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TECHNICAL EVALUATION OF THE ELECTRICAL, INSTRUMENTATION, AND CONTROL
DESIGN ASPECTS OF THE LOW TEMPERATURE OVERPRESSURE PROTECTION
SYSTEM FOR THE MAINE YANKEE NUCLEAR POWER PLANT

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SELECTED ISSUES PROGRAM

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ABSTRACT

This report documents the technical evaluation of the electrical, instrumentation, and control design aspects for the low temperature over-pressure protection system of the Maine Yankee 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 Program being conducted for the U. S. Nuclear Regulatory Commission by Lawrence Livermore Laboratory.

FOREWORD

This report is supplied as part of the Selected Electrical, Instrumentation, and Control Systems Issues (SEICSI) Program being conducted for the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Operating Reactors, by Lawrence Livermore Laboratory, Field Test Systems Division of the Electronics Engineering Department.

The U. S. Nuclear Regulatory Commission funded the work under the authorization entitled "Electrical, Instrumentation and Control System Support," B&R 20 19 04 031, FIN A-0231.

Part of this work was performed by EG&G, Inc., Energy Measurements Group, San Ramon Operations, for Lawrence Livermore Laboratory under U. S. Department of Energy contract number DE-AC08-76NV01183.

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1. INTRODUCTION

By letter to the Maine Yankee Atomic Power Company (MYAPCO) dated August 11, 1976, the U. S. Nuclear Regulatory Commission (NRC) requested an evaluation of system designs to determine their 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 December 2, 1976 and subsequent letters (see References), MYAPCO submitted the additional information requested by the NRC staff, including the administrative operating procedures and the proposed low temperature overpressure mitigating system (OMS). 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 the Maine Yankee nuclear power plant 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 (E&I&C) aspects of the Licensee's equipment and procedures based on the information provided (see References), and to define how well they meet the criteria established by NRC as necessary to prevent unacceptable overpressurization events.

2. EVALUATION OF THE MAINE YANKEE NUCLEAR POWER PLANT

2.1 INTRODUCTION

The review of the Maine Yankee low temperature overpressure protection system design by MYAPCU 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 RCS 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 residual heat removal (RHR) system.

The design basis criteria that were applied in evaluating the acceptability of the electrical, instrumentation, and control (EI&C) aspects of the low temperature OMS 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 OMS 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) Testability. The OMS must be testable on a periodic basis prior to dependence on the OMS to perform its function.
- (4) Seismic Category I and IEEE Std-279-1971 Criteria. The OMS should satisfy both the seismic Category I and IEEE Std-279-1971 criteria. The basic objective is that the OMS should not be vulnerable to a failure mode that would both initiate a pressure transient and disable the low temperature OMS. Events such as loss of instrument air and loss of offsite power must be considered.

2.2 MYAPCO OVERPRESSURE MITIGATING SYSTEM DESIGN

The MYAPCO OMS design information detailed in this section was derived from material cited in the References. The MYAPCO design for the Maine Yankee OMS is based on the use of two pressurizer SORV's along with two passive spring-loaded safety valves (SV's) which are located on the suction line of the RHR system piping. These valves, in conjunction with specific procedural controls, form the bases for the following conditions:

- (1) Each pressurizer SORV will provide sufficient and redundant relief capacity to ensure that the RCS pressure remains below 589 psig when the RCS temperature is below 220°F. The pressurizer SORV low pressure setpoint is 500 psig.
- (2) The two RHR SV's together will provide sufficient and redundant relief capacity to ensure that the RCS pressure remains below 589 psig when the RCS temperature is below 220°F. The RHR SV low pressure setpoint is 400 psig.
- (3) A 225°F temperature switch will be provided to ensure that the RHR-SV isolation valves and the pressurizer-SORV isolation valves are open at temperatures below 225°F. Valves that are not open will be annunciated on the main control board.
- (4) Additional assurance of preventing inadvertent blow-down at RCS temperatures above 300°F is provided by the inclusion of a 300°F temperature switch. This switch will ensure that the RHR-SV isolation valves are closed and that the pressurizer SORV's have been reset to the high setpoints required for normal plant

operation. Failure of the RHR-SV isolation valves to close or failure of the pressurizer SORV's to be reset to the high setpoint will be annunciated on the main control board.

The two pressurizer SORV's are equipped with a low pressure setpoint feature. This feature, when enabled by the operator by means of a keylock switch, causes each pressurizer SORV to open when the pressurizer pressure reaches a setpoint of 500 psig.

In accordance with plant cooldown procedures, the pressurizer SORV's are set to the low pressure setpoint when the system pressure is less than 450 psig. This low pressure setpoint is to be established prior to decreasing the RCS temperature below 220°F. Plant operating procedures provide that the RHR system suction isolation valves are normally open below 220°F, thereby making available the relief capacities of these two SV's as reactor vessel overpressure protection devices. An RHR interlock does exist, however, which prevents the opening of the isolation valves at all pressures in excess of 400 psig. It is concluded, therefore, that when the pressure is decreasing, the RHR SV's offer no overpressure protection until the pressure is reduced to 400 psig or below and the RHR-SV isolation valves are allowed to open.

For decreasing pressures between 500 psig (pressurizer-SORV low setpoint) and 400 psig (RHR-SV maximum isolation valve opening pressure for decreasing RCS pressure), it may appear that the OMS is vulnerable to an overpressure transient if the single failure criterion is applied and the pressurizer-SORV actuation circuitry fails. This is not the case, however, since the OMS will not be enabled unless the RHR-SV isolation valves are open, which implies that the pressure is equal to or less than 400 psig.

2.3 EVALUATION OF MAINE YANKEE USING DESIGN BASIS CRITERIA

Maine Yankee 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

In each design basis transient analyzed, no credit for operator action was taken until ten minutes after the initiation of the RCS overpressurize transient and after the operator was made aware of the overpressure transient by the low temperature overpressure transient alarm. The criterion for operator action is consistent with that suggested at recent meetings between pressurized water reactor (PWR) owners and the NRC (i.e., when a plant is operated in accordance with established operating procedures, the protection afforded by normal operating procedures is a vital part of the overall plan for protection against overpressurization).

In the analysis of postulated overpressure events presented in Appendix G of 10 CFR 50, operator action to mitigate the consequences of the event are conservatively assumed not to occur for ten minutes after the event. The operator is alerted to a possible overpressure event by means of the impending transient and pressurizer-SORV open alarms on the main control board. In this analysis, it is seen that adherence to normal operating procedures is the only requirement placed upon the operator to guarantee overpressure protection.

Although the above criterion has been established, there is no dependence on operator action after the ten-minute interval to mitigate the effects of an overpressurization event. The pressurizer, SORV's and the normally available capability of the RHR SV's provide redundant protection from overpressurization in all the events analyzed.

2.3.2 Single Failure Criterion

The NRC staff position requires that the OMS 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's be completely separate and distinct from those of the RHR SV's and that they should be vital sources.

The Maine Yankee OMS is intended 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 those 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.

Protection against overpressurization events is provided by the two pressurizer SORV's whose combined capacity is sufficient to maintain the reactor coolant pressure below 589 psig at all temperatures below 220°F, assuming the worst-case event. In addition, the RHR SV's provide redundant relief capacity whenever normal operating procedures require the RHR system to be open to the RCS.

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 pressurizer SORV's in conjunction with RHR SV's is an acceptable concept. However, the current system relies on a single enabling switch for both the pressurizer SORV's and the RHR SV's, and thus violates the single failure criterion.

We conclude that the Maine Yankee OMS does NOT satisfy all of the NRC staff single failure criterion. We recommend that separate enable/disable switches be used for the pressurizer SORV's and RHR SV's.

2.3.3 System Testability

The NRC staff position requires that the OMS 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's should be tested during each refueling. Deviations from this criterion should be justified.

There are two aspects associated with the testability of the Maine Yankee OMS. The first aspect is concerned with the pressurizer-SORV testing program for low pressure protection system operability. These tests are as follows:

- (1) Verification of upstream isolation valves functioning once per cold shutdown.
- (2) Performance of a channel functional test of the control circuitry from the pressure sensor to the valve solenoid once per refueling outage.
- (3) Performance of a channel calibration of the pressurizer pressure sensors once per 18 months.

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. These tests are as follows:

- (1) Actuation of the containment isolation system (CIS).
- (2) Actuation of the safety injection actuator signal (SIAS).
- (3) Flow testing of the high pressure safety injection pump (HPSIP).
- (4) Testing of the CIS trip valve.
- (5) Calibration of the RHR interlock circuitry.

The following preventative measures have been instituted to prevent inadvertent RCS overpressurization during this testing:

- (1) The initial conditions for the CIS actuation test require that the charging, letdown, and purification systems are secured prior to the test.
- (2) A procedural step in the SIAS actuation test closes the discharge valve on the charging pump (HPSIP) to be tested prior to SIAS actuation. The control switch for the other charging pump is in the "pull-to-lock" position.
- (3) The HPSIP flow test is performed while flooding the refueling cavity with the reactor vessel head removed.
- (4) The CIS trip valve test includes a caution statement, immediately preceding the test stroking of the letdown CIS trip valve, that requires an alternate letdown path if the plant is in a water-solid condition.
- (5) The prerequisite section of the calibration procedure for the RHR interlock circuitry requires that the RCS is depressurized and does not require relief protection (i.e., the reactor vessel head is removed or a pressurizer safety valve is removed for pressurizer venting).

When component testing is required which might cause an RCS pressure rise above the minimum pressure/temperature limit curves, the OMS will be operational consistent with the RCS temperature consideration.

For the Maine Yankee nuclear power plant, each 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 will be modified to require this test prior to plant cooldown for each refueling shutdown.

Since the Maine Yankee nuclear power plant uses two pressurizer SORV's driven by one pressure transmitter plus the safety/relief valves installed in the RHR system, the NRC staff position also applies to the RHR system valves and control circuitry that are used in the low temperature OMS.

We conclude that the Maine Yankee OMS satisfies the EIC testability criteria if the valves and control circuitry in the RHR system which are used for overpressurization mitigation are tested in accordance with the NRC staff position stated at the beginning of this section.

2.3.4 Seismic Design and IEEE Std-279-1971 Criteria

2.3.4.1 Seismic Design Criteria. The Licensee states that the Maine Yankee pressurizer SORV's and RHR SV's have been designed to meet the requirements of seismic Category I criteria.

2.3.4.2 IEEE Std-279-1971 Criteria

For the Maine Yankee nuclear power plant, the primary design purpose of the pressurizer SORV during normal plant operation is to provide the means by which an excess pressurizer pressure condition can be corrected without necessitating the opening of the safety-class mechanical safety valves. This capability eliminates the consequential potential leakage condition in case the safety valves reset and reseal incorrectly. A second feature allows the operator, using a switch mounted on the main control board, to manually energize and open the relief valve and decrease system pressure in the pressurizer. A third feature, the dual setpoint, was added during original system design to provide a means of potential reactor vessel low temperature overpressurization (LTO) protection. This existing dual setpoint feature permits the operator, using a permissive keylock switch mounted on the main control board, to arm the pressurizer-SORV trip circuit for both normal (2,335-psig trip) and LTO (500-psig trip) plant operation.

MYAPCO has stated that none of these three features constituted a requirement for a redundant safety class electrical actuation system and, therefore, no part of the electrical system was designed to meet IEEE Std-279-1971 and/or seismic Category 1 criteria. The dual setpoint LTO protection system is not a system that they are proposing be added to their plant, but rather it is an existing system which was implemented during original plant start-up. Since their proposed modification to the existing OMS requires no additional equipment, they believe that major system modifications are unnecessary to meet the IEEE Std-279-1971 criteria. They feel that the proposed modification of the auto-isolation feature of the RHR-SV isolation valves will result in a mechanically redundant relief capability by providing an alternate means (via the RHR SV's actuated at 400 psig) through which excess RCS pressure can be relieved.

The pressurizer SORV's depend only on electrical power to operate; they are not air-operated valves. The solenoids actuate a pilot which allows fluid pressure to open the valves. Thus, a loss of station or instrument air pressure will have no effect on the operability of these valves. The RHR SV's, on the other hand, are spring-loaded and the RHR-SV isolation valves are motor-operated. In the event of an electrical failure, the RHR-SV isolation valves will fail open, and the RHR SV's will still function.

We conclude that the Maine Yankee OMS would not be susceptible to a common-mode failure involving loss of offsite electrical power and air supply. Since the NRC staff requires complete redundancy and permits manual enabling only if one-out-of-two logic is employed, we recommend that MYAPCO install an additional separate keylock enable switch on the main control board for the RHR portion of the OMS. If this is done and if all of the Maine Yankee OMS equipment which interfaces with the safety systems satisfies the IEEE Std-279-1971 criteria, we conclude that the system will satisfy the NRC staff position with respect to the IEEE Std-279-1971 criteria for LTO protection.

2.4 ALARM SYSTEMS DESIGN AND OPERATION

Specific details concerning acceptable alarm systems design and operation for the Maine Yankee OMS 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 MYAPCO high-pressure alarm system design is as follows:

- (1) A computer-driven high-pressure alarm is available at a pressurizer pressure setpoint of 375 psig. This alarm derives its pressure signal from a different pressurizer pressure transmitter than is used to provide the low pressure setpoint feature for the pressurizer SORV's. The alarm is always present in the computer when the pressure is greater than 375 psig; however, an operator keyboard procedure removes this alarm from the computer printout routines during normal plant operation. Therefore, operator action to reinstate this alarm in the computer printout routines is provided in plant operating procedures where needed to ensure the presence of the alarm.
- (2) The computer alarm actuates an annunciator on the main control board. It requires operator acknowledgment and prints out the alarm message on the computer alarm typewriter. This alarm obviously depends upon the plant computer being operable, and there are times during cold-shutdown plant conditions when the computer must be removed from service.
- (3) Another high-pressure alarm is associated with the actuation of the pressurizer SORV's. At 500 psig increasing, the pressurizer SORV's receive an actuation signal to open. The same signal actuates an annunciator on the main control board and alerts the operator that the pressurizer SORV's have actuated.

- (4) The RHR SV's are needed to mitigate overpressurization in the event of a pressurizer-SORV OMS failure, but the RHR SV's do not appear to be instrumented for a main control board alarm. Also, in the event of a pressurizer-SORV OMS failure, it is conceivable that the pressurizer-SORV actuation alarm would not function to alert the plant operator that a pressure transient is in progress.

We conclude that this design is NOT adequate to annunciate all of the overpressure transient conditions and does NOT satisfy all of the NRC staff position. We recommend the installation of an audio/visual alarm which does not depend on the plant computer to provide unambiguous information to the operator of the actuation of the RHR SV's.

2.4.2 Pressurizer-SORV Isolation and RHR-SV-Isolation Valve Alarms*

The NRC staff position requires that

- (1) The upstream isolation valves to both the pressurizer SORV's and the RHR SV's 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 valves are open. A means shall be provided to ensure proper alignment of the isolation valves during OMS operation.
- (2) The alarms shall be of the audio/visual type and provide unambiguous information to the operator.

A description of the MYAPCO isolation valve alarm system design is as follows:

- (1) An alarm will be provided to alert the operator to align the OMS on plant cooldown. Both the pressurizer-SORV and RHR-SV isolation valves are included in this alarm.

*It should be noted that the enable alarm (Section 2.4.3) and the isolation valve alarm (Section 2.4.2) are the same alarm.

- (2) Since the OMS is to be activated at reactor coolant temperatures below 220°F, the proposed alarm will annunciate at 225°F decreasing if either pressurizer-SORV upstream isolation valve is closed or if either RHR-SV inlet isolation valve is closed.

We conclude that this design satisfies the NRC staff position provided that the alarm is of the audio/visual type and cannot be cleared until the OMS is properly aligned.

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 the pressurizer-SORV low pressure setpoint is activated before the RCS temperature is equal to or less than 220°F. Prior to cooling the RCS below 220°F, operating procedures will require the activation of the OMS by setting the keylock permissive switch to the "low pressure" setpoint and by setting the RHR-SV isolation and pressurizer-SORV isolation valve switches to the "open" position.
- (2) The alarm shall be of the audio/visual type and provide unambiguous information to the operator.

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

- (1) An alarm will be provided to alert the operator to align the LTO system on plant cooldown.
- (2) Since the LTO system is to be activated at reactor coolant temperatures below 220°F, the proposed alarm will annunciate at 225°F decreasing if the keylock permissive switch is positioned to "HPSR" (only the normal, high pressure setpoint is activated).

*It should be noted that the enable alarm (Section 2.4.3) and the isolation valve alarm (Section 2.4.2) are the same alarm.

We conclude that this design satisfies the NRC staff position provided that the alarm is of the audio/visual type.

2.4.4 Disable Alarm

The NRC staff position requires that

- (1) An alarm shall be activated as part of the plant heatup process to ensure that the SORV's are reset to the high setpoint when the RCS temperature is greater than 300⁰F.
- (2) The alarm shall be of the audio/visual type and provide unambiguous information to the operator.

A description of the MYAPCO disable alarm system design is as follows:

- (1) An alarm will be provided to alert the operator to align the components of the OMS for power operation.
- (2) This alarm will annunciate at a temperature of 300⁰F increasing to warn the operator that the relief selector switch should be set to the "high" setpoint position and/or that the RHR-SV isolation valves are open.

We conclude that this design satisfies the NRC staff position provided that the alarm is of the audio/visual type.

2.4.5 Pressurizer-SORV Open and RHR-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) An alarm be activated to alert the operator that either of the RHR SV's are in the "open" position.

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

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

- (1) A high-pressure alarm is associated with the actuation of the pressurizer SORV's. At 500 psig increasing, the pressurizer SORV's receive an actuation signal to open.
- (2) The same signal actuates an annunciator on the main control board alerting the operator that the pressurizer SORV's have been activated. This alarm is also used to alert the operator that a pressure transient is in progress.

We conclude that this design satisfies the NRC staff position for the pressurizer-SORV open alarm provided that the alarm is of the audio/visual type. We recommend that an alarm be installed to indicate if either of the RHR SV's are in the "open" position. This alarm should be of the audio/visual type. /

2.5 PRESSURE TRANSIENT REPORTING AND RECORDING REQUIREMENTS

The NRC staff position is that a pressure transient which causes the OMS 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/s.

The Maine Yankee nuclear power plant does not possess provisions for continuously recording temperature and pressure at low temperatures (including cold shutdown). The plant does, however, utilize the process computer which provides a computer alarm at 375 psig increasing. The computer alarm activates an annunciator on the main control board. It

requires operator acknowledgment and prints out the alarm message on the computer alarm typewriter.

Since the computer may not always be in service, we conclude that the Maine Yankee nuclear power plant does NOT satisfy all of the NRC staff position on pressure transient reporting and recording. We recommend that a pressure/temperature recorder be installed in accordance with the NRC 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.

MYAPCO states that the disabling of essential components during cold shutdown is as follows:

- (1) The "pull-to-lock" position associated with the control switches for the charging pumps deenergizes the charging pump and inhibits all of the automatic start signals and the SIAS from starting the pump.
- (2) The Maine Yankee technical specifications require one HPSIP (charging pump) to be operable along with all associated valves and controls set for automatic initiation, whenever the RCS is greater than 210°F and 400 psig. Below these conditions, a charging pump is still required if a reactor coolant pump is operating in order to supply the reactor coolant pump with seal injection water. The nonoperating charging pump control switch is placed in the "pull-to-lock" position to remove the pump from service, but it still retains its capability to be started from the main control board in case the operating pump becomes unavailable. The HPSIP header isolation valves are normally closed, but they must remain energized until the plant conditions are less than 210°F and 400 psig.

Below these conditions, the breakers for the valve motor operators will be opened, tagged, and placed under administrative control.

We conclude that this implementation satisfies the NRC staff position.

3. TECHNICAL SPECIFICATIONS

The technical specifications information detailed in this section was derived from the NRC Reactor Safety Branch/Division of Operating Reactors (RSB/DOR) safety evaluation report (SER) for the Maine Yankee OMS (refer to Reference 12).

To ensure operation of the OMS, NRC is requiring MYAPCO to submit technical specifications consistent with the analysis provided. MYAPCO has submitted tentative technical specifications (refer to Reference 8), and we find these to be acceptable with the following exception: The Licensee must add a statement to ensure that a reactor coolant pump may be started (or jogged) only if there is a steam bubble in the pressurizer with a maximum level of 30 percent or the steam generator/RCS temperature difference is less than 100°F.

The tentative technical specifications in Reference 8 for Maine Yankee include the following additions:

(1) Technical specification #3.4

"D. Low Temperature Overpressurization Protection

"1.a. The power operated relief valves, aligned for the low pressure setpoint, and the RHR spring relief valves shall be operable for RCS overpressure protection whenever the RCS is less than the minimum pressurization temperature and the RCS is not vented.

"1.b. If the conditions of D.1.a are not met, the RCS shall be depressurized and vented within eight hours.

"EXCEPTION: One power operated relief or RHR spring relief may be inoperable for seven days.

"2. No more than one HPSI pump may be energized at RCS temperature below 200°F.

EXCEPTION: A second HPSI pump may be energized for up to 5 minutes for the purpose of rotating operating equipment."

(2) Technical specification #4.1 - Table 4.1.3

<u>Channel Description</u>	<u>Surveillance Function</u>	<u>Frequency</u>	<u>Surveillance Method</u>
10. Pressurizer Power Operated	a) Calibrate	R	Apply known pressure to the pressure sensor.
Reliefs-Low Pressure Set-point	b) Test	R(5)	Manual actuation of each POR to verify solenoid operation.

(5) Must be performed prior to cooldown below 220°F.

We concur with the NRC RSB acceptance of these tentative technical specifications for Maine Yankee.

4. CONCLUSIONS

The E&C design aspects of the low temperature OMS for Maine Yankee were evaluated using those design basis criteria originally prescribed by the NRC staff and later expanded during subsequent discussions with the Licensee.

We conclude that the MYAPCO Maine Yankee OMS design as described does NOT satisfy all of the NRC criteria, requirements, or staff positions. In order to correct these deficiencies, the following recommendations are made:

- (1) The addition of a separate enable keylock permissive switch on the main control board is recommended for the RHR portion of the OMS. This is necessary to ensure that the OMS will satisfy all of the single failure criterion, the complete redundancy staff requirement, and the one-out-of-two logic staff requirement for manual enabling of the OMS.
- (2) The RHR-SV isolation valves, RHR SV's, and the associated control and monitoring circuitry should be tested in the same manner (including frequency) as the pressurizer-SORV subsystem.
- (3) The pressure transient recording and reporting equipment and procedures should be made to conform to the NRC staff position.
- (4) All of the alarms shall be shown to be of the audio/visual type, and to not be computer-driven.
- (5) An alarm shall be installed to indicate if either of the RHR SV's are in the "open" position. This alarm should be of the audio/visual type. This alarm can also serve as the RHR high-pressure alarm.

Except as noted above, we conclude that the MYAPCO Maine Yankee OMS design satisfies the NRC staff requirements.

REFERENCES

1. NRC Letter (Reid) to MYAPCO dated August 11, 1976.
2. MYAPCO Letter (Vandenburg) to NRC dated December 2, 1976.
3. NRC Letter (Reid) to MYAPCO (Groce) dated January 28, 1977.
4. MYAPCO Letter (Johnson) to NRC dated March 25, 1977.
5. NRC Letter (Reid) to MYAPCO (Groce) dated August 22, 1977.
6. MYAPCO Letter (Johnson) to NRC dated October 24, 1977.
7. NRC Letter (Reid) to MYAPCO (Groce) dated January 10, 1978.
8. MYAPCO Letter (Johnson) to NRC dated February 24, 1978.
9. NRC Memorandum (Check to Reid), "Review of Maine Yankee Overpressure Mitigating System (TAGS #6741)," December 18, 1978.
10. "Combined Heatup, Cooldown and Pressure-Temperature Limitations," Maine Yankee Appendix G Information, Section 3.4 of Amendment No. 31, June 19, 1977.
11. "Staff Discussion of Fifteen Technical Issues Listed in Attachment G November 3, 1976 Memorandum from Director, NRR to NRR Staff," NUREG-0138, November 1976.
12. NRC (RSB/DOR), "Safety Evaluation Report of the Overpressure Mitigating System for the Maine Yankee Atomic Power Plant," dated November 1978.

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