BALTIMORE
GAS AND
ELECTRIC

CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

ELECTRIC ENGINEERING
DEPARTMENT

April 23, 1985

Director of Nuclear Reactor Regulation
Attention: Mr. J. R. Miller, Chief
Operating Reactors Branch #3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317
High Pressure Safety Injection Pump Performance
Unit 1 Cycle 8 Reload License Submittal

Reference: Letter from A. E. Lundvall, Jr. to J. R. Miller, dated 3/22/85

Gentlemen:

The Unit 1 Cycle 8 reload license amendment request included changes to Technical Specification 3.5.2, ECCS Subsystems. One of the changes would eliminate the upper flow limit for the HPSI pumps. The bases for this technical specification (B 3/4.5.2) state that the upper flow limit was established to prevent pump runout when the system was in a minimum resistance configuration. As part of our recent effort to widen the allowed range for the HPSI flow control valve setting the HPSI system flow characteristics were reanalyzed to determine the maximum pre-Recirculation Actuation Signal (RAS) flow. The result of this analysis indicated that it was acceptable to allow the HPSI flow control valves to move to the full open position upon receipt of a Safety Injection Actuation Signal. In a pre-RAS condition the available Net Positive Suction Head (NPSHA) is almost twice that required (NPSHR). Thus, the only remaining concerns associated with operating the system in this manner were the potential for pump runout or exceeding the pump motor horsepower requirements. To validate the results of our analysis, testing was performed at the start of the Unit 1 Cycle 8 refueling outage.

The plant conditions existing at the time of the tests with regard to pump runout and horsepower requirements bounded the conditions that would be present in a pre-RAS LOCA environment. The conditions were as follows:

(1) Refueling Water Tank (RWT) was no lower than 31.1 feet throughout the runout portions of the test (the maximum normal operating level would be 39 feet). The lower level was accepted because it was impractical to keep the tank filled to the maximum level. However, during a LOCA there is always some back pressure in the containment (approximately 8 psig minimum at the time of a RAS) which is roughly equivalent to this difference in RWT water level.

A001
1/0

(2) The Reactor Coolant System was at atmospheric conditions with the head removed;

(3) The reactor water level was at the flange for the runout portions of the test; and

(4) The normal pre-RAS HPSI LOCA flow path was established with the flow control valves wide open prior to pump start. The LPSI pumps were operating with a total flow of 3000 gpm. The mini-flow recirculation valves were open.

(Note: It was not possible to simulate LOCA environment in the ECCS pump room for the purposes of bearing temperature monitoring.)

During the test the following parameters were monitored from the Main Control Room, Tech Support Center, ECCS Pump Room and Switchgear Room, as appropriate:

(1) Flow
(2) Discharge and Suction Pressure
(3) Fluid Temperature
(4) RWT and RCS Level
(5) Bearing Temperatures - contact pyrometer
(6) Motor Current and Voltage
(7) Vibration
(8) Pump Speed - not available because of instrument malfunction

The results of the testing were as follows (both Nos. 11 and 13 HPSI pumps were tested):

(1) No runout or cavitation was observed. All suction and discharge pressure gauges, flow meters and amp meters remained steady;

(2) Pump Total Dynamic Head, horsepower, and efficiency were plotted on the original pump curves and displayed a smooth transition;

(3) Bearing temperatures were well below limits (the maximum pump bearing temperature was 88°F and the maximum motor bearing temperature was 125°F);

(4) Vibration results were within the acceptance standards of the Hydraulics Institute, 14th edition; and

(5) Motor horsepower was within nameplate specifications.

An additional test was run on both pumps to simulate a low pre-RAS NPSH condition. This was accomplished by running the pumps in a recirculation mode from shutdown cooling return. In this condition the pump fluid is warmer and there is a lower suction elevation than the RWT. The same pump data was collected and no indications of cavitation were observed.

Based on the excellent results obtained we do not plan to test the Unit 2 HPSI pumps. Should you have any questions feel free to contact me at (301) 234-5381.

Very truly yours,

R. F. Ash
Supervising Engineer
Nuclear Generation Engineering Section

WCH/RFA/vf

cc: D. A. Brune, Esq.
G. F. Trowbridge, Esq.
Mr. D. H. Jaffe, NRC
Mr. T. Foley, NRC
R. R. Mills, CE