

October 30, 1996

EA No. 96-440

Mr. Ted C. Feigenbaum  
Executive Vice President - Nuclear  
c/o Mr. Terry L. Harpster  
P.O. Box 128  
Waterford, Connecticut 06385

SUBJECT: NRC AUGMENTED INSPECTION TEAM REVIEW OF THE UNDETECTED  
INTRODUCTION OF NITROGEN GAS INTO THE REACTOR VESSEL DURING  
PLANT SHUTDOWN REPORT NO. 50-213/96-80

Dear Mr. Feigenbaum:

On October 2, 1996, the NRC completed an Augmented Inspection Team (AIT) at the Connecticut Yankee Atomic Power Company. The enclosed report presents the results of that inspection.

The AIT was chartered to review the events surrounding the inadvertent decrease in reactor vessel water level during plant shutdown conditions. The team also reviewed other decay heat removal system challenges and equipment failures. The team developed a sequence of events, determined the safety significance of the events, and assessed the quality of response by the plant staff and management.

For approximately four days, control room operators were unaware that nitrogen gas was leaking into the reactor vessel and causing level to decrease. By September 1, 1996, reactor vessel level had decreased to approximately 3 feet below the reactor vessel flange. The decrease in reactor vessel level was potentially significant because a further decrease in level could have challenged the function of the operating decay heat removal system. While there were no actual public health and safety consequences of this event and adequate decay heat removal was maintained, the situation involving an unintended decrease in reactor water level in combination with the unavailability of decay heat removal equipment was safety significant.

The team identified several areas where operations performance was inadequate. Several operations procedures failed to provide adequate details or contained incorrect information. The absence of acceptable procedures was a contributing cause for both the nitrogen gas intrusion going undetected and for the inadvertent diversion of water from the reactor coolant system (RCS). Several of the events were exacerbated by plant operators failing to follow plant procedures, conducting activities without procedural guidance, or making inappropriate decisions. A lack of a questioning attitude resulted in the failure to promptly identify the nitrogen gas accumulation in the reactor vessel. The failure by more senior operators to convey expectations to less experienced field operators during pre-job briefings resulted in inappropriate equipment manipulation that either directly caused or contributed to these events.

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The team concluded that the timeliness of maintenance activities in restoration of the inoperable residual heat removal (RHR) pump to service and in support of maintenance of several isolation valves was inadequate. While the RHR pump repair activities were generally methodical and conservative, the unavailability of quality parts and vendor specifications, and repeated post maintenance test failures resulted in having only a single RHR pump available for more than 3 weeks. The team also noted that the poor material condition of several isolation valves was a contributing cause of these events. Leaking valves allowed nitrogen gas to inadvertently enter the reactor vessel and water from the RCS to be diverted to the containment sump.

The support of plant operations provided by engineering and technical support (E&TS) activities was not timely or effective. The condition of the temporary reactor head vent system was significantly degraded. Over the past several years, management failed to provide an effective response to previous plant staff concerns by not improving the vent header design. The failure to establish a functional reactor head vent allowed nitrogen gas to accumulate in the reactor vessel. The absence of a direct means of monitoring reactor vessel water level complicated the situation for the operators.

The failure by plant management and staff to fully appreciate the significance of these events as they occurred resulted in a poor event response and in a delay in initiating an integrated event recovery plan. The team determined that the actions taken during and following the event to establish actual reactor vessel level and to provide for continuing decay heat removal from the reactor coolant system (RCS) were not timely. Delays were also experienced in reestablishing control room reactor vessel level and temperature indications and in aligning a reactor coolant pump for service. The actions implemented to monitor the operating RHR pump, following the "B" RHR pump failure also were not comprehensive or timely. Further, an effective event review and recovery team was not established in a timely manner.

The AIT was not tasked with determining enforcement actions regarding the findings of this inspection. You will be notified in a future correspondence as to our decision on any possible enforcement actions.

You established an independent review team on September 3, 1996, and issued a final report after the AIT concluded on-site activities. The review of your overall corrective actions was beyond the scope of the AIT. The NRC will review your lessons learned and corrective actions and will document our results in a separate inspection report. Our initial review will focus on those actions that are associated with core offload and other refueling activities. The NRC also is reviewing the nitrogen intrusion event for potential generic communication.

Mr. Ted C. Feigenbaum

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Sincerely,

ORIGINAL SIGNED BY

Hubert J. Miller  
Regional Administrator  
Region I

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Enclosure: NRC Integrated Inspection Report No. 50-213/96-08

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