CONNECTICUT YANKEE ATOMIC POWER COMPANY
HADDAM NECK PLANT
RR#1 • BOX 127E • EAST HAMPTON, CT 06424-9341

September 19, 1990
Re: 10CFR50.73(a)(2)(i)(B)
10CFR50.73(a)(2)(v)(B) & (D)

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

Reference: Facility Operating License No. DPR-61
Docket No. 50-213
Reportable Occurrence LER 50-213/90-016-00

Gentlemen:

This letter forwards the Licensee Event Report 90-016-00, required to be submitted, pursuant to the requirements of Connecticut Yankee Technical Specifications.

Very truly yours,

John P. Stetz
Station Director

JPS/dl

Attachment: LER 50-213/90-016-00

cc: Mr. Thomas T. Martin
Regional Administrator, Region I
475 Allendale Road
King of Prussia, PA 19406

J. T. Shedlosky
Sr. Resident Inspector
Haddam Neck

IE22
1/1

NRC Form 366
(10-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)
Design Deficiency Identified In Auxiliary Feedwater Auto Actuation System

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 8	2 0	9 0	0 1 6	0 0	0 9	1 9	9 0		0 5 0 0 0
									0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 9	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
J. Calderone, Engineer	AREA CODE 2 0 3 2 6 7 - 2 5 5 6

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT

On August 20, 1990, at 1515 hours with the plant in Mode 1 at 9.5 percent power, an engineering evaluation revealed that the automatic actuation portion of the auxiliary feedwater (AFW) system did not meet the design basis requirements necessary to declare it operable. It was determined that the calculated flow rate achieved by automatic initiation of the AFW system alone is not sufficient to assure that the criteria of the design basis loss of feedwater analysis are met. Also, recent test results revealed that the AFW pumps could trip on an overspeed condition if a sudden loss of control air occurred. The cause is attributed to errors in the assumptions and calculations used for automatic initiation of the AFW system. Immediate corrective action was to remain below 10 percent power where the automatic initiation feature is not required. A change to the technical specifications was approved to allow continue operation for one cycle. Long term corrective actions include modifications to the AFW system. This event is reportable under 10CFR50.73(a)(2)(i)(B), and 10CFR50.73(a)(2)(v)(B) and (D).

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

BACKGROUND INFORMATION

There are two trains of auxiliary feedwater (AFW) (EIIS Code: BA) each consisting of one steam-driven auxiliary feed pump designed to deliver a minimum of 450 gpm at 600 psig at the design speed of 4430 rpm. AFW flow is controlled both by air operated steam admission valves (MS-PICV-1206A & B) to the Terry Turbines and by air operated feedwater bypass valves located in each of the four main feedwater lines. Each steam admission valve controls steam flow to maintain a constant preset steam pressure at the inlet to the Terry Turbine. Each steam admission valve receives control input from two controllers via a 3-way solenoid valve. The solenoid is normally energized allowing the signal from the manual controller. If the AFW system automatically actuates due to either two main feed pump circuit breakers opening or two out of four steam generator wide range levels less than 45 percent on train A or B (30 second time delay) or if vital power is lost, the 3-way solenoid valves will then reposition, aligning a preset signal to partially open the steam admission valves. This preset signal was selected to ensure that the Terry Turbines do not overspeed. In addition, all 4 AFW bypass valves will go fully open. The auto actuation feature has to be subsequently reset at the control board to allow operators to manually control AFW flow.

EVENT DESCRIPTION

On August 20, 1990, at 1515 hours with the plant in Mode 1 at 9.5 percent power, an engineering evaluation revealed that the automatic actuation portion of the AFW system did not meet the design basis requirements necessary to declare it operable based on the following two issues. First, it was determined that the calculated flow rate achieved by automatic initiation alone is not sufficient to assure that the criteria of the design basis loss of feedwater analysis are met. The automatic initiation system was designed to only partially open the steam admission valves. With the partial stroke of the valves, the turbine would not achieve design speed. The flow calculations had assumed that the pump operated at design speed. Thus, the calculated delivered flow rate would be reduced by approximately 15 gpm. With the lower pump speed that is developed by the automatic initiation system, the flow calculation does not demonstrate adequate flow to meet the loss-of-feedwater criteria without operator action to further open the steam admission valve. Increasing the steam admission valve automatic initiation set point was considered. However, the dynamic effects associated with the quick opening of the valve to a more open position than the current setting could possibly result in a turbine overspeed trip or a lifting of the steam relief valve protecting the turbine. If the turbine trips, local operator action would be necessary to restart the turbine. Thus,

it has been concluded that the current setpoint cannot be increased without reducing the reliability of the AFW system. Instead, operator action at the control board to manually increase steam flow must be credited.

Secondly, recent testing has shown that the Terry Turbines could overspeed if a sudden loss of control air occurred. On August 12, an automatic initiation AFW test was performed. When the automatic initiation signal was simulated, both Terry Turbines tripped on overspeed. The test was repeated with the same results. It was determined that the air controllers had been improperly set to allow the steam admission valves to open too far too quickly. Since the Terry Turbines oversped due to the rapid opening of the steam admission valves, it was concluded that the same overspeed condition could occur during a sudden loss of control air. In the event that a turbine overspeed occurs, local manual operator action is required to restart the turbine. The current loss of feedwater analysis shows that full AFW must be established within four mirutes. Considering the fact that operator action outside the control room is required, it is unlikely that AFW flow could be reestablished within four minutes. Thus, without credit for control air, the current design basis analysis would not be bounding.

CAUSE OF THE EVENT

The cause is attributed to errors in the assumptions and calculations used for automatic initiation of the AFW system.

SAFETY ASSESSMENT

This event is being reported under 10CFR50.73(a)(2)(i)(B), and 10CFR50.73(a)(2)(v)(B) and (D). While the original intent of the design basis analysis assumed that the loss-of-feedwater criteria can be met without operator action, it should be noted that operator action is implicit for controlling the AFW flow rate. Such actions have always been specified by the "symptom-based" Emergency Operating Procedures. The only significant difference in this instance would be the time required for operator action.

The current design basis analysis assumption is that the required auxiliary flow is achieved approximately 4 minutes after the initiation of the loss of feedwater. This includes approximately 1 minute to reach the automatic initiation low steam generator level set point, 1 1/2 minutes for valve stroke and pump speedup. These assumed delays are conservative.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Based upon a review of the Emergency Operating Procedures, CYAPCO has concluded that there is sufficient time for the operators to take action to increase flow from the value established by the automatic initiation system. The Emergency Operating Procedures require the operator to establish an AFW flow of 320 gpm. This is required in Step 2 of ES-0.1, Reactor Trip Response. Transfer to ES-0.1 occurs from Step 4 of E-0, Reactor Trip or Safety Injection. Because of the fact that increasing AFW flow is one of the first steps in the response to a loss of feedwater and that the importance of AFW is stressed in training, it is reasonable to assume that the operator would adjust AFW flow to the required amount within the analysis assumption of approximately 4 minutes.

CYAPCO has demonstrated the reasonableness of this assumption during operator requalification at the plant-specific simulator. During transient situations on the simulator, operators typically manually initiate AFW flow within 30 seconds, thus precluding automatic initiation (except in those cases where both main feed pumps trip and auto AFW initiation occurs within 30 seconds). The simulator training experience validates the assumption of allowing approximately 4 minutes for operators to manually adjust AFW flow to the level necessary to support the safety analysis assumptions. The dependence on operator action has only a small impact on the probabilistic risk assessment based on the high reliability of operator action to control AFW flow, as evidenced by numerous observations on the control room simulator, therefore the safety significance is considered small.

It was also concluded that the operability of automatic initiation of auxiliary feedwater is dependent upon control air. However, this dependence lasts only for the few seconds required to stroke the steam admission valves. While control air is a non-Category I system, it is a highly reliable system. Control air is required for normal operation, and as such is operable whenever the plant is at power. The system is equipped with accumulators so that even in the event of a failure of the compressors at the time when automatic initiation is required, air pressure would still be available during the short time period required for the valve stroke.

While the air lines have not been explicitly analyzed and as such it cannot be proven that they are able to withstand a seismic event, an engineering review supports the conclusion that the air lines would likely not fail in a seismic event. Based upon the above, the safety significance is considered small.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

CORRECTIVE ACTION

The immediate corrective action was to remain below 10 percent power where the automatic initiation feature of AFW is not required. A change to the plant's Technical Specification was approved to allow for continued operation for one cycle. Long term corrective actions include appropriate modifications to the AFW system to meet design basis requirements.

ADDITIONAL INFORMATION

None

PREVIOUS SIMILAR EVENTS

None