TECHNICAL EVALUATION OF THE

ELECTRICAL, INSTRUMENTATION, AND CONTROL DESIGN ASPECTS

OF THE LOW TEMPERATURE OVERPRESSURE PROTECTION SYSTEM

FOR THE YANKEE ROWE NUCLEAR POWER PLANT

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ABSTRACT

This report documents the technical evaluation of the electrical, instrumentation, and control design aspects for the low temperature overpressure protection system of the Yankee Rowe nuclear power plant. Design basis criteria used to evaluate the acceptability of the system included operator action, system testability, single failure criterion, and seismic Category I and IEEE Std-279-1971 criteria. This report is supplied as part of the Selected Electrical, Instrumentation, and Control Systems Issues Support Program being conducted for the U. S. Nuclear Regulatory Commission by Lawrence Livermore Laboratory.

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1. 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 susceptiblity 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.

The purpose of this report is to evaluate the electrical, instrumentation, and control (EI&C) aspects of the Licensee's equipment and procedures based on the information provided (refer to the Appendix), and to define how well they meet the criteria established by NRC as necessary to prevent unacceptable overpressurization events.

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2. EVALUATION OF YANKEE ROWE

2.1 INTRODUCTION

Review of the Yankee Rowe low temperature overpressure protection system (LTOPS) design by YAEC was begun in 1976 at NRC's request. The proposed overall approach to eliminating overpressure events incorporates administrative procedural, and hardware controls, with reliance upon the plant operator for the principal line of defense. Preventive administrative/procedural measures include:

(1) Procedural precautions.

(2) Deenergization (power removed) of essential components which are not required to be operable during the cold shutdown mode of operation.

(3) Maintenance of a non-water-solid reactor coolant system condition whenever possible.

(4) Incorporation of a low pressure relief setpoint for the existing solenoid-operated relief valve (SORV) control logic and the use of the shutdown cooling system (SCS).

The design basis criteria that were applied in evaluating the acceptability of the electrical, instrumentation, and control aspects of the LTOPS are as follows:

(1) Operator Action. No credit for operator action is taken until ten minutes after the operator is aware, through an action alarm, that an overpressure transient is in progress.

(2) Single Failure Criterion. The LTOPS shall be designed to protect the reactor vessel given a single failure which is in addition to the failure that initiated the pressure transient.

(3) System Testability. The LTOPS must be testable on a periodic basis prior to dependence on the LTOPS to perform its function.

(4) Seismic Catetory I and IEEE Std-279-1971 Criteria. The LTOPS should satisfy both the seismic Category I and IEEE Std-279-1971 criteria. The basic objective is that the LTOPS should not be vulnerable to a failure mode that would both initiate a pressure transient and disable the low temperature overpressure mitigating system. Events such as loss of instrument air and loss of offsite power must be considered.

2.2 YAEC LOW TEMPERATURE OVERPRESSURE PROTECTION SYSTEM DESIGN

The YAEC LTOPS design information detailed in this section was derived from the references in the Appendix. The YAEC design for the Yankee Rowe LTOPS is based on the use of a pressurizer SORV in conjunction with two passive spring-loaded safety valves (SV's) which are part of the SCS. These valves, in conjunction with specific procedural controls, form the basis for the following conditions:

(1) The existing pressurizer SORV provides relief capability in excess of a single SCS SV. The pressurizer-SORV low pressure setpoint is 500 psig. However, a new pressurizer SORV of increased capacity is to be installed to replace the existing valve.

(2) The two SCS SV's taken together provide slightly less than double the relief capacity of the existing SORV. The SCS-SV pressure setpoint is 425 psig.

(3) A key-operated interlock switch will be installed. The contacts of this interlock will be connected to the pressurizer SORV and the main coolant overpressurization alarm circuitry.

A new pressure channel will also be installed that will sense the main coolant pressure. The sensing line is the same as that used by the main coolant pressure channel of the reactor protection system (RPS). The new channel will consist of a power supply, pressure transmitter, dual setpoint trip device, auxiliary relay, and a strip chart recorder. One setpoint of the trip device will be connected to a panalarm, will actuate at 450 psig decreasing main coolant system pressure, and will be used to signal the operator to activate the key-operated interlock switch. The other setpoint of the trip device will be adjusted to operate the pressurizer SORV, through the auxiliary relay, at 500 psig increasing.

- An existing bistable located in the main control board will be set to actuate at 400 psig increasing. It will be wired via the permissive keylock switch to a main control board annunciator window to provide an alarm output to notify operators of an impending low temperature overpressure condition.

(4) Below 300°F, the SCS SV's are available in conjunction with the pressurizer SORV as pressure transient limiting devices. The SCS SV's have sufficient capacity to be considered as 100-percent backup for both the present and planned pressurizer relief valves.

2.3 EVALUATION OF YANKEE ROWE USING DESIGN BASIS CRITERIA

Yankee Rowe was evaluated under the guidance of the four design basis criteria stated in Section 2.1 of this evaluation, and with specific attention given to various pertinent NRC staff positions resulting from these criteria. Sections 2.3.1 through 2.3.4 are concerned with the four design criteria.

2.3.1 Operator Action

YAEC states that shortly after NRC's letter of August 11, 1976 expressed concern about reactor vessel overpressurization, the superintendent of the Yankee Rowe nuclear power plant established the temporary requirement for a special, dedicated operator to be stationed at the main control board during water-solid conditions. At that time, as now, the pressurizer relief valve was not equipped with a low pressure setpoint feature. The primary purpose of a special, dedicated operator was to make available immediately the relief capability of the pressurizer relief valve in the event of an overpressure transient. Instead of waiting for the implementation of an undefined, automatic design feature, this action provided immediate, protection during subsequent plant conditions requiring such protection. This action was taken despite the fact that the plant operating procedures were already conservative and cautious regarding water-solid conditions and in light of the fact that no overpressurization events are known to have occurred at the Yankee-Rowe plant in its operating history.

YAEC further states that this temporary requirement for a dedicated operator was established before all analyses were completed of the various postulated pressure transients. Whether or not operator action within the ten minute period was required to either protect the plant or meet the to-be-suggested single failure criterion was not known at that time. By having the operator available, the plant had the protection available until such time as it was shown to be unnecessary. Since then, review and analyses of various pressure transient events have been conducted and reported in YAEC's original submittal and in the answers to these questions. Reliance on operator action within ten minutes has been shown to be unnecessary except to operate the pressurizer relief valve manually until the automatic, low pressure setpoint feature is installed.

We conclude that Yankee Rowe will satisfy the NRC staff design basis criterion for operator action when all of the plant LTOPS modifications have been completed.

2.3.2 Single Failure Criterion

The NRC staff position requires that the LTOPS shall be designed to protect the reactor vessel given a single failure which is in addition to the failure that initiated the pressure transient. The NRC staff position also requires that the power supplies and power sources for the pressurizer SORV be completely separate and distinct from those of the SCS SV's, and that they should be vital sources.

The YAEC Yankee Rowe LTOPS is designed to protect the reactor vessel given a single failure in addition to the failure that initiated the overpressure transient. The single failure criterion has been applied to both the initiating events and the means of mitigating the effects of these overpressurization events. It was assumed that either a single equipment malfunction or a single erroneous operator control manipulation can initiate each of the overpressurization events considered.

YAEC states that the SCS SV's are available below 300°F. Therefore, these valves and the pressurizer relief valve are available as pressure transient limiting devices. The SCS SV's have sufficient capacity to be considered as 100-percent backup for both the present and planned pressurizer relief valves. Therefore, according to YAEC, the suggested single failure criterion is met at temperatures below 300° without operator action.

YAEC further states that, above 300°F, the SCS SV's are isolated from the main coolant system and, therefore, are unavailable to limit a pressure transient. However, the main coolant system is not solid at these temperatures and a pressurizer steam volume of ≥ 198 cubic feet is available. For all postulated events that could lead to overpressurization at these temperatures, the pressurizer steam volume limits pressure buildup over the first ten minutes to a value less than the 10 CFR 50, Appendix G limits. In this temperature range, operator action beyond ten minutes is an effective backup to the pressurizer relief valve low setpoint in limiting main coolant pressure. Therefore, the suggested single failure criterion can be met for all conditions requiring reactor vessel overpressure protection.

Means have been employed to provide the margin of protection afforded by the single failure criterion both in preventing an event initiation and in limiting the effects of an event once it is initiated. The use of a pressurizer SORV in conjunction with the SCS SV's is an acceptable concept.

We conclude that the YAEC Yankee Rowe LTOPS does satisfy all of the NRC staff single failure criterion.

2.3.3 System Testability

The NRC staff position requires that the LTOPS control circuitry from the pressure sensor to the valve solenoid should be tested prior to each heatup or cooldown. The SCS SV's and pressurizer SORV should be tested during each refueling. Deviations from this criterion should be justified.

There are two aspects associated with the testability of the YAEC Yankee Rowe LTOPS. The first aspect is concerned with the pressurizer-SORV testing program for low pressure protection system operability. Testing of the low setpoint feature of the pressurizer relief valve is to be done every refueling outage during cold shutdown conditions. Specific testing is as follows:

(1) Instrumentation Calibration Test: This test verifies the operability (within the setpoint deviation limit) of the analog system including transmitter, bistable devices, pressure recorder, and alarms.

(2) Functional Test: This test verifies the proper functioning of the pressurizer SORV circuitry and solenoid by injecting an actual trip signal into the circuitry during the instrumentation calibration test.

For the Yankee Rowe nuclear plant, the pressurizer SORV can be isolated from the pressurizer by means of an upstream isolation valve. Once isolated, the solenoid-operated pilot actuator can be tested for operability prior to plant cooldown. Normal operating procedures should be modified to require this test prior to plant cooldown for each refueling shutdown.

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Since the Yankee Rowe nuclear power plant uses a pressurizer SORV driven by a pressure transmitter plus the safety valves installed in the SCS, the NRC staff position for testing also applies to the SCS SV's and control circuitry that are used in the LTOPS.

The second aspect of the testing program involves the plant tests during cold shutdown which could result in an RCS overpressurization above the minimum operating limit curves. According to YAEC , the main coolant pumps are tested on a one-pump-per-week basis during cold shutdown. YAEC also states that the pumps are not tested during water-solid conditions.

We conclude that the YAEC Yankee Rowe LTOPS satisfies the NRC staff testability criteria if the valves and control circuitry in the SCS, which are used for overpressurization mitigation, are tested in accordance with the NRC staff position stated at the beginning of this section, and the pressurizer isolation valve is also tested on a periodic basis.

2.3.4 Seismic Design and IEEE Std-279-1971 Criteria

2.3.4.1 Seismic Design Criteria. YAEC states that the Yankee Rowe nuclear power plant was not designed to specific seismic criteria. Thus, the purchase specifications for the SCS SV's or the pressurizer SORV did not address seismic requirements. However, the design of these valves is identical to valves that are seismically qualified. The seismic requirements in the design changes will be in accordance with current YAEC specifications for additions or modifications to plant equipment.

Based on statements provided by YAEC, we conclude that the proposed Yankee Rowe LTOPS conforms to the intent of the NRC staff seismic design criteria.

2.3.4.2 IEEE Std-279-1971 Criteria. The design of the Yankee Rowe pressurizer relief valve system does meet the intent of the IEEE Std-279-1979 criteria. The mechanical equipment will be purchased for Safety Class I application. The quality assurance requirements which would be imposed on the purchase of electrical equipment and instrumentation designed to the requirements of the IEEE Std-279-1971 criteria will be imposed on the purchse of electrical equipment and instrumentation which will be used in the pressurizer relier valve control system.

The pressurizer SORV depends only on electrical power to operate; it is not an air-operated valve. The solenoid actuates a pilot which allows fluid pressure to open the valve. Thus, a loss of station or instrument air pressure will have no effect on the operability of this valve. The SCS SV's, on the other hand, are spring-loaded, and the SCS-SV isolation valves are motor-operated. In the event of an electrical failure, the SCS-SV isolation valves will "fail open," and the SCS SV's will still function.

conclude that the Yankee Rowe LTOPS would not be susceptible to a common-mode failure involving loss of offsite electrical power and air supply. We conclude that the system will satisfy the NRC staff position with respect to the IEEE Std-279-1971 criteria for low temperature overpressure protection.

2.4 ALARM SYSTEMS DESIGNS AND OPERATION

Specific details concerning acceptable alarm systems design and operation for the LTOPS are described below.

2.4.1 High-Pressure Alarm

The NRC staff position requires that a high-pressure audio/visual alarm shall be used during low RCS temperature operations as an effective means to provide unambiguous information to the operator that a pressure transient is in progress.

A description of the YAEC high-pressure alarm system design is as follows:

(1) YAEC proposes to add an alarm that informs the operator of an impending overpressure transient. The setpoint for this alarm will be 400 psig increasing. An associated relay will operate a window on panalarm N-C on the main control board. This alarm will be enabled by a key-operated switch that also sets the pressurizer SORV to the low pressure setpoint.

(2) Another high-pressure indication is associated with the actuation of the pressurizer SORV. At 500 psig increasing, the pressurizer SORV receives an actuation signal to open. An indicating light on the main control board alerts the operator as to whether or not the SORV valve solenoid is energized.

We conclude that this design is adequate to annunciate overpressure transient conditions and does satisfy the NRC staff position.

2.4.2 Pressurizer-SORV Isolation Valve

The NRC staff position requires that

(1) The upstream isolation valve to the pressurizer SORV shall be wired into the overpressure protection alarm in such a way that the alarm will not clear unless the system is enabled and the isolation valve is open. Means shall be provided to ensure proper alighment of the isolation valve during LTOPS operation.

(2) The alarms shall be of the audio/visual type and provide unambiguous information to the operator.

A description of the YAEC isolation valve alarm system designs is as follows:

(1) Plant operating procedures have been modified to instruct the operator to open the motor-operated isolation valve for the pressurizer SORV during required plant conditions.

(2) An auxiliary relay has been added to the pressurizer-SORV isolation valve "closed" circuitry. This will be used to notify the operator via the main control board annunciator to open the pressurizer-SORV isolation valve whenever the LTOPS key is placed in the "LTOP" position. The position of this relay in the circuit is such that the alarm window will not clear until the pressurizer-SORV isolation valve is placed in the "full open" position. This modification serves to notify the operator to open the pressurizer-SORV isolation valve and also confirms the opening of the pressurizer-SORV isolation valve at the main control board.

(3) The SCS-SV isolation valves can only be operated by inserting a key into the respective control switch. Once the key is removed, the control switch cannot be operated and, hence, the valve cannot be electrically operated. The keys are kept under the administrative control of the duty shift supervisor. There are no alarms associated with the SCS-SV isolation valves.

We conclude that the design for the pressurizer-SORV isolation valve alarm satisfies the NRC staff position,

2.4.3 Enable Alarm

The NRC staff position requires that

(1) An alarm shall be activated as part of the plant cooldown process to ensure that the pressurizer SORV shall be operable in accordance with the plant Technical Specifications.

(2) The alarm shall be of an audio/visual type and provide unambiguous information to the operator.

A description of the YAEC enable alarm system design is as follows:

(1) A key-operated interlock switch will be installed. The contacts of this interlock will be connected to the pressurizer SORV and the main coolant over-pressurization alarm circuitry.

(2) A new pressure channel will be installed which will sense the main coolant pressure. The sensing line is the same as that used by the main coolant pressure channel of the RPS. The new channel will consist of a power supply, 0-3000 psig pressure transmitter, dual setpoint trip device, auxiliary relay, and strip chart recorder. One setpoint of the trip device will be connected to a window on panalarm N-C. This alarm will actuate at a main coolant system pressure of 450 psig decreasing and will be used to signal the operator to activate the key-operated interlock switch.

We conclude that the design for the enable alarm does satisfy the NRC staff position.

2.4.4 Pressurizer-SORV Open and SCS-SV Open Alarms

The NRC Staff position requires that

(1) An alarm be activated to alert the operator that a pressurizer SORV is in the "open" position.

(2) All alarms shall be of the audio/visual type and provide unambiguous information to the operator.

A description of the YAEC pressurizer-SORV open alarm system design is as follows:

(1) An indicator is associated with the actuation of the pressurizer SORV. At 500 psig increasing, the pressurizer SORV receives an actuation signal to open.

(2) The same signal actuates an annunciator on the main control board alerting the operator that the pressurizer SORV has been activated. This annunciator could also be used to alert the operator that a pressure transient is in progress.

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We conclude that this design satisfies the NRC staff position for the pressurizer-SORV open alarm.

2.5 PRESSURE TRANSIENT REPORTING AND RECORDING REQUIREMENTS

The NRC staff position is that a pressure transient which causes the LTOPS to function, thereby indicating the occurrence of a serious pressure transient, is a 30-day reportable event. In addition, pressure-recording and temperature-recording instrumentation are required to provide a permanent record of the pressure transient. The response time of the pressure/temperature recorders shall be compatible with pressure transients that increase at a rate of approximately 100 psig per seconds.

YAEC states that its pressure transient reporting and recording system design is as follows:

> A new full range pressure recorder is to be installed on the main control board to continuously monitor reactor vessel pressure. The pressure transmitter providing the signal to this recorder will be the same one that provides the input to the pressurizer relief valve low pressure setpoint. The recorder will be capable of indicating pressure up to 3000 psig, but pressures in the range of 400 to 600 psig will also be accurately measured.

We conclude that the YAEC design for the pressure transient and recording system does NOT satisfy the NRC staff position in its entirety. We recommend that an RCS temperature-recording capability be included to supplement the proposed RCS pressure recording. We also recommend that information be provided to verify that the response time of the pressure recorders is approximately 100 psig/sec. This item was discussed with the licensee on August 9, 1979 and the licensee agreed to conform to the above staff position.

2.6 DISABLING OF ESSENTIAL COMPONENTS NOT REQUIRED DURING COLD SHUTDOWN

The NRC staff position requires the deenergizing of safety injection system (SIS) pumps and the closure of safety injection (SI) header/discharge valves during cold shutdown operations.

The portion of the Yankee Rowe SIS pertinent to RCS overpressure protection is composed of three low-pressure safety-injecti n pumps (LPSIP's), three high-pressure safety-injection pumps (HPSIP's), and the pipes and valves connecting the pumps to the RCS. This portion of the SIS is designed so that the three LPSIP's receive suction from the SI tank, and discharge to either the HPSIP suction header or directly to the RCS via the low pressure (LP) injection header. The HPSIP's can take a suction from either the SI tank or the LPSIP discharge (common header). The HPSIP's deliver water into the RCS via the high pressure (HP) injection header. The LP and HP injection headers are separate lines, each branching off into four lines. Each RCS cold leg receives LP and HP injection water from one of these branch lines.

The branch lines are joined with an arrangement of check valves and motor-operated valves (MOV's), and each of the four HP header branch lines has a flow-balancing throttle valve (newly installed). The following SIS valves are locked in the "open" position and deenergized during normal plant operation:

(1) Four "loop injection MOV's" (in the line directing the combined HP and LP flow to the RCS cold leg piping).

(2) Four "LP injection MOV's" (in the line directing LP injection flow to the individual injection lines).

(3) One "HP header MOV" and three "LP header MOV's" (in the main HP and LP headers).

During an RCS cooldown, the two safety injection actuation systems (SIAS's) are manually blocked at 1800 psig. This effectively disables all automatic initiation of the SIS components.* Also, each of the LPSIP and HPSIP control switches is placed in the "trip pull-out" ("TPO") position.** When RCS pressure is about 1000 psig, the power supply breakers to two HPSIP's and two LPSIP's are racked out or removed. Also, the four loop injection MOV's are shut and reenergized.

When the RCS temperature and pressure have been lowered to about 300°F and 300 psig, the SCS is placed in service. The third train of SIS pumps is deenergized (i.e., breakers racked out or removed) and the four LP injection MOV's are shut and reenergized. When the RCS temperature is below about 200°F, the three LP and one HP header MOV's are shut and reenergized.

The SIS is generally placed back in service in the reverse order during an RCS startup. However, there are various surveillance tests performed on the SIS which may require adjustment of the sequence.

YAEC has proposed removing the SIAS from SIS-MOV-535, which results in a significant reduction in the likelihood of a LPSIP mass addition event. YAEC has also shown that the removal of the SIAS from SIS-MOV-535 causes no appreciable degradation of the emergency core cooling system (ECCS) in its performance of loss-of-coolant accident (LOCA) mitigation.( )

Based upon the factors summarized above and the inclusion of certain procedures and administrative controls in the Technical Specifications (refer to Section 3), we conclude that Yankee Rowe satisfies the NRC staff position on the disabling of essential components not required during cold shutdown.

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*Unlike more recent plants, containment high pressure and steam/feedline break signals do not bypass the "block" feature. Only manual initiation of the SIAS is still operative when the SIAS are blocked.

**This action prevents the pumps from starting even if there was an inadvertent SIAS.

3. TECHNICAL SPECIFICATIONS

The Technical Specifications information detailed in this section was derived from the RSB/DOR SER entitled, "Review of Yankee Rowe Low Temperature Overpressure Protection System," dated January 18, 1979.

To ensure operation of the LTOPS, YAEC has submitted for NRC review its proposed Technical Specifications to be incorporated into the license for Yankee Rowe. These specifications are summarized below:

(1) The pressurizer SORV shall be operable in the low pressure setpoint mode whenever the RCS temperature and pressure are below 324°F and 450 psig. The SCS SV's shall be available for RCS overpressure protection whenever the RCS temperature and pressure are below 300°F and 300 psig. The pressurizer surge volume must be greater than 198 ft^3 whenever the RCS temperature is between 300°F and 324°F.

(2) The LTOPS components are to be tested at the following frequencies:

- (a) The pressurizer-SORV setpoint is verified every 18 months.
- (b) The SCS-SV setpoints are verified in accordance with the frequency specified by the ASME Section XI requirements.
- (c) The pressurizer level instruments are calibrated at least every 18 months.

(3) If the RCS temperature is below 300°F and the pressurizer SORV or one SCS SV become inoperable, they shall be restored to an operable condition within seven days, or the RCS shall be depressurized and vented to the atmosphere, the LPST, or the primary drain collecting tank (PDCT) within eight hours.

(4) A reactor coolant pump (RCP) may be started only if there is a bubble in the pressurizer or if the steam generator/RCS ΔT is below 100°F.

(5) Whenever the RCS temperature is between 200°F and 324°F, two-of-the-three LPSIP's power-supply breakers are open and either racked out or removed. When the RCS temperature is below 200°F, all HPSIP and LPSIP breakers are open and either racked out or removed.

(6) Whenever the RCS temperature is below 324°F, all four loop injection MOV's and all the LP injection MOV's are shut, and the LPSIP recirculation valve (MOV-532) is open.

The following Technical Specifications were not proposed by YAEC but they have been discussed by NRC with YAEC and are mutually agreeable:

(1) If the RCS temperature is below 300°F and the pressurizer SORV and one SCS SV become inoperable, or if two SCS SV's become inoperable, the RCS shall b depressurized and vented to atmosphere, the LPST, or the PDCT within eight hours.

(2) If the RCS temperature is between 300°F and 324°F, and if the pressurizer SORV becomes unavailable, then the RCS temperature shall be reduced to below 300°F and the SCS SV's placed in service, or the RCS temperature shall be raised to above 324°F. If neither of these actions can be completed within eight hours, the RCS shall be cooled down and depressurized to the atmosphere, the LPST, or the PDCT within an additional eight hours.

The NRC staff has reviewed the Licensee's proposed Technical Specifications described above and concluded that they are acceptable.

4. CONCLUSIONS

The EI&C design aspects of the LTOPS for Yankee Rowe were evaluated using those design criteria originally prescribed by the NRC staff and later expanded during subsequent discussions with the Licensee.

We conclude that the YAEC Yankee Rowe LTOPS design as described satisfies the NRC criteria, requirements, and staff positions.

APPENDIX

REFERENCES

1. NRC (Schwencer) letter to YAEC (Groce) dated August 11, 1976.
2. YAEC (French) letter to NRC (NRR) dated September 3, 1976.
3. YAEC (French) letter to NRC (NRR) dated October 26, 1976.
4. YAEC (Vandenburgh) letter to NRC (NRR) dated December 1, 1976.
5. NRC (Schwencer) letter to YAEC (Groce) dated February 16, 1977.
6. YAEC (Vandenburgh) letter to NRC (Reid) dated February 4, 1977.
7. YAEC (Groce) letter to NRC (NRR) dated March 31, 1977.
8. NRC (Schwencer) letter to YAEC (Groce) dated April 1, 1977.
9. YAEC (French) letter to NRC (Schwencer) dated April 25, 1977.
10. YAEC (Vandenburgh) letter to NRC (NRR) dated May 27, 1977.
11. NRC and YAEC telephone conversation on July 29, 1977.
12. YAEC (Vandenburgh) letter to NRC (NRR) dated November 1, 1977.
13. NRC (Schwencer) letter to YAEC (Groce) dated January 31, 1978.
14. YAEC (Grove) letter to NRC (NRR) dated March 9, 1978.
15. YAEC (Johnson) letter to NRC (NRR) dated April 28, 1978.
16. YAEC (Johnson) letter to NRC (NRR) dated April 28, 1978.
17. "Staff Discussion of Fifteen Technical Issues Listed in Attachment G, November 3, 1976, Memorandum from Director NRR to NRR Staff," NUREG-0138, November 1976.
18. NRC memorandum (P. Check to D. Ziemann), "Review of Yankee Rowe Overpressure Mitigating System (TACS #6871)," dated January 18, 1979.

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