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WESTERN MASSACHUSETTS ELECTRIC COMPANY
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August 17, 1990

Docket No. 50-213
B13604

Re: AFWS

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

Gentlemen:

Haddam Neck Plant
Auxiliary Feedwater System

The Connecticut Yankee Atomic Power Company (CYAPCO) is currently in startup from the Cycle 15 refueling outage for the Haddam Neck Plant. In conjunction with the surveillance testing of the auxiliary feedwater system, CYAPCO has identified nonconservatisms in the calculation of auxiliary feedwater flow delivered during a loss of normal feedwater event. CYAPCO has determined that the calculated flowrate achieved by automatic initiation of auxiliary feedwater alone is not sufficient to assure that the criteria of the design basis loss of feedwater analysis are met. To compensate for these nonconservatisms, the design basis analysis must credit operator actions to increase auxiliary feedwater flow to the required flowrate. These operator actions are currently included in the Emergency Operating Procedures and thus procedure changes are not necessary. No changes are needed in hardware, setpoints, or procedures to correct this problem. Only a change in the assumptions of the design basis analysis is required. Based on the discussion provided in this letter, CYAPCO has concluded that there is adequate justification for this change in the analysis assumptions. Because this is a change in CYAPCO's position that no operator action was required during automatic initiation of auxiliary feedwater as provided in previous submittals to the NRC Staff, CYAPCO is hereby informing the NRC Staff in writing of this change.

Background

Both trains of auxiliary feedwater flow are provided by steam turbine driven auxiliary feedwater pumps. Auxiliary feedwater flow is controlled both by the steam admission valves to the turbines and by the feedwater bypass control valves on the pump discharge. Prior to the installation of the automatic initiation system, credit was taken for operator action to start auxiliary feedwater flow and to increase the steam flow and auxiliary feedwater flow to the required conditions. In response to the Three Mile Island accident and the NRR Bulletins and Orders Task Force (Reference 1), an automatic initiation system for auxiliary feedwater flow was installed. In addition, it should be noted that in the Staff's Safety Evaluation Report of the auxiliary feedwater

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system automatic initiation (Reference 2), that although no credit was given to manual actions, the Staff recognized that manual control of the auxiliary feedwater system could be taken if failure of the automatic initiation circuitry occurred.

During the installation of the automatic initiation system, it was discovered that the steam admission valves could not be allowed to open fully since this may result in a turbine overspeed trip or lifting of a relief valve. As a result, 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. Thus, the calculated delivered flow rate would be reduced by approximately 15 gpm (Reference 3). Taking this into account and also some additional refinements in the flow calculation, a delivered flowrate of 297.8 gpm was established (Reference 4).

The design basis loss of feedwater analysis, submitted to the NRC Staff in Reference (5) and subsequently approved by the NRC in Reference (6) assumed 268 gpm. This value was selected to provide operational margin to the calculated delivered flowrate of 297.8 gpm (Reference 4).

Recent calculations have included several more conservative factors that have resulted in a reduction in calculated delivered flow.

These factors included:

1. the "pump degradation" curve was used rather than the "as-built" pump performance curve.

2. pressure losses assumed for several valves in the flow path were higher than previously assumed.

When these factors are taken into account, the revised calculations show that the auxiliary feedwater system will still provide an adequate flow rate when running at its design speed. However, the partial stroke of the steam admission valve following automatic initiation will not cause the auxiliary feed pump to automatically achieve its design speed. With the lower pump speed that is developed by the automatic initiation system, the conservative 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 setpoint 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 relief valve for 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 auxiliary feedwater system. Instead, operator action at the control board to manually increase steam flow must be credited.

Justification for Operator Action

While the original intent of the design basis analysis was to show that the loss of feedwater criteria can be met without operator action, it should be remembered that some operator action is always implicit for controlling auxiliary feedwater flow rate to prevent RCS heatup or control cooldown. 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 235 seconds after the initiation of the loss of feedwater. This includes approximately one minute to reach the automatic initiation low steam generator level setpoint, one and a half minutes for the time delay for automatic initiation and one and a half minutes for valve stroke and pump speedup. These assumed delays are very conservative.

Based upon a review of the Emergency Operating Procedures, CYAPCO has concluded that this 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 auxiliary feedwater flow of 320 gpm. This is required in Step 2 of ES-0.1, Reactor Trip Response. Transfer to ES-0.1 will occur from Step 4 of E-0, Reactor Trip or Safety Injection. Because of the fact that increasing auxiliary feedwater flow is one of the first steps in the response to a loss of feedwater and that the importance of auxiliary feedwater is stressed in training, it is reasonable to assume that the operator will adjust auxiliary feedwater flow to the required amount within the analysis assumption of 235 seconds.

CYAPCO has demonstrated the reasonableness of this assumption during operator requalification at the plant-specific simulator. During transient situations on the simulator, operators typically initiate auxiliary feedwater flow within 30 seconds, prior to initiation of automatic auxiliary feedwater, except for loss-of-feedwater events when automatic initiation of auxiliary feedwater will occur in less than 30 seconds. The heightened sensitivity of the operators combined with the experience on the simulator validates the conservatism of assuming approximately 4 minutes for operators to manually adjust auxiliary feedwater flow to the level necessary to support the safety analysis assumptions.

Conclusion

Based upon the above discussion, CYAPCO has concluded that taking credit in the design basis loss of feedwater analysis for operator actions that are currently specified in the Emergency Operating Procedures is the preferred approach for resolving the concern of the assumptions used in the auxiliary feedwater flow rate calculations. Changing the automatic initiation valve position setpoint is not desirable as it would result in a reduction in the reliability of the auxiliary feedwater system. CYAPCO is hereby informing the

NRC Staff of this change in the design basis analysis assumptions. No specific Staff action is being requested.

We trust you will find this information satisfactory and we remain available to answer any questions you may have.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

FOR: E. J. Mroczka
Senior Vice President

BY: C. Sears
C. F. Sears
Vice President

cc: T. T. Martin, Region 1 Administrator
A. B. Wang, NRC Project Manager, Haddam Neck Plant
J. T. Shedlosky, Senior Resident Inspector, Haddam Neck Plant

References:

(1) D. G. Eisenhut letter to D. C. Switzer, "NRC Requirements for Auxiliary Feedwater Systems at Haddam Neck Nuclear Power Plant," October 11, 1979.

(2) D. M. Crutchfield letter to W. G. Counsil, "Auxiliary Feedwater System Automatic Initiation and Flow Indication (TMI Action Plan Item II.E.1.2)--Haddam Neck," October 5, 1982.

(3) J. F. Opeka letter to Office of Nuclear Reactor Regulation, "Haddam Neck Plant Response to Request for Additional Information Concerning the Auxiliary Feedwater System," June 30, 1986.

(4) J. F. Opeka letter to Office of Nuclear Reactor Regulation, "Haddam Neck Plant Auxiliary Feedwater Flowrates," October 14, 1986.

(5) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Haddam Neck Plant Revised Non-LOCA Design Basis Accident Analysis, Loss of Normal Feedwater Flow," March 10, 1987.

(6) A. B. Wang letter to E. J. Mroczka, "Safety Evaluation of Northeast Utilities' Topical Report 151, 'Haddam Neck Non-LOCA Transient Analysis' (TAC No. 61990)," October 18, 1988.