

March 8, 1993

TO: Glenn Kelly, NRC

FROM: Jack Duncan, GE

JDD

Dear Glenn:

This note responds to your question regarding ABWR ECCS pumps taking suction from the suppression pool, which during Class II sequences could exceed the pump design basis temperature. After discussion, we plan to place the material which follows in the SSAR.

During Class II sequences (in which core cooling is successful but containment cooling is not) suppression pool temperature and (after some time) wetwell pressure will increase. The most likely operator response will be to manually vent the containment, in accordance with step PC/P, Primary Containment Pressure Control, of the Emergency Procedure Guidelines (SSAR Appendix 18A), before high containment pressure signals cause containment isolation. If the containment is successfully vented, suppression pool temperature will not exceed 212°F. Thus, RHR pump (design temperature of 358°F) and HPCF pump (design temperature of 212°F) operation should not be impacted, even if suction is taken from the suppression pool. If the reactor vessel is at a sufficiently high pressure that RCIC is available, RCIC operation with suction from the suppression pool could be impacted, since the RCIC pump design temperature is 170°F. However, the operator is instructed (step RC/L-2 of the EPGs) to take RCIC suction from the condensate storage tank if it is available. The HPCF pump NPSH Limit (Caution #5 of the EPGs) limits suction temperature to less than 100°C (212°F) at containment pressure below the automatic isolation setpoint value (nominally 2 psig). Furthermore, both HPCF and RCIC are normally aligned to take suction from the CST. Thus, if the containment is vented, of the 6 ECCS pumps available, only the single RCIC pump could possibly be damaged. This could occur if the CST is not available or because the operator fails to take suction from the CST. In the worst case, the RCIC pump could operate as much as 40°F above its design temperature.

In the less likely case that increasing containment temperature pressure caused containment isolation before the operator could vent the containment, there is a somewhat higher chance that pumps could be operated above their design temperature. RHR pump design temperature (358°F) cannot be exceeded since the containment over pressure protection rupture disk opens at 90 psig, limiting suppression pool temperature to less than 340°F. The HPCF and RCIC pump design temperatures could be exceeded, but only if the operator did not take suction from the CST. In this unlikely event, if pump damage were to occur, other pumps [fire protection pumps (the AC-independent water injection system), the fire truck pumper and condensate pumps] are available with cold suction sources. Thus, it is not likely that core cooling would be compromised by increasing suppression pool temperatures during Class II sequences.

As an additional note, the ABWR Emergency Procedure Guidelines provide operator guidance to avoid pump NPSH limits but not guidance to avoid suction temperatures above the pump design temperature. A caution will be added similar to Caution #5 to warn the operator that if taking suction from the suppression pool and suppression pool temperature exceeds pump design temperature, the pump may be damaged and become inoperable.

Further, a COL action item will be added to determine expected pump performance limits and determine preferential use between pumps if design temperatures must be exceeded during an emergency. If appropriate, plant procedures will be modified as a result of this action item.