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Wiscasset, Maine

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EXECUTIVE SUMMARY

Maine Yankee Nuclear Power Station NRC Special Inspection Report 50-309/96-11

A special inspection was conducted to review actions taken by Maine Yankee in response to logic testing deficiencies identified by the Independent Safety Assessment Team (ISAT) and the subsequent discovery of a severed wire in the "A" high pressure safety injection pump control circuit. The specific areas inspected included the licensee review of safety system logic testing surveillance procedures, test and independent oversight activities.

The inspectors found that the scope of the surveillance test reviews performed by the licensee was appropriate and the reviews were performed by knowledgeable, experienced engineers. The reviews were thorough and testing deficiencies were properly documented and detailed procedures were prepared and performed to ensure the safety systems logic and actuation circuits were properly tested. Test activities were performed safely by technically competent and safety focused operations, engineering and maintenance personnel. There was good command and control of test activities. However, certain issues were identified as deficiencies and appeared to be potential violations of NRC requirements as follows:

- An apparent violation of Technical Specification 4.1, Instrumentation and Controls, which required the periodic calibration, testing and checking of instruments channel, reactor protection system and engineered safeguard system logic channels. There were nine example surveillance tests required by Technical Specification 4.1 surveillance tests not demonstrating the functionality of the Safety Injection Actuation System, Main Steam Isolation, Feedwater Trip, Emergency Feedwater and the Recirculation Actuation System. **(Apparent Violation of TS 4.1)**
- There were three instances of surveillance tests required by Technical Specification 4.5 not demonstrating the functionality of the Emergency Power Actuation System. **(Apparent Violation of TS 4.5)**
- There was an instance of a surveillance test required by Technical Specification 4.6 not demonstrating the functionality of the Feedwater Trip System **(Apparent Violation of TS 4.6)**
- The failure to perform adequate testing was significant since proper testing would have identified the missing wire in the HPSI pump circuit earlier and would have minimized the period of time the pump was inoperable **(Apparent Violation of TS 3.9-2 No.1).**

Also, the failure of the P-61S pump to trip on a RAS signal is significant because it could result in a lack of adequate net positive suction head (NPSH) for the containment spray and HPSI pumps. Inadequate NPSH could cause pump cavitation resulting in possible pump damage and/or reduced system flow rates. The inadequacies with the previous tests of CS pump P-61S as a LPSI or CS pump and with testing the spare HPSI pump, P-14S, during the loss of power test are significant because the pumps could be and have been used as standby pumps and would have been expected to perform safety related functions for which they had not been properly tested.

During logic testing, the inspector identified a problem with the adequacy of a test instruction step to verify open contacts in the logic circuit **(URE 50-309/96-11-01)**.

Independent oversight of test activities was initially weak because Quality Program Department coverage was not in place at the beginning of test activities and was not present until this absence was questioned by the inspector. However, once the concern was raised, the plans developed were detailed and implemented well. The Event Review Board (ERB) that was formed to investigate the cause of the severed wire completed their review at the end of the inspection period and the inspectors were not able to complete their reviews of the board's results at that time. This item remains open pending completion of NRC's review of the results of the ERB's investigation **(URI 50-309/96-11-02)**.

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Report Details

Purpose

The purpose of this inspection was to review the actions taken by the licensee to assure the proper performance of the engineered safety features (ESF) systems. These actions were taken in response to logic testing deficiencies identified by the NRC Independent Safety Assessment Team (ISAT) and the subsequent discovery of a severed wire in the "A" high pressure safety injection (HPSI) pump (P-14A) control circuit. The specific areas inspected included the scope of the licensee's reviews and testing, a review of selected safety system logic testing surveillance procedures, observation of test-activities including management and independent oversight, and a preliminary review of the findings of the event review board that was formed to investigate the cause of the severed wire.

Background

During a review of surveillance test procedures, a member of the NRC ISAT found that the control circuit for the swing containment spray (CS) pump, P-61S, was not being periodically tested as were the "A" and "B" CS pumps. The swing pump can be aligned to function as a train A or train B low pressure safety injection (LPSI) pump or a containment spray pump when one of the normal pumps is out of service. In response to this finding the licensee performed additional review of safety system logic tests. This review identified that the periodic testing of the safety injection actuation signal (SIAS) had been inadequate because the HPSI pump controls were tested by simultaneously initiating a loss of power (LOP) and a SIAS. Since the pumps are designed to start on either of these signals, the procedure was deficient in that it did not independently test the parallel logic paths. The ISAT also identified a failure to properly test the spare HPSI pump during the station LOP testing.

The licensee developed a special test to address the SIAS test deficiencies. However, when the test was performed on August 17, 1996, the "A" HPSI pump, P-14A, did not start as designed in response to the SIAS. The licensee initiated unusual occurrence report (UOR) Number 96-072 to document this problem. The event was also reported to the NRC in accordance with 10 CFR 50.72(b) as a condition outside the design basis of the plant (Event Number 30888). A follow up investigation identified a severed wire in the HPSI pump control circuit in the main control board (MCB). The cut wire would prevent an auto start of P-14A when the pump is in standby with a SIAS present. If the pump was running and a SIAS signal was received, it would continue to run. The cut wire was replaced; and, since the plant was in hot standby ready to startup, the plant was cooled down pending additional review of the cause of the severed wire. A work order (WO 96-2928-02) was initiated to accomplish the re-installation of a replacement wire in the HPSI circuitry. The licensee established an event review board to investigate the cause of the severed wire.

Following the failure of the "A" HPSI pump test on August 17, 1996, licensee personnel performed a review of surveillance test procedures to determine if the logic systems were adequately tested. The inspectors reviewed the licensee's effort to assess the adequacy of the project scope, the quality of the reviews, the results of the review and corrective actions taken to resolve deficiencies. The inspectors also witnessed performance of some of the tests developed to verify proper system operation.

E3 Engineering Procedures and Documentation

E3.1 Systems Review

a. Inspection Scope (37551)

The inspectors reviewed the licensee's scope of reviews, a sample of the test instructions developed to achieve proper testing, including the 10 CFR 50.59 determinations, and a sample of the Safety Issue Concerns generated to address the identified discrepancies.

b. Observations and Findings

As a compliance backfit, NRC Generic Letter No. 96-01: Testing Of Safety-Related Logic Circuits, required, in part, that licensees compare electrical schematic drawings and logic diagrams for the reactor protection system, emergency diesel generator load shedding and sequencing, and actuation logic for the engineered safety features systems against plant surveillance tests to ensure that all portions of the logic circuitry are adequately covered in surveillance procedures to fulfill the technical specification (TS) requirements. The letter also requested that surveillance procedures be modified as necessary to ensure compliance with the plant technical specifications. Maine Yankee originally planned to complete these actions prior to start up from the next refueling outage, approximately mid-1997. As a result of the August 17, 1996, HPSI pump test failure, the licensee decided to review all safety features actuation systems within the scope of GL 96-01 prior to plant restart from the August 1996 unplanned shutdown. The systems reviewed were:

- Safety Injection Actuation System (SIAS)
- Containment Spray Actuation System (CSAS)
- Recirculation Actuation System (RAS)
- Containment Actuation System (CIS)
- Feed Water Trip System
- Emergency Feed Water (EFW) Actuation
- Reactor Protection System (RPS)
- Emergency Power Systems Actuation (Loss of Offsite Power)
- Main Steam Isolation

The licensee described the review plans in a letter to the NRC dated August 23, 1996. The reviews were to ensure that the outputs were tested with each input taken separately and included the safety functions required by the technical specifications (TS) and assumed in the Final Safety Analysis Report (FSAR). The letter stated that ancillary functions such as bypasses, interlocks, and inhibit circuits were beyond the present review scope. During discussions with licensee management, and during a conference call between NRC and licensee management on August 28, 1996, the inspectors confirmed that those bypasses, interlocks and inhibit circuits demonstrating TS functionality would be tested before restart.

Maine Yankee assembled an engineering team to review the current station Technical Specification required safety system logic testing procedures to ensure all safety system logic circuits were fully tested. When testing deficiencies were identified, special functional test instructions were developed for the safety system actuation circuit by the plant engineering department and approved by the Plant Operations Review Committee (PORC) prior to the performance of testing. Maine Yankee conducted the required 10 CFR 50.59 review of the test package prior to the start of testing to ensure that no unreviewed safety question existed.

In addition to discussing specific reviews with the licensee engineers, the inspector reviewed several system test procedures, the associated electrical drawings, and the licensee review findings. The systems reviewed by the inspector included the reactor protection system, the main steam isolation system and the recirculation actuation system. The inspector found the licensee reviews to be thorough and the engineers that performed the reviews were experienced and very knowledgeable. The inspector also reviewed the procedure developed to test the affected portions of the HPSI pump P-14A, the HPSI swing pump P-14S, and the core spray/low pressure coolant injection system swing pump P-61S. The inspector found the procedure to be well written and accomplished the test objectives.

During the review process, the licensee documented all identified discrepancies that required further testing in Safety Issue Concerns and generated work orders to provide the functional test instructions required.

c. Conclusions

The inspector found that the scope of the licensee review was appropriate and in accordance with GL 96-01. Detailed test instructions were generated to test the identified test inadequacies. Engineering, operations and maintenance personnel showed good safety perspective and demonstrated good technical knowledge.

E3.2 Deficiencies in Surveillance Testing

a. Inspection Scope (37551)

Using inspection procedure 37551, the inspectors reviewed the licensee's identified deficiencies in the surveillance testing of six systems. Test deficiencies that required testing prior to plant restart were documented in accordance with the Safety Issue Concerns program and special tests were developed to test the affected portions of the circuits.

b. Observations and Findings

(1) Safety Injection Actuation System

Technical Specification (TS) table 4.1-2 logic testing requirements for this system were as follows:

- Low Pressure SIAS Initiation Channels (Table 4.1-2 Channel 1) - Simulated signal applied to meter relay and SIAS actuation logic verified.
- Low Pressure SIAS Signal Block Permissive and Auto Unblock (Table 4.1-2 Channel 2) - Part of above.
- SIAS Actuation Relays (Table 4.1-2 Channel 3) - Complete automatic test initiated as in above and including all normal automatic relay operations.
- Containment High Pressure Channels (CIS, CSAS, SIAS) (Table 4.1-2 Channel 4) - Known pressure applied to sensors and actuation logic for SIAS, containment isolation and containment spray verified.
- Manual SIAS Initiation (Table 4.1-2 Channel 7) - Manual Switch Test

The licensee reviewed test procedures 3.1.14A & B, "A" ("B") Train EDG/ECCS Cold Shutdown Test; 3-6.2.1.5.4, Safeguard Channel Calibration Safety Injection Actuation Signal; and 3-6.2.2.14, Safety Injection Actuation Signal Initiation Channels, and identified two significant discrepancies:

- High pressure safety injection (HPSI) pump start signals for safety injection (SIAS) and undervoltage (UV) conditions were not tested independently. Both trains A (P-14A) and B (P-14B) pumps were affected as well as the swing pump (P-14S).
- Dual function swing pump (P-61S) was not tested as a low pressure safety injection (LPSI) and containment spray (CS) pump for UV and SIAS actuation.

These deficiencies in the Technical Specification required testing of the SIAS are, collectively, an apparent violation of Technical Specification 4.1, which required the periodic calibration, testing and checking of instruments channel, reactor protection system and engineered safeguard system logic channels. **(Two examples of Apparent Violation of TS 4.1)** Work orders were generated to control test activities necessary to ensure system functionality. The discrepancies that occurred during the initial tests were:

- HPSI pump A failed to start on SIAS due to a severed wire in the control circuit. The pump was later tested satisfactorily following wire replacement.

- HPSI pump B tripped when SIAS was reset due to a defective pump suction pressure switch. However, the safety function of the circuit was not affected. The pressure switch was replaced and the circuit tested satisfactorily.

(2) Emergency Power Actuation Systems

Technical Specification Table 4.5.A.2 required demonstration of the ability of each diesel generator to start automatically and restore power to vital equipment by initiating or simulating loss of all normal a-c station service power supplies.

The licensee reviewed test procedure 3.1.14A & B, "A" ("B") Train EDG/ECCS Cold Shutdown Test, and identified three significant discrepancies as follows:

- Service water pumps, P-29B and P-29C, were not verified to remain operating on the bus if they are the only available pumps in their train.
- Primary component cooling (PCC) pump, P-9B, was not tested as the preferred pump.
- Secondary component cooling (SCC) pump, P-10B, was not tested as the preferred pump.

These deficiencies in the Technical Specification required testing of the Emergency Power Actuation System are, collectively, an apparent violation of Technical Specification 4.5 which required the periodic testing of the station electrical power system (**3 examples of Apparent Violation of TS 4.5**). Work orders were generated to control test activities necessary to ensure adequate system functionality. The tests were conducted satisfactorily with no discrepancies.

(3) Main Steam Isolation

Technical Specification Table 4.1-2 required testing for the Main Steam Isolation valve circuits with (Table 4.1.2. Channel 13) known pressure and differential pressure applied to pressure and level sensors. The licensee reviewed test procedure 3-6.2.1.2.1, Protective and Safeguard Channel Calibration Main Steam Isolation Valve Circuits, and identified three significant discrepancies:

- Two Solenoid Operated Valves (SOVs) control the operation of each of the excess flow check valves; however, the testing did not separately verify the operation of each SOV.

- The three parallel actuation circuits for each SOV are not separately verified.
- The operation of the manual close feature is not verified in a test procedure.

These deficiencies in the Technical Specification required testing are, collectively, another example of an apparent violation of Technical Specification 4.1, which required the periodic calibration, testing and checking of instruments channel, reactor protection system and engineered safeguard system logic channels (**3 examples of Apparent Violation of TS 4.1**). Work orders were generated to control test activities necessary to ensure adequate system functionality. The tests were completed satisfactorily with no discrepancies.

(4) Feedwater Trip System

Technical Specification Tables 4.1-2 and 4.6.D.a requirements were:

- Feedwater Trip System (TS Table 4.1-2 Channel 20) - (a) Simulate initiation signal and verify logic operation; and (b) Simulate logic operation and verify valve closure and actuation of main and auxiliary feedwater pump trip controls.
- Main Feedwater Pumps (TS Table 4.6.D.a) - Each main feedwater pump, condensate pump, and heater drain pump trip system shall be tested by tripping the actuation circuitry with a safety injection signal coincident with steam generator low pressure signal.

The licensee reviewed test procedures 3-6.2.1.2, Protective and Safeguard Channel Calibration Steam Generator Pressure, and 3-1-5.1, Emergency and Auxiliary Feedwater Valve Checklist, and identified two significant discrepancies:

- Tests did not verify tripping of each main feedwater pump, condensate pump and heater drain pump circuit breaker as required by TS Table 4.6.D.a.
- SIAS permissive for feedwater trip system was not adequately tested as required by TS Table 4.1-2.

The Technical Specification Table 4.1-2 surveillance testing deficiency is another example of an apparent violation of Technical Specification 4.1, which required the periodic calibration, testing and checking of instrument channels, reactor protection system and engineered safeguard system logic channels (**Example of Apparent Violation of TS 4.1**). The Technical Specification Table 4.6.D.a surveillance testing deficiency is an apparent violation of Technical Specification 4.6, which required the

periodic testing of the feedwater trip system (**Apparent Violation of TS 4.6.**) Work orders were generated to control the technical specification logic test activities necessary to ensure adequate system functionality and the tests were completed satisfactorily with no discrepancy.

(5) Emergency Feed Water Actuation

Technical Specification Tables 4.1-2 and 4.6.B testing requirements are as follows:

- Emergency Feedwater Initiation (Table 4.1-2 Channel 21) - Simulate initiation signal and verify logic operation.
- Emergency Feedwater Pumps (TS 4.6.B) - During each refueling shutdown, a verification test shall be conducted to assure that each motor driven emergency feed pump auto-start circuit actuates upon receipt of an emergency feedwater actuation test signal in accordance with Table 4.1-2, number 21b.

The licensee reviewed test procedures 3-6.2.1.3, Protective and Safeguard Channel Calibration Steam Generator Low Level, and 3-6.2.2.22, Emergency Feedwater Initiation Monthly Surveillance, and identified one significant discrepancy:

- Emergency feed water pump circuit breaker closure was not tested (remainder of logic was tested).

The deficiency in the Technical Specification required testing is another example of an apparent violation of Technical Specification 4.1, which required the periodic calibration, testing and checking of instruments channel, reactor protection system, and engineered safeguard system logic channels (**An example of Apparent Violation to TS 4.1**). A work order was generated to control the technical specification logic test activities necessary to ensure adequate system functionality. The tests were completed satisfactorily with no discrepancy.

(6) Recirculation Actuation Signal

The Technical Specification Table 4.1-2 testing requirement was:

- Refueling Water Tank Level RAS Initiation (Table 4.1-2 Channel 10) - Fluid removed from level transmitters to verify actuation of valves.

The licensee reviewed test procedure 3.1.15.2, ECCS Operational Test Recirculation Actuation System, and identified two significant discrepancies:

- Manual actuation was not tested.
- Automatic trip of swing pump (P-61S), when used as low pressure safety injection pump, was not tested.

The deficiencies in the Technical Specification required testing are two additional examples of an apparent violation of Technical Specification 4.1, which required the periodic calibration, testing and checking of instrument channels, reactor protection system and engineered safeguard system logic channels (**Two examples of Apparent Violation to TS 4.1**). Work orders were generated to control the technical specification logic test activities necessary to ensure adequate system functionality. During the testing, two problems were identified:

- Automatic trip of P-61S failed due to time delay relay contact failure (intermittent). Relay was replaced and feature was tested satisfactorily.
- P-61S tripped and restarted when resetting the undervoltage relay due to an apparent "relay race." The licensee stated that a design change is being evaluated to resolve the problem and the pump will not be put in service until a design basis evaluation is performed.

c. Conclusions

All identified test deficiencies were properly resolved. Technically detailed test instructions were developed and implemented to ensure system functionality prior to plant restart. The inspectors noted that activities were conducted safely by very capable personnel.

M4 Engineering Staff Knowledge and performance

M4.1 Observation of Testing Activities (URI 50-309/96-11-01)

a. Inspection Scope (62707, 37551)

Using Inspection procedures 62707 and 37551, the inspectors observed portions of test activities involving the following:

- WO 96-02928-00, Functional Test for P-14A/S on A Train SIAS and Bus 5 Undervoltage.
- WO 96-02929-00, Functional Test for P-14B/S and P-61S (LPSI/CS) on B Train SIAS and Bus 6 Undervoltage.

- WO 96-03045-00, Service Water System Pumps Start of non-preferred pumps (P-29B and C) with the preferred pumps (P-29 A and D) unavailable.

The inspectors also reviewed completed work packages that functionally tested the following systems:

- Initiation of HPSI Pump, P-14B and Pump P-61S as LPSI on SIAS and UV logic.
- Emergency Feedwater Trains A and B initiation on Low Steam Generator Level.
- Initiation of PCC Pump, P-9B when P-9A is Unavailable.
- Initiation of SCC Pump, P-10B when P-10A is Unavailable.
- Feedwater Trip Trains A and B actuation.
- Main Steam Isolation.

b. Observations and Findings

The first test was performed on August 17, 1996 and controlled by work order WO 96-2928-00, Functional Test for P-14A/S on a Train A SIAS and Bus 5 Undervoltage. The inspector observed the performance of the test from the main control room. During the period of inspection, the "A" High Pressure Safety Injection pump (P-14A) and the spare HPSI pump (P-61S) were tested for proper response to a safety injection signal. At step 5.3.10 of the work order functional test instructions, pump P-14A did not start as required on an SIAS actuation signal. Subsequent investigation by plant personnel revealed that the SIAS circuit wiring had been severed at the actuation relay and the lead marked "spare". At the other end of the wire a fifteen foot section had been removed between the relay location and a terminal board in the main control board. The wire was not marked "spare" at this end. All testing was stopped to enable plant management to review the situation. Station management directed that an Event Review Board be established to investigate the cause of the missing wire. Following replacement of the missing wire, test activities resumed. The failure of the "A" Train HPSI to function as designed was an indication that previous Technical Specification required tests have been inadequate at identifying this discrepancy. This is an example of an apparent violation of Technical Specification **3.9-2 No.1** as the related limiting condition for operation of engineered safeguard system logic channels (**Apparent Violation of TS 3.9-2 No.1**).

On August 24, 1996, the inspector observed functional test, WO 96-02929-00, P-4B/S and P-61S (LPSI/CS) on B Train SIAS and Bus 6 Undervoltage. The inspector observed a discrepancy during the performance of step 5.3.3 of the test. The step required that a volt-ohmmeter (VOM) be used to verify open circuit continuity (infinite resistance implied) at contact 5-5C of P-61S Relay 86-RASB-2 (ZAC) in Main Control Board, Section C as a part of the test on the spare pump/circuits. Although the contacts appeared to the inspector to be physically open, electricians could not verify the open circuitry using the VOM. When the relay activated the VOM indicated high but not infinite resistance. The high resistance indicated parallel circuits on the contact. The test was halted and the discrepancy investigated. It was discovered that there was an indication light (with resistor) wired parallel to the contacts which made it impossible to electrically verify (infinite resistance) the open contacts using a VOM. Test personnel initiated a test change to correct the discrepancy.

The inspector noted weak planning for the test or related procedure development resulting in the test procedure implementation problems in verifying open contacts. This area is unresolved pending further NRC staff review (URI 50-309/96-11-01).

On August 28, 1996, the inspector observed the test for the service water system pumps. This functional test verified that the non-preferred pumps (P-29B and C) will automatically start when the preferred pumps (P-29 A and D) are not available. The inspector observed the entire test and verified that the testing was as directed by the work order. All circuit logic was verified to operate as required and the testing was completed satisfactory.

c. Conclusions

The inspector determined that Maine Yankee properly conducted the required logic testing in accordance with approved work instructions. The procedures were generally well written and reviewed by the station PORC committee prior to performance.

E7 Quality Assurance in Engineering Activities

The inspectors observed and reviewed the independent oversight activities conducted by Maine Yankee with regard to this issue. The reviews included observation of Quality Programs Department (QPD) personnel activities, and discussions with personnel. The inspectors also reviewed the preliminary results of the Event Review Board (ERB-013) that had been established to perform the root cause analysis for the HPSI Pump P-14A Auto Start severed wire.

E7.1 Quality Programs Department Coverage of Activities

a. Inspection Scope (40500, 37551)

The inspectors assessed the scope of coverage of work activities provided by the Quality Assurance Program personnel. This review involved observation of QPD personnel coverage of on-going testing, review of plans developed for work coverage including procedures and documents review, and discussion with QPD personnel.

b. Observations and Findings

QPD supervision developed a plan which involved reviewing the process used by corporate engineering department personnel to determine the scope of logic circuits to be tested, reviewing the implementation of the actions taken to address any deficient surveillance procedures including observation of testing activities, and conducting an independent review of selected systems. The inspector noted that the initial Quality Controls (QC) coverage of test activities appeared weak since the plans were not in place until testing had progressed appreciably and also until the inspector had expressed a concern about what appeared to be an absence of QC presence in the field. This weakness was immediately corrected and the inspector was satisfied with the coverage maintained.

During their reviews, QPD personnel identified some areas of concern that were discussed and resolved with engineering personnel. The inspector reviewed some of the concerns identified and noted that the issues were technically sound and were of significance. This was noted to be an indication of a good independent oversight being provided by the QPD.

c. Conclusions

QPD Personnel developed a comprehensive plan for test coverage activities and implemented the plan well. The independent reviews were technically detailed. The inspectors concluded that a good independent oversight was provided by QPD.

E7.2 Event Review Board - Root Cause Analysis (URI 50-309/96-11-02)

a. Inspection Scope (40500)

On August 20, 1996, the President of Maine Yankee Atomic Power Company convened an Event Review Board to investigate the circumstances surrounding the severed wire found in the control circuitry of P-14A on August 17, 1996, and to provide to senior Maine Yankee management enough information about the event to make a risk-informed decision relative to plant start-up. The board's report was approved on September 10, 1996, but the inspector had not completed a detailed review of the report at the end of this inspection. However, a cursory review was completed. The inspector also discussed the findings of the Event Review Board with the board chairman.

b. Observations and Findings

The board had determined that the most likely cause of the severed wire in the HPSI Pump P-14A automatic initiation circuit was inadvertent cutting and partial removal during the process of removing spare/unused wires from the main control board either during the 1990 or 1992 refueling outage. During that process, there had been a minimum of administrative controls for the removal process and activities had been conducted under level 3 maintenance which did not require a work order to be generated. The removal of unused wires had been prompted during the process of developing updated as-built Instrumentation and Controls (IC) loop diagrams as part of a setpoint control program. The process had been stopped in early 1992, when an inadvertent SIAS actuation had occurred.

The board had concluded that tampering was a very unlikely scenario because of several factors. The area was not easily accessible, thereby limiting the opportunity, a single cut would have sufficed instead of two cuts and the removal of a 15 foot section of wiring, and there had been no history of such type events. In addition, the nature of the event appeared inconsistent with an intent to create a regulatory or public relations problem to put essential systems in jeopardy or to seriously affect production. The cut section of wire was sent to a material research laboratory for analysis. Preliminary results indicated that the wire had been cut in the 1993/1994 time frame (plus or minus a couple of years), and that the cut had been made with similar tools for both ends and appeared to be a set of diagonal cutters.

The board determined that the principal causal factor and condition adverse to quality was "The description of maintenance levels within procedure O-16-3, Work Order Process, was less than adequate." Other adverse conditions identified included: a less than adequate judgement exercised by the individual(s) who cut the wire, and a less than adequate management expectation for the classification of maintenance levels. The board's recommendations to prevent recurrence were that management should ensure that the classification thresholds for differing maintenance levels are as desired and correctly reflected within procedures governing the work order process and that supervisory training should include how to interpret the maintenance level classification guidance.

c. Conclusions

At the conclusion of this inspection, the inspectors had not assessed the adequacy of the event review board since a detailed review of the result had not been completed. This item remains open pending completion of the NRC's review and assessment of the results of the Event Review Board (URI 50-309/96-11-02).

X1 Exit Meeting Summary

The inspectors interacted with various members of the licensee during this inspection. A list of some of the key people is provided below. On August 24, 1996, the inspectors discussed some of the preliminary findings with licensee personnel denoted below. On September 17, a summary of the inspection findings was presented to the licensee at an exit meeting. No proprietary materials were reviewed during this inspection. The licensee acknowledged the inspection findings at that meeting.

Overall Assessment/Safety Significance

The in-operability of the "A" HPSI pump due to the severed wire was safety significant since in an accident, the automatic initiation of the safety related equipment needed to mitigate the accident would not have occurred. Both trains of HPSI are required to be operable when the plant is in a power operation condition thereby apparently violating the related TS limiting condition for operation. The pump is designed to start automatically during an accident. A mitigating factor for this problem is that the pump could have been started manually from the control room during an accident. The immediate actions of emergency operating procedure (E-O "Emergency Shutdown from Power or Safety Injection") require that the control room operator verify proper actuation of SIAS, when it is required, and then manually initiate P-14A if it had not been running. The severed wire would not have prevented the manual start of the pump. The inspectors also noted that the "B" HPSI pump performance was satisfactory when similar testing was performed to verify operability of its control circuitry.

The inadequacies with the Technical Specification required surveillance tests of the Engineered Safeguards Systems, the Main Steam Isolation, the Emergency Power System and the non-adherence to procedure during test activities are apparent violations of NRC requirements and are being reviewed by the NRC. It was noted that the system functionalities were tested satisfactorily at this time and identified deficiencies were corrected prior to plant restart from the unplanned shutdown.

The failure to perform adequate testing was significant since proper testing would have identified the missing wire in the HPSI pump circuit earlier and would have minimized the period of time the pump was inoperable. Also, the failure of the P-61S pump to trip on a RAS signal is significant because it could result in a lack of adequate net positive suction head (NPSH) for the containment spray and HPSI pumps. Inadequate NPSH could cause pump cavitation resulting in possible pump damage and/or reduced system flow rates. The inadequacies with the previous tests of CS pump P-61S as a LPSI or CS pump and with testing the spare HPSI pump, P-14S, during the loss of power test are significant because the pumps could be and have been used as standby pumps and would have been expected to perform safety related functions for which they had not been properly tested.

Independent oversight of test activities was initially weak because Quality Program Department coverage was not in place at the beginning of test activities and not until this absence was questioned by the inspector. However, once the concern was raised, the plans developed were detailed and implemented well. The Event Review Board (ERB) that was formed to investigate the cause of the severed wire completed its review at the end of the inspection period and the inspectors were not able to complete their reviews of the board's results at that time. This item remains open pending completion of NRC's review of the results of the ERB's investigation.

Persons Contacted

Maine Yankee Atomic Power Corporation

- R. Arsenault, Assistant Manager, Maintenance
- W. Ball, Assistant Manager, Operations
- W. Barry, Plant Engineering Supervisor
- R. Bickford, Plant Outage Manager
- * J. Connel, Manager, Technical Support Department
- * J. Frothingham, Manager, Quality Programs Department
- * + E. Gilford, Assistant Manager, Corporate Engineering Department
- * H. Gilpatrick, Section Head, Corporate Engineering Department
- * J. Hebert, Manager, Nuclear Engineering and Licensing
- * S. LeClerc, Section Head, Quality Programs Department
- * G. Leitch, Vice President, Operations
- C. Lloyd, Quality Controls Supervisor
- * J. McCann, Licensing Section Head
- * J. McCumber, Engineering Manager, YNSD MY Project
- * S. Nichols, Manager, Corporate Engineering Department
- * J. Niles, Assistant Manager, Operations Department
- * C. Shaw, Plant Manager
- R. Smith, Licensing Engineer
- * S. Smith, Manager, Operations
- * E. Soule, Manager, Plant Engineering Department
- + M. Swartz, Licensing Engineer
- W. Tracy, Section Head, Quality Programs Department
- * M. Veilleux, Manager, Maintenance Department
- * J. Weast, Licensing Engineer
- * D. Whittier, Vice President, Licensing and Engineering

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- * R. Conte, Branch Chief, Division of Reactor Projects
- W. Olsen, Resident Inspector
- + L. Scholl, Reactor Engineer
- * + J. Yerokun, Senior Resident Inspector

* Indicates those present at the September 17, 1996 Exit meeting.

+ Indicates those present at the August 24, 1996 debrief.

INSPECTION PROCEDURES USED

IP 37551	Onsite Engineering
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 62707	Maintenance Observation
IP 71707	Plant Operations

ITEMS OPENED, CLOSED, AND DISCUSSED

Apparent	VIO	The "A" High Pressure Safety Inspection (HPSI) pump was inoperable for a number of years dating back to the early 1990'S with respect to the ability to automatically start on a safety inspection signal (an apparent violation of Technical Specification 3.9-2 No. 1). (Section M4.1.5)
Apparent	VIO	Nine instances of surveillance tests required by Technical Specification 4.1 not demonstrating the functionality of safety related systems constituting an apparent violation of Technical Specification 4.1, Instrumentation and Controls, which required the periodic calibration, testing and checking of instruments channel, reactor protection system and engineered safeguard system logic channels. (Sections E3.2.b(1), (3), (4), (5), (6))
Apparent	VIO	Three instances of a surveillance tests required by Technical Specification 4.5 not demonstrating the functionality of the emergency power actuation system constituting an apparent violation of Technical Specification 4.5, Emergency Power System Periodic Testing, which required the periodic testing of the station electrical power system. (Section E3.2.b (2))
Apparent	VIO	An instance of a surveillance test required by Technical Specification 4.6 not demonstrating the functionality of the Feedwater Trip System constituting an apparent violation of Technical Specification 4.6, Periodic Testing, which required the periodic testing of the feedwater trip system (Section E3.2.b (4))
50-309/96-11-01	URI	Adequacy of test instruction step requiring that an open contact in the SIAS circuit be verified open with a test instrument. (Section M4. 1.b)
50-309/96-11-02	URI	Review and assessment of the results of the root cause analysis for the HPSI cut wire issue conducted by Event Review board. (Section E7)

LIST OF ACRONYMS USED

CED	Corporate Engineering Department
CFR	Code of Federal Regulations
CIS	Containment Isolation Signal
CS	Containment Spray
CSAS	Containment Spray Actuation System
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EFW	Emergency Feedwater
ERB	Event Review Board
ESF	Engineered Safety Features
FSAR	Final Safety Analysis Report
GL	Generic Letter
HPSI	High Pressure Safety Injection
IC	Instrumentation and Controls
ISAT	Independent Safety Assessment Team
LOP	Loss of Power
LPSI	Low Pressure Safety Injection
MCB	Main Control Board
MYAPC	Maine Yankee Atomic Power Company
NPSH	Net Positive Suction head
NRC	Nuclear Regulatory Commission
PCC	Primary Component Cooling
PORC	Plant Operations Review Committee
QA	Quality Assurance
QC	Quality Control
QPD	Quality Programs Department
RAS	Recirculation Actuation Signal
RPS	Reactor Protection System
SCC	Secondary Component Cooling
SIAS	Safety Injection Actuation Signal
SOV	Solenoid Operating Valve
TS	Technical Specification
UOR	Unusual Occurrence Report
WO	Work Order