U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No.:	50-336/98-203
Docket No.:	50-336
License No.:	DRP-65
Licensee:	Northeast Nuclear Energy Company
Facility:	Millstone Unit 2
Location:	Millstone Nuclear Power Station 156 Rope Ferry Road Waterford, Connecticut 06385
Dates:	August 24 - September 4, 1998, and September 14 - 25, 1998
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Millstone Nuclear Power Station Unit 2
Inspection Report 50-336/98-203

During the periods from August 24 - September 4, 1998, and September 14 -25, 1998, a team from the U.S. Nuclear Regulatory Commission's (NRC's) Independent Corrective Action Verification Program (ICAVP) Branch, Office of Nuclear Reactor Regulation, conducted a functional inspection at Millstone Nuclear Power Station Unit 2. After the 3 weeks of inspection at Unit 2, the team spent a week in Reading, Pennsylvania, at the offices of Parsons Power Group Inc. (Parsons), the Unit 2 ICAVP contractor.

This inspection represents one of the many facets of the NRC's oversight of the ICAVP. Within that context, the purpose of this inspection was to assess the effectiveness of the Configuration Management Plan (CMP) implemented by Northeast Nuclear Energy Company (NNECO), the licensee for Millstone Unit 2, as well as the effectiveness of Parsons' review of the Tier 1 systems. To accomplish these objectives, the team focused its inspection on the auxiliary feedwater (AFW) system, as well as the emergency diesel generator (EDG) sequencer.

During the onsite portion of the inspection, the team identified one apparent violation. This significant violation was the failure to properly evaluate a Technical Requirements Manual (TRM) clarification that allowed isolation of the single flow path for AFW system to one of the two steam generators (SGs). From the standpoint of the potential impact on plant safety, it is significant because, with the AFW in the allowed condition, a main steam line break on the opposite SG would result in a condition outside the accident analysis assumptions. Specifically, in such a scenario no AFW would be supplied to an intact SG. The finding is also significant because it was missed by the licensee's CMP review as well as the Parsons' review.

The team noted that the ICAVP Tier 2 inspection (Inspection Report 50-336/98-213) identified an apparent configuration control process weakness regarding the proper translation of accident analyses inputs and assumptions into the facility design and plant operating procedures and the reconciliation of the facility design and procedures to the accident analyses inputs and assumptions. The apparent violation and several other findings discussed in this report are additional examples that further highlight that concern.

Overall, the breath and depth of the Parsons' review was comprehensive, and the Parson's review was conducted in accordance with the NRC approved audit plan.

While the AFW system was undergoing modifications (both physical and analytical), the team was able to review a substantial portion of the AFW system design, including some of the modifications completed during the outage. Based on the team's independent design review, and on the team's assessment of the Parsons implementation of Tier 1, preliminary indications are that NNECO's CMP was generally effective in identifying and correcting nonconformance with the plant design and licensing bases.

1.0 Introduction

From August 24 - September 4, 1998, and from September 14 - 25, 1998, a team from the U.S. Nuclear Regulatory Commission's (NRC's) independent Corrective Action Verification Program (ICAVP) Branch, Office of Nuclear Reactor Regulation, conducted a functional inspection at Millstone Nuclear Power Station Unit 2. After the 3 weeks of inspection at Unit 3, the team spent one week in Reading, Pennsylvania, at the offices of Parsons Power Group Inc. (Parsons), the Unit 2 ICAVP contractor.

This inspection represents one of the many facets of the NRC's oversight of the ICAVP. Within that context, the purpose of this inspection was to assess the effectiveness of the Configuration Management Plan (CMP) implemented by Northeast Nuclear Energy Company (NNECO), the licensee for Millstone Unit 2, as well as the effectiveness of Parsons review of systems deemed to be within the scope of the CMP and Parsons oversight. In order to accomplish these objectives, the team focused its inspection on the design of the auxiliary feedwater (AFW) system, as well as the design of the emergency diesel generator (EDG) sequencer.

1.1 Background

As part of verifying the licensee's implementation of the Millstone CMP, the NRC committed to review a system within the scope of the CMP, that had not been reviewed by Parsons, the Unit 2 ICAVP contractor, and a system that had been reviewed by both by the licensee (under the CMP) and Parsons. The results of the first or "out-of-scope" inspection are documented in NRC Inspection Report 50-336/98-202, dated June 11, 1998. This inspection report documents the findings and results of the second or "in-scope" inspection.

1.2 Description of System and Safety Function

The AFW system is designed to provide water to the secondary sides of the steam generators (SGs) to replace water converted to steam during plant startup and shutdown, when the main feedwater pumps are not available, and during abnormal and emergency conditions. Using the AFW, the unit can either be maintained in a hot standby condition or cooled down to a temperature at which the residual heat removal system can be used to perform a direct primary system cooldown, all the way to cold shutdown.

The AFW system, consisting of three pumps, normally takes water from the condensate storage tank (CST) and supplies it to one or both SGs through their individual AFW regulating valves. The turbine-driven auxiliary feedwater (TDAFW) pump is manually started and operates on steam supplied from either SG through lines taking steam from the steam generator side of the main steam isolation valves. The TDAFW pump supplies approximately 600 gpm of water under design conditions, and if Alternating Current (AC) electrical power is lost, the pump would be available to supply water for decay heat removal for inlet steam pressures as low as 50 psig. The two motor-driven auxiliary feedwater (MDAFW) pumps are electrically powered from independent safety-related buses that can be powered by the EDGs. The MDAFW pumps which automatically start, after preset time delays, on steam generator low level or high pressurizer pressure, can each supply approximately 300 gpm of water to either SG.

The CST is the normal water supply for the AFW pumps, has a total capacity of approximately 250,000 gallons. The portion of that volume required to meet design basis requirements (presently 150,000 gallons) is protected from external hazards such as tornado generated missiles. The capability to cross-connect the fire water system to the suction of the AFW pumps provides a backup to the CST as the water source for the AFW pumps.

The EDG sequencer consists of electronic modules in the engineered safeguards actuation system (ESAS) cabinets which generate timing pulses after undervoltage is sensed on the safeguards buses and after it is determined that the buses are isolated and the EDG breaker is closed. The timing pulses generated at 0, 2, 8, 14, and 20 seconds initiate the loading of the required equipment on to the EDG.

1.3 Inspection Scope and Methodology

In conducting the Millstone Unit 2 "in-scope" inspection, the team used Inspection Module 93801, "Safety System Functional Inspection." In addition, because the inspection was intended to assess Parsons performance in implementing its NRC-approved ICAVP audit plan and the effectiveness of the licensee's CMP, the team emphasized system design, including modifications, and the translation of the design and licensing bases into operations and surveillance activities.

After completing 3 weeks of inspection at Millstone Unit 2, the team spent 1 week at the Parsons offices in Reading, Pennsylvania, the ICAVP contractor for Millstone Unit 2. The purpose of that review was to ascertain the adequacy of Parsons review of the "in-scope" systems. The team's review concentrated on the systems and portions of systems reviewed during the team's onsite inspection. The team compared its onsite findings with the discrepancy reports (DRs) generated by the contractor. Additionally, the team assessed DR quality, classification, and the licensee's response to the DRs. The team also evaluated Parsons' assessment of programmatic areas, such as HELB and environmental qualification.

1.3.1 Unit 2 Auxiliary Feedwater Boundaries

1. The Instrument air system or valves 2-FW-43A and B bounded by check valves 2-IA-680/675 (air bottles upstream of valves 2-IA-672/677 included).

2. The CST, T-40, bounded by valves 2-CN-187, 2-CN-211, and 2-CN-241 and fire protection system valves 2-FIRE-94A/B/C, the CST recirculation system included.

3. The AFW system to include the MDAFW turbine, P-9A/B, and the TDAFW pump, P4, bounded by valves 2-FW-54 and 2-FW-12A/B.

4. The main steam system to include the TDAFW pumps, H21, bounded by valves 2-MS-201/202. (Steam traps 105, 156, 158 and 159 included.)

5. Pressurizer pressure instruments PT 102 A/B/C/D (ATWS/AMSAC) and SG level transmitters LT 1113 A/B/C/D and LT 1123 A/B/C/D.

The team also reviewed electrical components in the system boundaries back to the motor control center (MCC), and the EDG sequencer. Additionally, the team reviewed ventilation to the electrical switchgear rooms and MCCs, which is required to maintain room temperatures within design operating conditions for electrical components. Finally, the team inspected instrumentation within the system boundaries back to the initiating component.

2.0 Mechanical

2.1 Scope of Review

The mechanical engineering review focused on verifying that the AFW system was capable of performing its safety functions; that it satisfied all of the applicable design and licensing bases and regulatory requirements; that it met all applicable codes and standards; and that its design was consistently translated into the plant's operating, testing, maintenance, and other procedures. The scope of the inspection included, in addition to the AFW system, applicable portions of all systems required to support the AFW system, such as the instrument air system, the CST, the main steam system, the fire protection system, and the floor and equipment drain system.

2.2 Findings

2.2.1 Potential for Exceeding AFW System Design Pressures

Per Surveillance Procedure SP-2660, Rev. 6, dated October 12, 1994, "Auxiliary Feedwater Pump Turbine Periodic Testing," the turbine over speed trip setpoint is acceptable between 4,750 revolutions per minute (rpm) and 4,950 rpm. For centrifugal pumps, the developed head is a function of rpm squared; therefore, the developed head for the TDAFW pump under minimum flow conditions at the maximum acceptable trip setpoint is approximately 3,820 feet of water equal to 1,654 psid.

With the addition of the pump's suction head, which for suction from the CST is static head and for suction from the backup source, the plant fire protection system, is the fire protection pumps discharge pressure at minimum flow conditions, plus the static head provided by the fire protection system storage tanks, the team recognized the potential for system pressure to exceed the rating of some of the system components with the pump operating near the over speed trip setpoint. Subsequent licensee evaluation of this condition indicated that the maximum TDAFW pump over speed discharge pressure for this alignment could have been as high as 1,820 psig without accounting for static head of the fire water storage tanks.

The team performed a sample review of components that would be affected by this over pressure condition including the pump discharge piping and AFW flow control valves 2-FW-43A and B. Per Bechtel Specification 7604-MS-1, "Piping Class Summary," EBD, sheet 2, Rev. 12, dated August 28, 1974, the AFW pump's discharge piping design pressure was 1,600 psig, accounting for the excess pressure condition allowed by the ANSI B31.1 Piping Code for conditions less than 1 percent of the time. The AFW flow control valves design pressure was 1,400 psia per NUSCo vendor drawing 25203-29092, sheets 29 and 30. Therefore, these components could experience pressure in excess of their design ratings.

The risk of component rupture, is not considered a significant concern. First, the design pressures of components could be only slightly exceeded. Second, the pump normally operates at speeds well below those capable of generating these excessive pressures and if the pump did operate at the necessary speeds it would only be for very brief periods. In response to this finding, the licensee generated Condition Report (CR) M2-98-2553.

This is an Inspector Followup Item pending NRC's review of the licensee's evaluation and corrective action. (IFI 336/98-203-01)

2.2.2 Inadequate AFW Pump Performance Testing Acceptance Criteria

Siemens Calculation EMF-98-015, Rev. 0, dated June 1, 1998, "Millstone Unit 2 Loss of Normal Feedwater Flow Transient with Reduced Auxiliary Feedwater Flow," was done to demonstrate that the AFW pumps were capable of delivering the required performance for the most demanding Final Safety Analysis Report (FSAR) Chapter 14 event without causing dryout of the SGs or exceeding other design parameters in the fuel or the reactor coolant system. This calculation showed that the maximum allowable performance degradation of these pumps from their reference curves was 5 percent.

Since the AFW pumps performance surveillance tests were performed at minimum recirculation flow conditions, a 5-percent reduction in developed head at minimum flow should have been the minimum acceptable performance allowed in the surveillance test procedure acceptance criteria. However, for all three AFW pumps, the acceptance criteria fell below the performance required by the design basis calculations. Additionally, the procedures acceptance criteria did not account for instrument uncertainties, which further increased the discrepancy between the design basis analyses requirements and these acceptance criteria.

As a result of a similar Tier 2 inspection question, the licensee had generated AR No. 98008632 to determine the accident analyses' required performances for all safety-related pumps, this was in response to NRC Information Notice (IN) 97-90. Additionally, during CMP, the licensee issued CR-M2-97-0525 relating to this issue. The team's review of the AFW system in particular indicated an additional concern. Specifically, the affect of the analyses on the Technical Specification (TS) surveillance acceptance criteria was not assessed. T.S. 4.7.1.2 requires each motor-driven pump to develop ≥ 1,070 psig discharge pressure, and the turbine-driven pump to develop ≥ 1,080 psig discharge pressure.

This is an Unresolved Item pending NRC's review of the licensee's evaluation and corrective action of this issue. (URI 50-336/98-203-02)

2.2.3 MDAFW Pump Room Maximum Temperature

Calculation T-02428, Rev. 1, dated August 19, 1998, "Millstone Unit 2 Turbine Building High Energy Line Break (HELB) Analysis," determined that the maximum temperature in the MDAFW pump room (that has no ventilation system) would be 195 °F for the case of a 4-inch steam line break in the TDAFW pump room discharging for 8 hours. This analysis assumed that at 1 hour into the event, one of the two motor-driven pumps in the room would be secured, eliminating a major heat source. However, the licensee had no analysis demonstrating that AFW system flow requirements at 1 hour could be met with the only remaining MDAFW pump. To the contrary, Siemens Calculation EMF-98-015, Rev. 0, dated June 1998, "Millstone Unit 2 Loss of Normal

Feedwater Flow Transient with Reduced Auxiliary Feedwater Flow," showed that two pumps were required. Additionally, this assumption was not reflected in the plant procedures. Based on the team's observations, calculations performed by the licensee at the end of the inspection indicated that even with two pumps running, temperatures in the room would remain at or below 195 °F. However, the assumptions in T-02428 indicate a lack of communication between various groups to assure design assumptions are correctly used in calculations and properly reflected in plant procedures.

The licensee's failure to correctly translate design bases information into plant procedures is a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that constitutes an additional example of Violation 50-336/98-213-01 and is not being cited individually. No additional response to violation 50-336/98-213-01 is required. Further corrective actions for this example are expected to be taken in conjunction with corrective actions for the previously cited violation.

Calculation T-02428 also addressed the environmental temperature conditions on the mezzanine deck (14-feet, 6-inch level), immediately above the AFW system pump rooms, for various turbine building line break scenarios. The worst scenario with respect to extended time at elevated temperature appeared to be, again, the 4-inch steam line break in the TDAFW pump room discharging for 8 hours. For this event, the pressure relief hatch in the ceiling of the TDAFW pump room would lift to discharge the steam directly into the mezzanine area, where several AFW system flow control components are located, producing a maximum temperature of 304 °F at 25 minutes into the event. The temperature would remain steady for another 6½ hours and then slowly decrease to 208 °F at 28 hours.

The equipment in this area had not yet been formally evaluated by the licensee for this environment, there was some vendor data available from modification package PDCR 2-022-092, Rev. 0, "Millstone 2 - Backup Air Supply for Feedwater Regulator Valves (2-FW-43A and B"), which estimated that the maximum temperature for a main feedwater line break, (considered the enveloping event at that time), would be 220 °F, decaying exponentially to ambient in 20 minutes. From this data, the 2-FW-43 A&B valve positioner and the electro-penumatic converter, the low-pressure regulators, the high-pressure regulators, the instrument air check and relief valves and the 2-FW-44 operator were not qualified for the newly calculated conditions. Additionally, the 2,200 psi backup air bottles installed by this package were incorrectly evaluated for over pressurization at 220°F by Calculation 91-LOE-043M2, "Auxiliary Feedwater Regulator Valve Backup Air Supply," Rev. 3, dated December 5, 1992. The backup in bottles would also require requalification for the more harsh environment. Finally, the licensee had previously identified the CST to hot well makeup valve (CN-241) was a single failure vulnerability upon a HELB in the turbine building (CR-M2 97-1173). The licensee is planning a design change to address that issue. The licensee is tracking the overall issue of turbine building HELB qualification under Licensee Event Report (LER) 98-019. Additional discussion regarding inadequate environmental qualification of equipment can be found in Seciton 4.2.1 of this report.

This is an Unresolved Item pending the NRC's review of the licensee's completed effort to qualify AFW system components on the turbine building at 14-feet, 6-inch level.
(URI 50-336/98-203-03)

2.2.4 Inadequate Configuration Control of AFW Regulator Valves Backup Air Supply

AFW regulating valves 2-FW-43A and B were air-operated valves that were required to open to provide AFW to the SGs for decay and sensible heat removal for various design basis events and accidents. To assure the accomplishment of this function, the valves were designed to open on loss of instrument air. The valves also had the safety function of closing to prevent depletion of the system's safety-related water source, the CST, and to allow the AFW supplies to the SGs to be regulated.

The normal air supply to the valves operators was the nonsafety-related plant instrument air system. Plant Modification PDCR 2-022-92, Rev. 0, "Backup Air Supply for Auxiliary Feedwater Regulator Valves (2-FW-43A and B)," installed nonsafety-related backup air supplies for AFW regulator valves 2-FW-43A/B to assure that they could be closed for all events that might incapacitate normal instrument air. Type K, 2,200 psig air cylinders were specified as the backup air source. However, during a system walkdown, the team discovered one of the cylinders at 2,500 psig. Further review revealed that its rated pressure was 2,400 psig and that it had a rupture disk rated at 4,000 psig. Thus the system configuration had not been maintained in accordance with the system design.

The team also reviewed the applicable operating procedure, OP 2669 A, Rev. 34, Change 1, "PEO Rounds," and found that it also did not correctly reflect the system design. Per the applicable rounds sheet, a backup air bottle pressure as high as 3,350 psig would have been incorrectly considered acceptable.

The licensee's failure to correctly translate design bases information into plant procedures is a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that constitutes an additional example of Violation 50-336/98-213-01 and is not being cited individually. No additional response to violation 50-336/98-213-01 is required. Further corrective actions for this additional example are expected to be taken in conjunction with corrective actions for the previously cited violation.

2.2.5 AFW Feed Regulator Valves Backup Air Supply Not Tested

As described in the previous section, AFW regulating valves 2-FW-43A and B are air-operated valves and require a backup air supply to assure that they could accomplish their functions, even if they lost their normal nonsafety-related air supply.

Calculation 91-LOE-043M2, "Millstone Unit 2, AFW Regulation Valve Backup Air Supply," Rev. 3, determined that the minimum bottle pressure to assure 90-minute availability and five valve strokes was 973 psig, and that the maximum allowable leakage test pressure drop rate was 9.0 psig per minute. However, the team identified that the licensee performed no periodic surveillance testing to verify the stroke capability or certify that the leakage rate was maintained within the allowable value. The team also identified that instrument air check valves 2-IA-680 and 2-IA-675 were not in the licensee's Inservice Test (IST) program. These check valves are located in the backup air system to the AFW flow control valves, 2-FW-43A and 2-FW-43B. The check valves are not in the IST Program because the backup air system is categorized as a nonsafety system. During the CMP, the licensee identified that the backup air system may need to be reclassified as safety-related and issued Action Request (AR) 97029421 to reevaluate the safety classification of the 2-FW-43A/B backup air system. Because the backup air system originally had been installed as nonsafety-related, other aspects of the system do not meet safety-related standards including having required components covered by inservice testing and ensuring that non-seismically-qualified components cannot damage the equipment during a seismic event. The licensee is presently reevaluating the necessary quality standards for the backup in the system.

This issue is considered an Unresolved Item pending the NRC's review of the licensee's evaluation and subsequent corrective actions. (URI 50-336/98-203-04)

3.0 Electrical

3.1 Scope of Review

The team reviewed the AC and Direct Current (DC) distribution systems that supply power to the AFW system components to assure that the systems are capable of supporting those components. The review included capacity, voltages available, and protective device coordination. Also reviewed were the vital switchgear rooms heating, venting, and air conditioning (HVAC) systems and the EDG sequencer system which allows components to be loaded onto the vital buses when offsite power is not available.

The review focused of the AC and DC distribution systems one-line diagrams to verify the capacity of the power sources that supply the systems, and on calculations to confirm the adequacy of the power sources.

3.2 Findings

3.2.1 480-Volt Cable Ampacity

Calculation 7604-E-204-3, "480-Volt Cable Ampacity," was reviewed to assure that installed 480-volt cables were adequate. The calculation sizes 480-volt cables for motors up to 125 hp. The licensee informed the team that this calculation is presently being revised. Change Notice (C/N) No. 1 addressed UIR 2271, which identified cables listed in FSAR Table 8.7-2, whose ampacity may be lower than those shown in the table due to their smaller diameters. This C/N addressed the impact of changed cable outside diameters on cable ampacity for a tray fill of 35 percent in order to address CR M2-97-2352. FSAR change request (FSARCR) 97-MP2-191 was issued to reflect the effect of these changes on the FSAR table. The impact of overfilled cable trays on the allowable cable ampacity is being separately evaluated. The team concluded that additional effort is necessary to evaluate cable tray loading before concluding that all 480-volt cables are sized correctly.

This is considered an Inspector Followup Item pending the NRC's review of the licensee's completion of its analysis of cable tray overfill on cable ampacity (IFI 50-336/98-203-05).

3.2.2 Review of Short Current Analyses

Calculation PA91-004-286E2, "6.9 KV, 4.16KV, and 480-Volt Short Circuit and Equipment Duty Analysis," Rev. 1, changes 1 and 2, was reviewed. The calculation was done using OPAL Version 3.0 which is a load management system developed by Power Technologies Inc., with a quality assurance database to calculate different types of load flow solutions, including short circuits.

The database is provided in Specification SP-EE-344. OPAL models the electrical system from the 345KV switchyard down through the 480-volt MCCs. The team reviewed the assumptions used and the results and that the equipment is satisfactory for its intended service.

3.2.3 Unit 2 Voltage Profile

Calculation PA91-004-276E2, "Millstone Unit 2 Station Service Study-Voltage Profile," Rev. 0, changes 1 and 2, was also reviewed. This calculation also uses the OPAL calculation and database to determine voltages available at all 6.9KV, 4.16KV, 480-volt load centers and 480-volt MCC buses. It is done under steady-state conditions for (1) Mode 1 normal full power on the RSST, (2) Mode 2 normal full power on the NSST, (3) Mode 3 loss-of-coolant-accident conditions with offsite power on the NSST, and (4) Mode 4 refueling on the RSST (light load conditions). The team reviewed the assumptions and results of this calculation and agreed that voltage levels for all AFW components were acceptable.

3.2.4 Large Cable Ampacity

Calculation 7604-E-204-6, "Review of Main Feeder Cable Ampacities," Rev. 1, was reviewed to assure the adequacy of installed high voltage electrical cables. This is a manual calculation originally done in 1972 with R1 issued in 1973. The calculation determined the cable sizes for the feed to buses 24C and D from the RSST, ties between buses 24C-24E and 24D-24E, ties to Unit 1 (bus A5-A6) and sizes to certain loads fed from buses 24C -24D. All cables were sized for a 50 °C ambient and were derated where cable tray covers are used and where run in underground ducts. Cables supplying the 1500 KVA load center transformers were included in the calculation. The team observed that cables to the AFW pumps were not included in the calculation; however, the 350-MCM cables supplying the condensate pumps are capable of carrying 328 amperes at 50 °C ambient, and will envelope the AFW pump. On the basis of this statement and the fact that the AFW pump and tie cables are enveloped by other portions of the calculation. The team is satisfied that cables for AFW components and required ties are properly sized.

3.2.5 Switchgear Relay Settings

Calculation 97-ENG-01912-E2, "Switchgear Relay Settings," Rev. 0, 4.16KV, was reviewed to assure that existing protective relay settings provide adequate protection and coordination. Input for each component to be protected include motor data sheets, transformer ratings, cable ampacity, and relay setpoint drawings. The data was entered into CYMTCC, a relay coordination calculation developed by Coordination Inc. Relay setpoint curves were developed in the program and produced by the software graphics. The team reviewed the curves for the AFW pump and the breaker supplying the 4.16KV transformer supplying the vital 480-volt buses. In addition the team reviewed the curves supplying buses 24C and 24D from the RSST and agrees that the settings to protect the AFW system pump motor and the 4.16KV 480-volt transformer.

The calculation made four recommendations for change setpoints for (1) 1500 KVA transformers, (2) bus tie breakers to bus 24E, (3) low-pressure and high-pressure safety injection pumps, and (4) the tie to Unit 1. In response to the team's request for information about the status of these recommendations, the licensee provided a copy of EWR 98-022, which had been approved for implementation after startup. The team questioned the timing of the change for the low-pressure and high-pressure safety injection pumps because the curves plotted for the pumps showed that the breakers could trip during motor acceleration. The licensee subsequently prepared CR

M2-98-2653 to change the required time of implementation to MODE 4. Issuance of the CR addressed the team's concern.

3.2.6 DC System Analysis

Calculations 97-ENG-01773-E2, "DC System Analysis, Methodology and Scenario Development," Rev. 1, and 97-ENG-01775-E2, "Battery 201B and Charger, Associated Cable and Device Electrical Verification," Rev. 0, were reviewed to assure the adequacy of the unit's DC electrical system. These calculations using computer software programs BATTPRO, DCSDM, and DC/ELF supersede all previous calculations and applicable change notices. The new calculations develop various loss-of-power scenarios that the battery is designed to address. The new calculations determine the following for the installed batteries (1) the minimum required size in accordance with IEEE 485, (2) available voltage at electrical devices during the scenarios, (3) maximum short circuit current at various nodes in the dc system, (4) voltage available at the same nodes with the battery on float, and (5) minimum charger capacity required. Attachment C to Calculation 97-ENG-01775 lists devices requiring analysis because the minimum voltage required for operation has not been provided. Attachment L to the calculation lists devices that will experience over voltage during operation at normal float voltage of 135 volts. Attachment N to the calculation is a tabulation of inverter loading used in the calculation. To insure that inverter loading is maintained within the bounds of this battery sizing, the measured input loading must be at or below 5421 watts for inverter No. 2 and 1987 watts for inverter No. 4. The team reviewed the calculations and is in general agreement with the assumptions and methodology. In response to the team's questions as to planned actions to address Attachments C, L, and N, CR M2-98-2000 was provided. The recommended corrective actions, when implemented, will address the team's concern.

3.2.7 Vital Switchgear Ventilation

Calculations 92-FFP-830 and 831, ES East and West DC Vital Switchgear rooms, and Calculations 92-FFP-932 and 933, ES Lower and Upper Switchgear Rooms, and 4.16 and 6.9 KV, "Heat Gains and Maximum Room Temperature," were reviewed to assure that heat removal for the vital switchgear rooms are adequate. Each of the vital AC switchgear rooms are cooled by separate closed-cycle air subsystems sized for 100 percent of the normal room cooling requirements. Each of the subsystems consisted of fan coil units using service water as the ultimate heat sink. The East 480-load center is located in the auxiliary building and is cooled 100 percent by outside air. The DC switchgear rooms are provided with closed-cycle air subsystems using mechanical refrigeration. The calculations show that 40 °C ambient is maintained except in one case. For the upper switchgear room, a safety injection actuation signal (SIAS) without loss-of-normal-power, the temperature rises to 50 °C. In response to the team's questions about the exception, the licensee provided memo EIC-93-136 which described the results of an engineering evaluation of the potential for inadequate or complete loss of service water. This evaluation concluded that at 50 °C the switchgear had to be derated to 82 percent of its rating, but that there was sufficient margin to do so. The evaluation also included cable in the room (which had been sized for 50 °C) and auxiliary motors which the evaluation stated were also capable of operation at the higher ambient temperature. The licensee also provided a copy of FSARCR 93-MP2-45 which was written to address this elevated temperature. The team found the licensee's evaluations satisfactory.

3.2.8 120-Volt Vital AC System

During the review of the 120-volt vital AC system, the team noted that a fault at VA10 or VA20 would cause the faulted panel to switch to its backup source due to the current-limiting feature of the inverter. Since the backup inverter has the same current limiting feature as the primary inverter it's voltage would also collapse and the fault would not be cleared. The licensee concurred with the staff evaluation and stated that in such case the redundant supply would be available. The team agreed with the licensee, but noted that this arrangement was not in agreement with FSAR Section 8.6.2.2, that states, "The distribution panels (VA10-VA40) provide feeder protection by the use of molded case circuit breakers with thermal magnetic trips." In response to the team's concerns, the licensee provided the team a copy of DCR M2-98008. The purpose of this DCR is to implement modifications required to resolve concerns regarding the lack of adequate coordination afforded by the present design of the Millstone 2 vital bus system. The modifications included in this DCR were for circuits required for Modes 5 and 6. Revision 1 to this DCR will address the balance of circuits required for Mode 4. The DCR also states that certain branch circuits required to support core reload do not require modification. Engineering Evaluation M2-EV-98-0041 is intended to demonstrate that the latter branch circuits inherently provide vital bus isolation by virtue of unique circuit and/or component design features. The team concluded that, when implemented, the DCR will address the team's concern. Further, the team concluded that the engineering evaluation provided a satisfactory basis for omitting certain branch circuits in the DCR.

3.2.9 Electrical Train Separation

The team inspected the main control room panel C05 to assess how separation was accomplished for relays 86/Z1A and 86/Z1B, used in the automatic initiation circuit for AFW facility Z1. It was noted that redundant wires from these relays came within 6 inches of each other and that heat-shrinkable tubing was used as the barrier. The team noted that the tubing used was colored blue, which is the color used for safety channel 4 devices. The wiring that was protected by the tubing is either safety channel 1 or 2 wire which are colored yellow and red. It was not initially apparent to the team that heat-shrinkable tubing was in use and the coloring definitely caused confusion. When the licensee was questioned about the practice of using heat-shrinkable tubing of the same color as wiring for another safety channel, the team was provided a copy of Parsons DR M2-97E0001-18 which identified the condition earlier and that recommended corrective actions to tape the blue tubing with red or yellow tape as appropriate. The team concluded that the choice of blue tubing was a poor one, but that the addition of appropriately colored tape would acceptably address the issue.

3.2.10 Emergency Diesel Generator Sequencer

The diesel sequencer at Millstone Unit 2 consists of a module in the engineered safeguards actuation system (ESAS) cabinet that generates timing pulses of 0, 2, 8, 14, and 20 seconds when an under voltage is sensed on either bus 24C or 24D, and after is determined that the safeguards buses are isolated and the diesel generator breaker is closed.

The team noted that LER 97-026-00 documented an invalid ESAS actuation occurred while shifting from normal to reserve station service transformers. Investigation indicated that the signal was generated by a random fuse failure. During reviewing of this event, the team also reviewed LER 95-028 which described an instance in which both diesel generators started and several other engineered safety function (ESF) components were activated. In that case, the cause was attributed to electromagnetic interference (EMI) during surveillance testing. The team noted that there have been other instances of noise problems with the sequencer module. PDCR 2-026-93 added noise suppression devices to the ESAS cabinets with some success noted. DCR M2-97050 replaces the sequencer modules with those of a different vendor who has done extensive EMI testing and has demonstrated that the new module would not be susceptible to EMI. The team's review of the sequencer for Unit 2 found the logic to be simple and straightforward. The additional testing after installation required by the DCR should confirm whether the EMI problems have been solved.

4.0 Instrumentation and Control

4.1 Scope of Review

The team reviewed the AFW automatic initiation logic and its implementation, control functions (pump and valve controls), and monitoring and status functions (including those supporting licensee commitments to Regulatory Guide (RG) 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident". The team also reviewed selected set point calculations, logic diagrams, elementary diagrams, loop diagrams, the configuration database for microprocessor-implemented AFW initiation functions, instrument installation details, design modifications and supporting documents. In addition, the team reviewed a sample of AFW control equipment with respect to environmental qualification and 10 CFR Part 50, Appendix R, safe-shutdown compliance. The team also physically inspected selected instrument and control installations such as the CST level instrumentation, AFW flow instrumentation and tubing, control room instrumentation, the fire shutdown panel, the hot shutdown panel, and the TDAFW pump controls.

4.2 Findings

4.2.1 Inadequate Environmental Qualification of AFW Instrumentation and Control (I&C) Components

The team identified two concerns regarding the capability of AFW I&C components to perform their safety functions in the harsh environment resulting from the design basis accident that the components are required to mitigate. The first involved the electro-pneumatic signal converter and valve positioner associated with AFW regulating valves 2-FW-43A and B; the second involved the TDAFW pump speed-changing motor and resistors.

Electro-pneumatic converters PY 5276 and PY 5279 and the corresponding valve positioners had not been environmentally qualified. The licensee told the team that they had assumed that the AFW regulating valves would be fully opened by the qualified pilot solenoid valves and would not need to be subsequently positioned (throttled) for safe shutdown. However, the team noted that if the steam line serving the TDAFW pump ruptured, the HELB could be propagated from the TDAFW pump room through the relief hatch at 14-feet and 6-inch elevation above the room. This scenario could expose the electro-pneumatic converters and valve positioners to the effects of an HELB, for which they had not been qualified. The TDAFW pump would be inoperable during this event, due to the steamline rupture, therefore, this event could result in loss of the inability to control AFW flow with consequent overfeed or overfill of the SGs. To address the team's concern, the licensee issued CR M2-98-2826.

The TDAFW pumps speed changing motor and resistors are located in the TDAFW pump room. In investigating the qualification and configuration of these control components for design basis HELB conditions, the team determined that no environmental qualification data for these installed components were retrievable. The licensee indicated that a temperature profile peaking at 281 °F would exist for an HELB outside the pump room. To address the team's concerns, the licensee issued CR M2-98-2840.

This is an Unresolved Item pending NRC's review of the licensee's evaluation of the issues discussed in the two CRs. (URI 50-336/98-203-03).

4.2.2 Vulnerability of AFW System to a Fire or Explosion Originating in Hydrogen Lines Routed in the Fire Area Containing the AFW Flow-Regulating Valves

During a plant tour, the team noted that hydrogen lines were routed within fire area R-3, which also included the redundant AFW control valves and other redundant AFW components and cabling. The team requested the licensee to provide the safe-shutdown analysis and fire hazards analysis that justified this configuration.

In response to this request, the licensee provided the team its Appendix R exemption request (NU letter to Docket, Subject: Millstone Nuclear Power Station, Unit 2, 10 CFR Part 50, Appendix R "Request for Exemption," dated February 29, 1988), and the NRC staff letter (NRC letter from John F. Stolz to Edward J. Mroczka, Subject: Appendix R Exemption for Millstone Unit 2, April 29, 1988), that granted the exemption from Section III.G.2.b of Appendix R. For redundant AFW control valves 2-FW-43A and B, this exemption relieved the licensee from the requirements for 20 feet separation free of intervening combustibles, with fire detection or suppression capabilities. The exemption was granted on the basis of a failure analysis and fire hazards analysis that the licensee had submitted. Given the configuration observed in the field for fire area R-3, the team noted that the fire hazards analysis (FHA) submitted to NRC staff to support the exemption request did not identify the hydrogen line or its appurtenances (meters, fittings, etc.) as a potential fire source or combustible for the fire zone containing the AFW control valves and the potential effect on components such as the electro-pneumatic signal converter, the valve positioner, the pilot solenoid valve mechanism, and the control valve itself.

Additionally, the safe-shutdown failure analysis to support the exemption of AFW flow control valves did not address flow-regulating and SG level control capability. The licensee indicated that credit would be taken for speed control of the TDAFW pump, but this was not mentioned in the basis of the exemption of record.

The licensee informed the team that the suppression features for this fire area were being improved as a result of a recent technical evaluation (FP-EV-98-0005, "Technical Evaluation of the Partial Suppression and Partial Detection in Appendix R Fire Area R-3," Rev. 0, dated June 29, 1998). To address the team's concerns, the licensee issued CR M2-98-2566.

The licensee also stated that the potential effect of the hydrogen line on the AFW system components will be addressed as part of the ongoing fire hazards evaluation.

This issue remains an Inspector Followup Item pending NRC's review of the licensee's evaluation and corrective action. (IFI 50-336/98-203-06)

4.2.3 Material Condition of Resistors and Connections Used in Speed-Setting Circuit for TDAFW Pump

During a selective walkdown of the TDAFW pump room and control components, the team found that the resistors in the speed changing control circuit were installed within an unlabeled box near the turbine. The box had ventilation holes on one side but no provisions for draining condensate. Examination of the inside of the box revealed evidence of significant moisture accumulation (rust and rust stains) in the box and on the wiring. The condition of the connections appeared unsatisfactory. The resistors are part of the 125 Vdc circuit for raising or lowering turbine speed from the control room or remote shutdown panels. A single ground on the circuit would not affect operation provided there were no other grounds on the 125 Vdc system serving the speed-setting motor. However, if the circuit were open or the resistors were shorted, the remote speed control would be rendered inoperable or erratic. The box actually contained three resistors rather than the two shown on the schematic, but the licensee determined that the resistance values and configuration were equivalent to those shown on the schematic. To address the team's concerns, the licensee issued CR M2-98-2802. As a result of the walkdown performed to review the team's concern, the licensee also found the governor speed-changing motor felt warm. The circuit's design is such that the motor should be energized only when speed is being manually raised or lowered; therefore, the warm motor suggested the possibility that short or "sneak" circuit that was energizing the motor. The licensee included this concern in CR M2-98-2802.

This is an Inspector Followup Item. (IFI 50-336/98-203-07)

5.0 Structures and Supports

5.1 Scope of Review

The team reviewed Piping Stress Problem 3, "Main Steam to Auxiliary Feedwater Pump Turbine Problem 3," Rev. 3, "Pipe Support Calculation C-013, Rev. 1, "Re-evaluation of Pipe Supports for Stress Problem 3 Limitorque Actuator Replacement for MOV: MS-202," and Specification SP-M2-ME-030, Rev.0, "Specification for Rigorous Piping Stress Analysis and Pipe Support Design." In conducting the review, the team sought to confirm that NNECO prepared the calculations in accordance with licensing and design bases for Millstone Unit 2 contained in the FSAR.

The team also reviewed seismic and structural documents for the CST including 90-032-422-EC, Rev. 1, "MP-2 CST N_2 Blanket - Seismic Review Plus Modifications - Part 1," Calculations 90-032-423-EC, Rev. 1, "MP-2 CST N_2 Blanket Pressure Review Plus Modifications - Part 2," 17272.02-NM(B)-001, Rev. 2, "Evaluation of New Weather Enclosure and Platform Associated with the CST Modifications," and 17272.02-NM(B)-007, Rev. 2, "Generation of CST Nozzle Loads and Evaluation of Local Stresses at Nozzle-Shell Intersection." The CST is the preferred source of water for the AFW pumps and the above calculations provide the basis for demonstrating that the CST can withstand the FSAR loadings due to seismic, wind, and tornado wind forces.

5.2 Findings

5.2.1 Integrated Welded Attachment Evaluations

Pipe Stress Problem 3 includes the piping from the main steam header to the inlet nozzle of the AFW pump turbine. The calculation was revised to incorporate Limitorque actuator replacement for MS-202 valve and to reevaluate pipe break locations. Piping Stress Problem 3 also contains calculations for integral welded attachment (IWA) evaluations. The loadings for pipe support 413063 are reported in three directions and, therefore, the IWA evaluation should consider for all three loadings. However, the evaluations provided in Piping Problem 3 only accounted for two of the loadings. Section 3.13.4 of Specification SP-M2-ME-030 identifies approved methods for the qualification of IWAs to Code B31.7, Class II or III, or Code B31.1 piping. Other methods may be applied with prior approval of the design engineering supervisor. The IWA evaluation for pipe support 413062 used an unapproved method without the approval of the design engineering supervisor. The licensee agreed to evaluate these issues by performing a CCN to Piping Stress Problem 3 before restart. These items are being tracked by CR M2- 98-2969.

5.2.2 CST Stress Calculations

CST calculation 17272.02-NM(B)-007 determines the local stresses at the nozzle-shell intersection, and CST calculation 90-032-423-EC determines the free field stresses in the tank. However, neither calculation attempted to combine the effects of the free field stresses with the local stresses. The licensee agreed to corrective action that will revise calculation 17272.02-NM(B)-007, and combine local stresses with the free field stresses as required. Based on the team's review, there did not appear to be a safety issue; however, the licensee is tracking this item in CR M2-98-2710.

The completion of the calculations identified in the CRs M2-98-2969 and M2-98-2710 is an Inspector Followup Item. (IFI 50-336/98-203-08)

6.0 Operations

6.1 Scope of Review

Evaluate the AFW system emergency, abnormal, and normal operating procedures, TSs, the Technical Requirements Manual (TRM), operator training modules, and the FSAR description and accident analyses.

6.2 Findings

6.2.1 Inadequate TS Clarification

The team reviewed the Unit 2 TRM and an incorporated TS Clarification 3.7.1.2(1), which allows Unit 2 to operate for up to 72 hours with one of the two AFW flow paths inoperable. The team concluded that this was an unanalyzed condition in that the minimum equipment described in the FSAR accident analysis would not be available during an event involving a faulted SG with the inoperable AFW flow path to the intact SG. The consequence of operating in this condition is that, with a fault in the SG with the operable flow path, no AFW flow would be provided to the operable SG.

TS Clarification 3.7.1.2(1) was processed in accordance with EN 21224, "Control of Technical Requirements Manual," Rev. 1, dated November 8, 1994. Revision 1 to EN 21224 did not require that 10 CFR 50.59 safety evaluations (SEs) be performed for TS clarifications; therefore, an SE was not performed for TS Clarification 3.7.1.2(1). Although an SE was not performed, the Plant Operations Review Committee approved TS Clarification 3.7.1.2(1).

Millstone Unit 2 TS 3.7.1.2 covers AFW operability requirements but discusses only operability of the AFW pumps. AFW flow path requirements are not addressed in Unit 2 TSs. TS Clarification 3.7.1.2(1) requires that when either 2-AFW 43A or B (the single flow paths to each SG) was declared inoperable, a 72-hour limiting condition for operation (LCO) would be entered. The LCO would be exited after the inoperable AFW flow control valve was isolated and a dedicated operator stationed at the bypass valve, 2-AFW 56A or B. The purpose of the dedicated operator was to throttle AFW 56A or B, as directed by the control room, to control AFW flow to the SG. The licensee stated that it may take several hours to station the dedicated operator once the AFW flow control valve was declared inoperable.

Standard Combustion Engineering (CE) TSs describe operability requirements for AFW and allows a unit to operate for up to 72 hours with one AFW flow path inoperable . However, the bases for the Standard CE TSs assume that there are two AFW flow paths to each SG. Therefore, an AFW flow path to a SG would be available when the other flow path to the same SG was inoperable. This is in contrast with the Millstone Unit 2 design of only a single AFW system flow path to each SG.

10 CFR 50.59 states that the holder of a license authorizing operation of a utilization facility may make changes in the procedures as described in the safety analysis report without prior Commission approval, unless the proposed change involves a change in the technical specifications incorporated in the license or an unreviewed safety question. The team concluded that TS Clarification 3.7.1.2(1) was processed without performing a 10 CFR 50.59 safety evaluation and allowed Unit 2 to operate for up to 72 hours with one of the two AFW flow paths inoperable, a situation that had not been previously evaluated in the FSAR. Operation of Unit 2 with one of the two AFW flow paths inoperable is an unreviewed safety question because the consequences of an accident previously evaluated in the FSAR may be increased and, therefore, such operation requires Commission approval.

The failure to perform a safety evaluation for TS Clarification 3.7.1.2, is an apparent violation of 10 CFR 50.59. (EEI 336/98-203-09)

6.2.2 Operation of the TDAFW Pump With One of the Two Steam Supplies Isolated

Steps 4.14 and 4.19 of Operating Procedure (OP) 2322, "Auxiliary Feedwater System," Rev. 23, Change 5, provide instructions for operation of the unit with one of the two steam supplies to the TDAFW pump (2-MS-201 or 2-MS-202), closed. The procedure requires that the operator take specific manual actions in areas outside of the control room before starting the TDAFW pump. The manual actions involved operating valves to drain condensate from the turbine steam supply piping.

The licensing and design bases for Millstone Unit 2 state that the TDAFW pump can be started within 10 minutes from the control room after a loss of feedwater. The team questioned whether this licensing and design basis requirement could be met with 2-MS-201 or 2-MS-202 closed. The licensee issued CR M2-98-2625 to resolve this issue.

This item is unresolved pending NRC's review of the licensee's resolution of CR M2-98-2625. (URI 50-338/98-203-10)

Additionally, valves 2-MS-201 and 2-MS-202 are susceptible to pressure locking and thermal binding. Section 4.19 of OP 2322 instructs operators to open 2-MS-201 or 2-MS-202 to prevent pressure locking and thermal binding every 8 hours when a valve is closed in Mode 1, 2, or 3. The team questioned the basis and justification for cycling the valves every 8 hours. The licensee was not able to provide this information during the inspection and issued CR M2-98-2822 to resolve this issue.

This is an Inspector Followup Item. (IFI 50-336/98-203-11)

6.2.3 Operation with an Inoperable AFW Flow Valve

In the event that an AFW flow control valve, 2-FW-43A or B, becomes inoperable, steps 4.12 and 4.13 of OP 2322 direct the operator to isolate the affected 2-FW-43A/B flow path and station a dedicated operator at the associated AFW flow control bypass valve, 2-FW-56A/B. The team reviewed the SE, dated March 16, 1994, for this evolution. The team noted that the SE did not address whether an HELB in the turbine building would affect the ability of an operator to maintain manual control of 2-FW-56A/B. During the current outage, a potential for a HELB in the turbine building was identified by the licensee. The licensee issued CR M2-98-2800 to resolve this team's concern.

This is an Inspector Followp Item. (IFI 50-338/98-203-12)

6.2.4 Inconsistent Physical Protection for AFW Valves

During a walkdown of the AFW system, the team noted that certain valves in the AFW system were protected inside vital areas while other valves performing the same function were protected solely by valve anti-tamper switches. When the team raised this question to the licensee, the initial response was that such an arrangement provided equivalent protection. However, the team noted that if the tamper switches were rendered inoperable, present procedures would only require operators to increase the frequency of rounds. However, inoperability of a vital door or alarm would require continuous compensatory action by plant security personnel. In response to this concern, the licensee issued CR M2-98-2693.

This is an Inspector Followup Item. (IFI 50-338/98-203-13)

7.0 Maintenance

7.1 Scope of Review

Evaluate the AFW check valve, TDAFW pump, MDAFW pump, and flow control valve vendor technical manuals, and conduct an in-depth system walkdown.

7.2 Findings

The team found maintenance practices for the components reviewed to be in accordance with vendor requirements. The team also found the NRC information notices were properly evaluated and corrective actions were implemented when appropriate.

8.0 Surveillance

8.1 Scope of Review

The team reviewed the surveillance procedures that implement AFW TS Surveillance Requirements 4.3.2.1.1, 4.3.2.1.2 (Table 4.3-2(9.b) and Table 4.3-2(9.c)), 4.7.1.2.a.1, 4.7.1.2.a.2.a, 4.7.1.2.a.2.b, 4.7.1.2.a.3, 4.7.1.2.a.4, 4.7.1.2.a.5, 4.7.1.2.a.6, 4.7.1.2.b, 4.7.1.2.c.1, 4.7.1.2.c.2., and 4.7.1.3. The team also reviewed the procedures testing the system and support system pumps and valves to verify that they were tested in accordance with the ASME Boiler and Pressure Vessel Code, Section XI. Finally, the team evaluated the adequacy of the surveillance for the AFW pump Room water tight door and the condensate pit level switches 2-LS-6901A/B/C/D.

8.2 Findings

8.2.1 Testing of CST Relief Valves and Rupture Disks

CST pressure control devices, relief valves 2-CN-571 and 2-CN-572 and rupture disks 2-PSE-7201A/B/C/D were not in the licensee's IST program. At the end of the inspection CR M2-98-2832 was initiated to evaluate if the pressure control devices are required to be included in the IST program.

This is considered an Unresolved Item pending the NRC's review of the licensee's determination of whether the components need to be in the IST program. (URI 50-336/98-203-14)

9.0 Evaluation of Parsons Power Group Inc. (Parsons) Activities

The team's review did not encompass all Tier 1 systems reviewed by Parsons, but concentrated on the systems and portions of systems selected for the NRC "in-scope" review (AFW and EDG sequencer), as described in Section 1 of this report.

In assessing the quality of Parsons' review, the team first compared its onsite findings with the DRs generated by Parsons. The team evaluated the DR quality, classification, and the response of the licensee to the DR, where available. The team verified that all components within the system boundaries were reviewed by all necessary Parsons disciplines. Finally, the team checked to ensure that programmatic areas, such as an HELB and environmental qualification, had received an acceptable review. The team noted that the number of DRs written by the Parsons reviewers on the systems within the NRC onsite inspection scope exceeded the number of findings made by the inspection team. This is attributed to the significantly greater resources in terms of personnel and time expended by Parsons. The team observed that Parsons had identified many issues that were similar to those the team identified.

The team only identified one issue not discovered by Parsons. Parsons' reviews failed to identify that the implementation of TS Clarification 3.7.1.2(1) had the potential to result in the loss of AFW flow. The team explored the reason why Parsons failed to identify the improper clarification and concluded that the failure was an isolated weakness attributable to an inadequate understanding of the system configuration by the individual reviewing the TRM. Given the unique nature of the Unit 2 system design, the team considered this to be an isolated problem in an otherwise well performed review by Parsons. To ensure that no other issues were missed, Parsons reverified their reviews of all TS Clarifications applicable to the Tier 1 systems using an expanded review team comprised of individuals with operations engineering background. No additional problems were identified.

10.0 Conclusions

The team identified the apparent violation regarding the failure to properly evaluate a TRM clarification that allowed isolation of the single flow path for AFW system to one of the two steam generators (SGs). From the standpoint of the potential impact on plant safety, it is significant because, with the AFW in the allowed condition, a main steam line break on the opposite SG would result in a condition outside the accident analysis assumptions. Specifically, in such a scenario no AFW would be supplied to an intact SG. The finding is also significant because it was missed by the licensee's CMP review as well as the Parsons' review.

The team also noted that the ICAVP Tier 2 inspection (Inspection Report 50-336/98-213) identified an apparent configuration control process weakness regarding the proper translation of accident analyses inputs and assumptions into the facility design and plant operating procedures and the reconciliation of the facility design and procedures to the accident analyses inputs and assumptions. This apparent violation and other findings in this report are additional examples that further highlight that concern.

Overall, the breath and depth of the Parsons' review was comprehensive, and the Parson's review was conducted in accordance with the NRC approved audit plan.

While the AFW system was undergoing modifications (both physical and analytical), the team was able to review a substantial portion of the AFW system design, including some of the modifications completed during the outage. Based on the team's independent design review and on the team's assessment of the Parsons implementation of Tier 1, preliminary indications are that NNECO's CMP was generally effective in identifying and correcting nonconformance with the plant design and licensing bases.

Before a final conclusion can be drawn from this inspection on the readiness of the AFW system, the corrective actions for the many outstanding issues identified in the report will have to be completed.

11.0 Entrance and Exit Meetings

Upon arriving onsite, the team conducted an entrance meeting to formally brief the licensee on the scope and duration of the inspection.

After completing the onsite inspection, the team conducted an exit meeting with the licensee on October 6, 1998. During the exit meeting, which was open for public observation, the team leader presented the results of the inspection. The team leader subsequently answered questions concerning the inspection at a public meeting held at the Waterford Town Hall on the evening of October 6, 1998. Appendix B presents a partial list of persons who attended the entrance and exit meetings.

Appendix A

List of Violations, Unresolved Items, and Inspector Followup Items

This report categorizes the inspection findings as violations (VIO), apparent violations being considered for escalated enforcement (EEI), unresolved items (URIs), or inspector followup items (IFI), in accordance with Manual Chapter 0610 of the NRC Inspection Manual. A violation is a matter about which the Commission has determined that there is enough information to conclude that a violation of a legally binding requirement has occurred. A URI is a matter about which the Commission requires more information to determine whether the issue in question is acceptable or constitutes a deviation, nonconformance, or violation. The NRC may issue enforcement action resulting from its review of the identified URIs. An IFI is a matter for which additional information is needed that was not available during the inspection.

Item Number	Finding Type	Section	Title
50-336/98-203-01	IFI	2.2.1	Potential AFW system overpressure on TDAFW overspeed
50-336/98-203-02	URI	2.2.1	Inadequate TS surveillance values for AFW pumps
50-336/98-203-03	URI	2.2.3 4.2.1	Environment Qualification of AFW components in turbine building
50-336/98-203-04	URI	2.2.5	Qualification of AFW backup air system
50-336/98-203-05	IFI	3.2.1	Affect cable tray overfill on cable ampacity
50-336/98-203-06	IFI	4.2.2	Adequacy of Appendix exception fire area R-3
50-336/98-203-07	IFI	4.2.3	Material condition of TDAFW pump speed control circuitry
50-336/98-203-08	IFI	5.2.1 5.2.2	IWA and CST stress calculations
50-336-98-203-09	EEI	6.2.1	Apparent violation for failure to perform required 50.59 evaluation
50-336/98-203-10	URI	6.2.2	Operation with 2-MS-201 or 202 closed
50-336/98-203-11	IFI	6.2.2	Susceptibility of 2-MS-201 and 202 to pressure locking/thermal binding
50-336/98-203-12	IFI	6.2.3	Dedicated operator for 2FW-56A/B
50-336/98-203-13	IFI	6.2.5	Equivalency of AFW security measures
50-336/98-203-14	URI	8.2.1	Testing of CST pressure control devices and relief valves

Appendix B

Entrance & Exit Meeting Attendees

NAME	ORGANIZATION
Steve Brinkman	MP2 Engineering Director
Mike Ahern	MP2 Engineering
Joe Fougere	Mgr ICAVP*
Martin Bowling	MP2
Harry Miller	MP2
Eugene Imbro	NRC/ Director, ICAVP
Larry Nicholson	NRC/Region I/ Deputy Director, DRS+
Peter Koltay	NRC/ICAVP
James Luehman	NRC/ICAVP/Team Leader
Stephen Tingen	NRC/ICAVP*
Victor Ferrarini	NRC/Contractor*
Donald Prevatte	NRC/Contractor*
James Lievo	NRC/Contractor*
Ray Cooney	NRC/Contractor*
David Beaulieu	NRC Senior Resident Inspector
Terry Concannon	NEAC*
John Markowicz	NEAC

*Attended Entrance Meeting only
+Attended Exit Meeting only

Appendix C

List of Documents Reviewed

(Individual drawings, calculations, LERs, CRs, and ORs specifically referenced in the report)

1. PROCEDURES

a. Emergency Operating Procedures

EOP 2525, Standard Post Trip Action, Revision 16
EOP 2526, Reactor Trip Recovery, Revision 12
EOP 2528, Electrical Emergency, Revision 10
EOP 2530, Station Blackout, Revision 4
EOP 2532, Loss of Primary Coolant, Revision 15
EOP 2534, SG Tube Rupture, Revision 14
EOP 2536, Excess Steam Demand, Revision 14
EOP 2537, Loss of All Feedwater, Revision 12
EOP 2540, Functional Recovery, Revision 17
EOP 2540B, Functional Recovery of Vital Auxiliaries (AC and DC Power), Revision 9
EOP 2540D, Revision 13, 5/14/98, Functional Recovery of Heat Removal

b. Operating Procedures

OP 2201, Plant Heatup, Revision 27
OP 2203, Plant Startup, Revision 13, Change 3
OP 2207, Plant Cooldown, Revision 22
OP 2315C, Turbine Ventilation System, Revision 12
Op 2316A, Main Steam System, Revision 29, Change 3
OP 2319B, Condensate Storage And Surge System, Revision 13, Change 2
OP 2322, Revision 23, Change 8, 6/12/98, Auxiliary Feedwater System.

c. Surveillance Procedures

SP-2660, Revision 6, 10/14/84, Feedwater Pump Turbine Periodic Testing.
SP 2618A, Revision 7, Fire Protection System Fire Pump Automatic Start Test.
SP 2610A, Revision 8, 3/8/96, Motor Driven AFPs Operability and Inservice Testing.
SP-2402S R0 3/19/97 Auto AFW Calibration and Functional Test
SP-2403GB Facility 2 RSST UV Time Delay Calibration
SP-M2-IC-019, Millstone Unit 2 I&C Setpoints, Revision 00.
SP-ST-EE-286, Guidelines for Calculating Instrument Uncertainties, Revision 6.
SP-EE-315, Millstone Unit 2 Guidelines for Calculating Setpoints for Safety Systems, Revision
SP-ST-EE-329, Standard Specification for Use and Control of Master Set point Index, Revision
EN-21009, Secondary Plant Performance Monitoring, Revision 3
EN 21063F, 480V and 4160V Switchgear Room Ventilation Test, Revision 4
IC 2429E, Condensate Storage Tank Level Calibration, Revision 1, Change 3
IC 2440, Circulating Water Pump Trip Functional Test, Revision 0
IST 2-98-01, Post-Modification Testing of Cavitating Venturis for AFW Pump Discharge, Revision 1
SP 2402M, Function Test of Steam Generator Level and Auto Auxiliary Feedwater Initiation Logic, Revision 7
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Appendix D

List of Acronyms

AC	Alternating Current
AFW	auxiliary feedwater
AR	action request
CCN	calculation change notice
CFR	*Code of Federal Regulations*
CMP	Configuration Management Plan
CR	condition report
CST	condensate storage tank
DC	Direct Current
DR	deficiency report
EDG	emergency diesel generator
ESAS	engineered safeguards actuation system
ESF	engineered safety feature
FSAR	Final Safety Analysis Report
FSARCR	Final Safety Analysis Report Change Request
HELB	high energy line break
HVAC	heating, ventilaiton and air conditioning
ICAVP	Independent Corrective Action Verification Program
IFI	Inspection Followup Item
LOCA	loss-of-coolant accident
MCC	motor control center
MDAFW	motor-driven auxiliary feedwater
MOV	motor-operated valve
NNECO	Northeast Nuclear Energy Company
NRC	Nuclear Regulatory Commission (U.S.)
OP	operating procedure
PEO	plant equipment operator
P&ID	piping and instrumentation diagrams
PDR	Public Document Room (NRC)
QA	quality assurance
RG	Regulatory Guide
RSST	reserve station service transformer

SG	steam generator
TDAFW	turbine-driven auxiliary feedwater
TRM	Technical Requirements Manual
TS	Technical Specification
URI	unresolved item
VIO	violation