March 3, 1995
LD-95-003

Docket No. 52-002

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: System 80+™ Reactor Coolant Pump Seal Coolers

References: (1) ABB-CE Letter LD-94-069, dated December 8, 1994
(2) ABB-CE Letter LD-92-067, dated May 14, 1992

Dear Sirs:

In response to a question from the staff during their review of the System 80+ Design Control Document, this letter provides additional information on the removal of the "Auxiliary" Throttle Seal Coolers (TSCs) from the reactor coolant pumps (Reference 1). The removal of these coolers will simplify the pump design and minimize the small break and inter-system LOCA potential. The removal of the TSCs results in an increase in the pump seal cooling water temperature, but the final temperatures are well within the maximum seal water temperature limits imposed for operation.

The System 80+ Reactor Coolant Pump (RCP) shaft seals are cooled by (1) seal injection water from the Chemical and Volume Control System, and (2) the Component Cooling Water System (CCWS) through a high pressure seal cooler. Pump operation may continue indefinitely provided either seal injection flow or the CCWS is available. The System 80+ Standard Plant design includes an additional support system, the Dedicated Seal Injection System, which is not included in the System 80 design. This system features a positive displacement pump to provide a diverse means of seal injection to the RCPs if normal means of seal cooling are lost.

In the event of loss of either seal injection to the seal assembly or loss of CCWS flow to the high pressure seal cooler, the seal cooling water temperature will increase. Performance tests and analyses have shown that a minimum margin of 22°F (12°C) exists between the seal cooling water outlet temperature and the seal cooling water temperature limit specified by the pump manufacturer.

Under normal operating conditions, i.e., with seal injection in operation, and CCWS in operation at a best-estimate cooling water temperature of 95°F, a margin of 41.4°F (23°C) exists between the

Combustion Engineering, Inc.
P.O. Box 500
1000 Prospect Hill Rd.
Windsor, CT 06095
Telephone (203) 688-1911
Fax (203) 285-5203

seal cooling water temperature and the maximum allowable operational limit. For transient conditions, the maximum pump seal cooling water temperatures (Reference 2) for loss of the CCWS remain valid and these values would not change as a result of removing the TSCs. For the "loss of seal injection" transients, the evaluation of the maximum seal cooling water temperature at the TSC outlet indicates that those temperatures would remain below the maximum operating seal temperature limit of 176°F (80°C) [specified by the pump manufacturer]. This evaluation considered: (1) the loss of seal injection flow and (2) the loss of CCWS flow.

An analysis was performed considering removal of the TSCs using the above transient cases and an energy balance. A best-estimate CCWS cooling water temperature of 95°F (CESSAR-DC, Section 9.2.2.5.2.D) was assumed. It was also assumed that there was no heat loss to the environment and that all heat from the RCP seal bearings goes into the seal cooling water flow stream. In the seal cooling water flow stream, one of the thermocouples in the test was located downstream from the high-pressure seal coolers, but upstream from the test-loop TSC inlet. Test results for this thermocouple would not be affected by either removal of the TSCs or by loss of CCWS flow to those TSCs. Since the test was done for a CCWS water temperature of 100°F, the seal cooling water test temperatures for this thermocouple (from the Reference 2 test) were decreased by 5°F to account for the assumed 95°F best-estimate CCWS temperature. The energy balance was conducted by adding energy input from the RCP seal bearing downstream of the TSC inlet thermo-couple and calculating the corresponding increase in seal cooling water temperature.

The results of this evaluation indicate that for the worst case transient (loss of seal injection flow) with the TSCs removed, the margin between the seal cooling water temperature and the maximum allowable operating limit is 22°F (12°C). These results verify that removal of the TSCs from the System 80+ RCP design does not challenge the performance or the integrity of the seal design for normal and transient operation.

If you have any questions, please call me or Mr. Stanley Ritterbusch at (203) 285-5206.

Very truly yours,

COMBUSTION ENGINEERING, INC.

S. E. Ritterbusch for

C. B. Brinkman
Director
Nuclear Systems Licensing

ser/lw
Enclosure: As Stated
cc: S. Magruder (NRC)
P. Lang (DOE)