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Docket No. 50-213
A01738

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) W. G. Counsil letter to D. M. Crutchfield, dated April 8, 1981.
(2) D. M. Crutchfield letter to W. G. Counsil, dated February 27, 1981.
(3) D. M. Crutchfield letter to W. G. Counsil, dated May 21, 1981.

Gentlemen:

Haddam Neck Plant
SEP Topic VI-7.B; ESF Switchover

In Reference (1), Connecticut Yankee Atomic Power Company (CYAPCO) responded to questions forwarded via Reference (2) concerning SEP Topic VI-7.B, ESF Switchover, for the Haddam Neck Plant. CYAPCO responded to Questions 1, 2, 3, 5, and 6 and requested additional time to respond to Question 4. The purpose of this submittal is to provide CYAPCO's response to Question 4 and to respond to the Staff's evaluation in Reference (3).

Question 4

If the injection pumps are not automatically tripped on low level, quantify the level at which the operator must secure these pumps and the time remaining beyond this level (assuming all pumps are running) at which loss of NPSH occurs.

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Response

The injection pumps at the Haddam Neck Plant are not automatically tripped on low level in the RWST. On a safety injection signal and assuming that offsite power is available, the following pumps draw injection water from the RWST;

(2) Charging pumps @ 300 gpm each
(2) LPSI pumps @ 3350 gpm each
(2) HPSI pumps @ 2800 gpm each

Emergency Operating Procedure EOP 3.1-4, which was forwarded to the Staff via Reference (1), requires the operator to secure the LPSI, HPSI, and charging pumps after 100,000 gallons have been pumped from the RWST. At this point, the minimum level in the RWST would be 125,000 gallons. Assuming the maximum flow rate of 12,900 gpm from the RWST, NPSH for the HPSI pumps is lost immediately following the injection of 100,000 gallons from the RWST. This occurs at approximately 7.75 minutes from the initiation of injection.

Based upon vortex formation in the RWST, NPSH for the LPSI and charging pumps is lost approximately 6.31 minutes following the 100,000 gallon injection. This time was calculated by conservatively assuming that the HPSI pumps continued to inject and that the flow rate remained constant at 12,900 gpm. Should the operator fail to switchover to recirculation mode after the injection of 100,000 gallons, an additional 81,400 gallons of water will be injected before NPSH for all injection pumps is lost. Failure of the operator to perform the switchover in the required time frame will not damage the RHR pumps since the RHR pumps are separate from the LPSI pumps and are not automatically initiated to inject.

These calculations were based upon the following assumptions:

1. Large-break LOCA which results in a rapid (instantaneous) depressurization of the reactor coolant system to 45 psig.
2. Offsite power is available, thus all pumps are operating.
3. The maximum HPSI, LPSI, and charging pump flows, based on system head losses were used.
4. Immediate starting of all pumps.
5. The RWST bulk fluid temperature is $60^{\circ}F$.
6. Initial volume of water in the RWST is the Technical Specification minimum of 225,000 gallons, accounting for the level instrument error of $\pm$ 2% of full scale.

Although it is possible that the HPSI pumps may cavitate after the injection of 100,000 gallons from the RWST, the LPSI and charging pumps will have adequate NPSH available for another 6.31 minutes. Additionally, the loss of NPSH for the HPSI pumps does not necessarily cause pump incapacitation; following the injection of 100,000 gallons, substantial suction head still exists. The assumption of a large-break LOCA is the worst case situation. A smaller break would require a much smaller flow rate which will in turn cause smaller suction piping losses, thus ensuring greater NPSH availability as well as smaller injection rates.

Based upon the above summary, CYAPCO has concluded that the existing RWST capacity and pump configurations are acceptable for the following reasons:

1. More realistic calculations regarding break size and safety injection pump flow rates reveal that substantially longer operator action times are available.

2. Loss of NPSH, especially for the HPSI pumps, is not indicative of pump inoperability.

3. The RHR pumps, which are used for long term cooling in the recirculation mode, are not automatically initiated during this hypothetical event.

4. Under the worst case assumption the pump flow rates are compatible with the current LOCA analysis.

5. Conservatively assuming that the HPSI, LPSI, and charging pumps are secured immediately after 100,000 gallons are injected and one RHR pump is started (assuming the second RHR pump has failed), the resulting flow rate is more than four times that required to compensate for boiloff.

Regarding the Reference (3) evaluation, CYAPCO has determined that the evaluation is substantially correct with the following correction. The RWST level indication (L-1806) is normally supplied from the control air system, a non-safety grade system, and is backed up by an emergency compressor which is powered from a Class 1E bus.

In response to the Staff's conclusions presented in Reference (3), CYAPCO intends to install a redundant Class 1E RWST level indication system during the next refueling outage, currently scheduled for October, 1981. It should be noted, however, that the redundant level indications will share a common instrument tap on the RWST. The instrument tap was described in Reference (1). CYAPCO's present understanding, however, is that the transmitters required for the new level indication system may not be available before startup from the refueling outage. CYAPCO intends to install the remainder of the system during the refueling outage and include provisions to allow installation of the transmitters during any operational mode. Installation would then occur within 60 days of receipt of the qualified transmitters. Continued operation until the new level indicating system is installed is acceptable because of the modifications to the containment sump level monitoring system required by Item 11.F.1 of NUREG-0737. The sump level instrumentation currently being installed will provide the operator with a backup indication to enable him to determine when he may start the RHR pumps without damage to initiate the recirculation phase of ECC.

CYAPCO also hereby amends the response to Question 5 given in Reference (1). As required by Technical Specification 3.6, the RHR heat exchanger bypass valve (RH-FCV-602) is locked in the closed position with the air supply isolated whenever the reactor is critical and coolant temperature is above 350°F. Therefore, minimum flow is always directed through the RHR heat exchangers. In this case, the line valves are:

- RH-V-788, 8 inch check valve on the RHR pump discharge
- RH-V-789, 8 inch manual gate valve in a locked open position
- RH-V-791, 8 inch manual gate valve, in a locked open position
- RH-V-794, 8 inch manual gate valve, in a locked open position
- RH-FCV-796 in a locked open position with the air supply isolated whenever the reactor is critical and coolant temperature is greater than 350°F. This valve is not identical to RH-FCV-602, as indicated in Reference (1), however, both are air operated.

This information does not substantively impact the response to Question 6 given in Reference (1).

This letter is being docketed one week later than the date specified in Reference (1), with the concurrence of the Staff. This delay facilitated combining responses to References (2) and (3), the latter of which was not received until May 26, 1981.

We trust you find the above information responsive to your requests, and that it will be appropriately incorporated into a revised evaluation for this SEP topic.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

W. G. Counsil
Senior Vice President