SAFETY EVALUATION REPORT OF THE ELECTRICAL, INSTRUMENTATION AND CONTROL ASPECTS OF THE YANKEE ROWE LOW TEMPERATURE OVERPRESSURE PROTECTION SYSTEM

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1.0 INTRODUCTION

By letter to the Yankee Atomic Electric Company (YAEC) dated August 11, 1976, the U.S. Nuclear Regulatory Commission (NRC) requested an evaluation of system designs to determine susceptibility to overpressurization events and an analysis of these possible events, and proposed interim and permanent modifications to the systems and procedures to reduce the likelihood and consequences of such events. By letter dated September 3, 1976 and subsequent letters (refer to the Appendix), YAEC submitted the additional information requested by the NRC staff, including the administrative operating procedures and the proposed low temperature overpressure mitigating system. The system hardware includes sensors, actuating mechanisms, alarms and valves to prevent a reactor coolant system (RCS) transient from exceeding the pressure and temperature limits of the Technical Specifications for Yankee Rowe as required by the Code of Federal Regulations, Title 10, Part 50 (10 CFR 50), Appendix G.

2.0 EVALUATION

The enclosed Technical Evaluation Report was prepared for us by the Lawrence Livermore Laboratory as part of our technical assistance program.

3.0 SYSTEM DESCRIPTION

The Yankee Rowe low temperature overpressure protection system (LTOPS) is composed of the pressurizer solenoid operated relief valve (SORV) with a manually enabled low pressure setpoint, two ASME code safety valves on the Shutdown Cooling System and the pressurizer steam bubble.

The SCS safety valves (SVs) are connected to the RCS when the SCS is operating. By procedure, the SCS is brought "on-line" at about 300°F during an RCS cooldown, and removed from service at the same temperature on a startup. Therefore, whenever the RCS is below 300°F, the two SCS SVs are available for RCS overpressure protection.

The SORV setpoint is manually switched to its low pressure setpoint whenever RCS temperature is below 324°F. A key lock switch located in the control room is used to lower the solenoid actuation point from its normal high setpoint (2500 psig) to the low pressure setpoint (500 psig).

The Yankee Rowe pressurizer is required to have a steam bubble of at least 198 ft^3 whenever RCS temperature is above 180°F. Below 180°F the pressurizer is maintained in a water-solid condition.

An enabling alarm is provided which senses RCS pressure. Whenever RCS pressure is below 425 psig, the alarm annunciates to warn the operator to enable the LTOPS. The SORV MOV is alarmed so that if the LTOPS is enabled and the SORV MOV comes off its open seat (i.e., starts to close), the operator is alerted. Also, a high pressure alarm at 400 psig alerts the operator to a pressure transient in progress. The LTOPS equipment as a function of RCS temperature is shown below:

Temperature	LTOPS Components
$300^{o}F \leq T \leq 324^{o}F$	SORV + Pressurizer Bubble
$180^{o}F \leq T \leq 300^{o}F$	SORV + 2 SCS SVs + Pressurizer Bubble
$T \leq 180^{o}F$	SORV + 2 SCS SVs

We find the above design features acceptable.

4.0 CONCLUSIONS

Based on our review of the enclosed consultant's Technical Evaluation Report, we agree with their findings that the administrative controls and hardware changes proposed by the licensee provide adequate protection for Yankee Rowe from overpressure transients at low RCS temperatures by reducing the probability of initiation of a transient and by limiting the pressure of such a transient to below the limits set by Appendix G of the Technical Specification. We, therefore, conclude that the EI&C aspects of the overpressure protection system meet our criteria, and as such, are acceptable as a long term solution to the problem of overpressure transients.