that the PORV could be opened from the main control panel would be an inexpensive fix to better assure ability of feed and bleed in plants with installed PORVs.

I believe we should pursue the possibility of backfitting this modification on affected plants. In the interim I will see to it that the guidelines under review adequately instruct the operator on how to open PORVs that cannot be opened from the control panel.

*Each PORV has an effective flow area of 0.00754 ft^2 or 1.176 inches diameter (from CEN-114P). The equivalent single diameter of 2 PORV's is 1.66 inches.

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Plants Without PORVs

At our request, RES, via the SASA program, has completed initial calculations using the TRAC code on the ability to depressurize CE plants without PORVs in the event of loss of all feedwater (or rather, steam generator heat removal capability.) These analyses specifically looked at the capability of the head vent system and the auxiliary pressurizer spray.

The analyses showed that the head vent system (3/4 inch-line 3/16 inch orifice) was not capable of removing a sufficient quantity of steam and was therefore not capable of depressurizing the primary system.

The second analysis investigated the capability of the auxiliary pressurizer spray to depressurize the primary system. The results of these calculations showed that the auxiliary spray was initially successful in depressurizing the system to below the HPI shutoff head. However, once the steam generators dried out and the system saturated at the safety valve setpoint, the pressurizer went water-solid due to steam production and accumulation in the vessel. Once the pressurizer went water solid, the auxiliary spray was ineffective. EG&G stopped the calculation with the vessel level somewhere in the upper plenum above the hot legs. They extrapolated the inventory loss rate and concluded auxiliary spray bought perhaps an hour's additional time before core uncovery, compared to the no-spray case. The inventory extrapolation did not consider however, that once the vessel liquid level dropped below the hot leg elevation, steam generated in the core could now pass directly to the pressurizer and out the safety valve. The voiding of the hot legs would allow the pressurizer to drain (i.e., no CCFL in surge line), and fill with steam and the auxiliary spray would become effective again. EG&G agreed in principle with the scenario and will extend the calculation to beyond hot leg uncovery. If auxiliary spray proves beneficial, we will advise CE of our conclusions and see if they agree (i.e., include appropriate actions in guidelines).

Based on the analyses performed to date in support of our review of emergency operator guidelines, this aspect of the SASA program has been very useful to RSB. I feel significant insights on plant capabilities to accomodate events beyond the design bases can be obtained with the SASA program. Analysis schedules are still the limiting problem with the program although some improvements are being made.

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