January 6, 2003

Mr. J. Alan Price, Site Vice-President - Millstone
c/o Mr. David Dodson, Acting Manager - Licensing
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

SUBJECT: MILLSTONE, UNIT 2 - NRC INSPECTION REPORT NO. 50-336/02-012

Dear Mr. Price:

On November 22, 2002, the NRC completed a team inspection at the Millstone Nuclear Power Station, Unit 2. The enclosed report documents the inspection findings which were discussed on November 22, 2002, with Mr. S. Scace and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety system design and performance capability of the Unit 2 auxiliary feedwater and service water systems, compliance with the Commission's rules and regulations, and with the conditions of your license. The inspection consisted of systems walkdown, examination of selected procedures, drawings, modifications, calculations, surveillance tests and maintenance records and interviews with site personnel.

Based on the results of this inspection, the team identified two findings of very low safety significance (Green), and both issues were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they have been entered into your corrective action program, the NRC is treating these issues as non-cited violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny any of these non-cited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; and the NRC Resident Inspector at the Millstone, Unit 2 facility.

In accordance with 10CFR2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's Agency Wide Document and Access Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Lawrence T. Doerflein, Chief
Systems Branch
Division of Reactor Safety

Docket No. 50-336
License No. DPR-65

Enclosure: Inspection Report 50-336/02-012

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J. Alan Price i

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.:	50-336
License No.:	DPR-65
Report No:	50-336/02-012
Licensee:	Dominion Nuclear Connecticut, Inc.
Facility:	Millstone Nuclear Power Station, Unit 2
Location:	P. O. Box 128 Waterford, Connecticut 06385
Dates:	November 4 - 8 and November 18 - 22, 2002
Inspectors:	A. Della Greca, Senior Reactor Inspector, Team Leader, DRS R. Berryman, Reactor Inspector (Trainee), DRS G. Cranston, Reactor Inspector, DRS P. Kaufman, Sr. Reactor Inspector, DRS G. Morris, Reactor Inspector, DRS R. Keefer, Reactor Inspector (Trainee), DRS D. Schroeder, Reactor Inspector, DRS M. Shlyamberg, USNRC Contractor
Approved By:	Lawrence T. Doerflein, Chief Systems Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000336/02-012; on 11/4-8 and 11/18-22/2002; Millstone Nuclear Power Station, Unit 2; Safety System Design and Performance Capability.

The inspection was conducted by five region-based inspectors and one NRC contractor. Two findings of very low safety significance (Green) were identified, both of which were considered to be non-cited violations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 “Significance Determination Process” (SDP). Findings for which the SDP does not apply may be “Green” or may be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process,” Revision 3, dated July 2000.

Cornerstone: Mitigating Systems

Green: The team identified that a small line high energy line break (HELB) in the turbine building could cause a loss of both motor-driven auxiliary feedwater (MDAFW) pumps. The loss of the pumps would be the result of the motor bearings overheating and failing due to the high ambient room temperatures caused by the small line HELB.

This issue was considered to be of very low safety significance (Green) based on a Phase 1 evaluation of the Significance Determination Process (SDP) because the inadequate cooling of the AFW pump motor bearings was a design deficiency of the AFW system that did not result in an actual loss of system function. The issue was determined to be a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control. (Section 1R21.1)

Green: The team identified that the design bases of the service water system (SWS) pertaining to pump operation following a flooding event were not correctly translated into instruction because, (1) the need to and the steps that are required to restore operability of the SWS within two hours were not included in the applicable plant procedure; and (2) the steps required to initiate manual blowdown of the SW strainers were not included in the applicable plant procedure.

This issue was considered to be of very low safety significance (Green) based on a Phase 1 evaluation of the Significance Determination Process (SDP) because the inadequate service water system restoration procedure was a system design deficiency that did not result in an actual loss of system function. The issue was determined to be a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control. (Section 1R21.2)

Report Details

1. REACTOR SAFETY
Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Safety System Design and Performance Capability (71111.21)

a. Inspection Scope

The team reviewed the design and performance capability of the Unit 2 auxiliary feedwater (AFW) and the service water (SW) systems. The AFW system functional requirement is to provide cooling to the steam generators, on low steam generator water level, with or without AC power. When AC power is available, the system functional requirements are satisfied by two motor-driven pumps that are automatically initiated. During a station blackout, steam generator level is maintained by an independent subsystem that includes a manually initiated turbine-driven pump. The SW system functional requirement is to provide a dependable source of cooling water to essential plant heat loads to permit the safe shutdown and cooldown of the reactor, maintain shutdown conditions, and to allow control of an accident, in the event that one should occur. These functions are provided by three vertical half-capacity pumps that supply water to the essential loads through two redundant, independent, cross-connected headers.

The team also reviewed portions of selected supporting systems such as the ac and dc power systems. The team reviewed the AFW and SW system design basis documents (DBD), the Technical Specifications (TS), the Updated Final Safety Analysis Report (UFSAR), and design output documents. The design output documents reviewed included system calculations, piping and instrumentation drawings (P&ID), system logic diagrams, schematic diagrams, instrumentation loop diagrams and one-line diagrams. This review was performed to determine whether the system and component functional requirements during normal, abnormal, and accident conditions were being met and to ensure consistency with various design documents, design specifications, and control diagrams.

The team reviewed selected electrical calculations and analyses, and instrument setpoint calculations to verify that the assumptions were appropriate, that proper engineering methods and models were used and there was adequate technical basis to support the conclusions. The team specifically reviewed the design capability of major components of the system including pumps, heat exchangers, and pneumatic and motor-operated valves required to change state. These reviews were performed to determine if the design basis was in accordance with the licensing commitments, regulatory requirements, and design output documents.

Selected mechanical and electrical calculations and analyses were reviewed to verify that the appropriate assumptions were used and that they agreed with the current system and plant configuration. The team also verified that proper engineering methods were utilized and that adequate technical bases existed to support conclusions. The team performed independent calculations to evaluate the adequacy of selected design calculations and verified that recent plant modifications would not adversely affect the auxiliary feedwater or service water systems.

The team reviewed normal, abnormal, and emergency procedures to verify that they were consistent with the AFW and SW systems design and licensing basis, risk, and operating assumptions. In addition, the team reviewed the AFW and SW system interfaces (instruments, controls and alarms), and the alarm response procedures available to operators to support operator decision making.

The operational readiness, configuration control, and material condition of the AFW and SW systems were assessed by reviewing applicable operating procedures, component maintenance records, preventive maintenance procedures, test procedures and system health reports, and by conducting system walkdowns. The team reviewed in-service test (IST) procedures and IST test results, including the SW full flow test results, to verify that the tests met the licensing bases and the performance data met the acceptance criteria and TS requirements. The team also reviewed selected IST data and analyses results to verify that they were consistent with vendor requirements. The walkdown of the AFW and SW systems was performed to verify the physical installation of the system and components were consistent with design documents, calculations, assumptions, and installation specifications.

During these walkdowns the team examined the design, equipment and material condition, and physical line-up of major components, including pumps, valves, piping, heat exchangers, instrumentation, and circuit breakers. The team verified that the appropriate procedures and equipment were staged at locations to assist operators in performing the appropriate manual actions when required by station procedures. The team also interviewed site personnel including licensed and non-licensed operators, system engineers, and maintenance personnel, regarding the operation and performance of the Unit 2 AFW and SW systems.

The team reviewed selected design change packages (DCP) and safety evaluations (SE) associated with the service water system to ensure that these changes did not degrade the functional capability of the system. Additionally, the team performed walkdowns of selected DCPs to ensure the changes were installed per the design change package.

b. Findings

.1 Auxiliary Feedwater Pump Motor Bearing

Introduction

The team identified a Green non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III, Design Control, regarding a failure to assure that the motor driven auxiliary feedwater pumps would remain operable subsequent to a small high energy line break (HELB) in the turbine building.

Description

The Unit 2 auxiliary feedwater (AFW) system is designed to provide cooling water to the steam generators when the normal feedwater system is not available to ensure decay heat is removed from the primary plant. The AFW system is comprised of two full capacity subsystems, each capable of satisfying the system functional requirements. One subsystem includes two motor-driven AFW (MDAFW) pumps; the other a turbine-drive AFW (TDAFW) pump. The AFW system was designed with adequate redundancy and physical and electrical separation to meet the single failure criterion.

During a review of a system design change, the team observed that the attachment points for bearing oil cooling on the MDAFW pump motors end bell and the oil cooling line that passed thorough the oil reservoir for bearing oil cooling had been removed when the end bell was replaced. Apparently, the motor bearing oil cooling provisions had been removed since the cooling line had never been used. The team also observed that there was no forced ventilation or room coolers in the MDAFW pump room and that heat removal was provided by natural circulation of air through louvers in the ceiling.

Based on the temperature profile that had been developed to qualify environmentally the equipment in the MDAFW pump room, during a small HELB in the turbine building, the temperature in the room could reach 209^{O}F. The team determined that, under these high temperature conditions, the motor bearing temperature could exceed the bearing design limit of 250^{O}F and that the overheating could result in the loss of both MDAFW pumps. The team also noted that, if the HELB involved the steam pipe to the TDAFW pump, a total loss of AFW flow capability to the steam generators could occur. Therefore, the team concluded that Dominion had not adequately maintained the AFW system within its design basis and that the design change that removed the oil cooling capability was not adequate because an evaluation of the need for bearing oil cooling had not been done.

In response to the team’s questions, Dominion completed an operability determination (OD) MP2-032-02 and concluded that the MDAFW pumps were conditionally operable, based on the maximum recorded room ambient temperature of 104^{O}F, but degraded since design maximum allowable bearing temperature of 250^{O}F could be exceeded if a postulated HELB occurred when the pump room was at its design basis temperature of 110^{O}F. In the supporting analysis, Dominion assumed that within the first two hours of the HELB event, one of the two MDAFW pumps would be secured, consistent with their regular simulator training, reducing the heat addition to the room. The team found the licensee’s analysis reasonable. Dominion initiated CR 02-12052 to evaluate the issue and identify corrective actions needed to restore the system to full operability.

<u>Analysis</u>

During a postulated HELB, the MDAFW pumps are credited in the UFSAR safety analysis as the primary decay heat removal system. However, the team concluded the system design does not ensure the MDAFW pumps would remain operable during a postulated HELB since the design does not provide for bearing water cooling, or alternatively ensure the bearings would remain below their maximum design temperature in a high temperature HELB environment. Dominion personnel missed opportunities to evaluate this condition when they (1) removed the bearing oil cooling capability in conjunction with design change DM2-00-1707-98; (2) performed technical evaluation M2-EV-99-0075 to provide justification for using a different type of motor bearing oil, and (3) performed technical evaluation M2-EV-98-0082 to address operation of the reactor building closed cooling water (RBCCW) system pump motor bearings at elevated temperatures.

The finding was considered to be more than minor because, if left uncorrected, a pipe break in the TDAFW steam supply line could cause the loss of the TDAFW pump and subsequently the loss of both MDAFW pumps due to motor bearings overheating. This condition affected the Mitigating System cornerstone because it could prevent the AFW system from performing its safety function to remove decay heat as assumed during a postulated HELB.

Inspection Manual Chapter (IMC) 0609, Appendix A, “Significance Determination of Reactor Inspection Findings for At-Power Situations” was used to assess the safety significance of this finding. Since the finding was a design deficiency of the AFW system which did not result in a loss of function, the finding screened to Green in Phase 1, Step 1, for Mitigating Systems. Based on the results of the phase 1 Significance Determination Process (SDP), the team determined that the significance of inadequate cooling of the AFW pump motor bearings was very low (Green).

Enforcement

10 CFR 50 Appendix B, Criterion III, Design Control, requires, in part, that measures be established to assure that the design basis for safety-related structures, systems and components are correctly translated into specifications, drawings, procedures and instructions. The Criterion also requires that the design control measures provide for verifying or checking the adequacy of the design. Contrary to this requirement, Dominion had opportunities to but failed to correct an old design issue pertaining to motor bearing operating temperature and, hence, failed ensure that the design bases of the MDAFW pump motors were correctly maintained during a small HELB temperature environment. The opportunities for correcting the deficiency arose when Dominion prepared design changes DM2-00-1707-98 and M2-EV-99-0075 and technical evaluation M2-EV-98-0082. However, because of the very low safety significance of this issue, and because it was entered into the Millstone corrective action program as CR 02-12052, the issue was treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy, issued on May 1, 2000 (65 FR 25368). **(NCV 50-336/02-12-01)**

.2 Service Water Pump Restoration

Introduction

The team identified a Green non-cited violation of 10 CFR 50, Appendix B, Criterion III, Design Control, regarding a failure to assure that the design bases of the service water system (SWS) pertaining to pump operation following a flooding event were correctly translated into instructions. Specifically, the requirement to and the steps that are needed to restore operability of the SWS within two hours were not included in the applicable plant procedure and the steps required to initiate manual blowdown of the SW strainers were not included in the applicable plant procedure.

Description

The team's review of the SW intake structure determined that the original design bases assumed a flood elevation of +22 feet. Accordingly, the SW pump motors were installed above this level. During the plant construction, the licensee identified a potential for the flood level in the intake structure to reach a 28-foot elevation and render the SW pump motors and other safety related SWS equipment inoperable, following the flood. Because of the very low probability of the event which would result in flooding above 22 feet, the licensee proposed to implement a flooding recovery procedure in lieu of a plant modification. The Atomic Energy Commission (AEC) accepted the licensee's plan of actions in their safety evaluation report (SER) dated May 10, 1974. The SER stated: "The applicants will perform the procedure prior to fuel loading to determine that all steps can be performed as expected."

The key elements of the licensee's proposed procedure (NECO letter, dated April 5, 1974) were to: (1) secure and protect one of the SW pump motors within 2 hours; (2) connect the fire water to one of the diesels; and (3) "When the water level recedes below 22 feet, the motor which is protected would be re-commissioned and started... The time required for this step once the water level has receded is approximately 2.0 hours." The team's review of how the these procedural requirements were implemented found that provisions had been made to protect one of the SW pump motors if flooding exceeded the 22-foot level. However, (1) the records of the tests required by the AEC to be completed before the loading of the fuel were either lost or did not exist; (2) the records of a test conducted in 1999 to address the 2-hour limit for securing and protecting a SW pump motor, as stated in section 3/4.7.5 of the TS bases, were either lost or did not exist; (3) section 3/4.7.5 of the TS bases captured only the 2-hour requirement to secure the SW pump motor before a potential flooding event, but was silent about the 2-hour system restoration requirement; (4) Dominion engineering incorrectly believed that there was no time limit for restoring the SWS to service, following a flooding event; (5) in 1996, the licensee incorrectly relocated the solenoid valves required for strainer blowdown operation from the floor to an elevation above the 22-foot flood level, but below the TS specified 28-foot flood level; and (6) restoration procedure AOP 2560 did not include the steps necessary for manual blowdown of the strainer.

In response to the teams questions, Dominion completed an evaluation and concluded that the issue was not a concern because appropriate compensatory measures could be put in place to mitigate the consequences of flooding beyond the 22-foot elevation, including manual rotation of the strainers and manual opening of the blowdown valves. The team found Dominion's conclusions reasonable. Dominion initiated CR-02-12532 to evaluate the issue and identify the corrective actions needed to ensure that the design bases of the system were properly met.

Analysis

As stated in section 3/4.7.5 of the Millstone, Unit 2, technical specification bases, "... one service water pump motor will be protected against flooding to a minimum elevation of 28 feet to ensure that this pump will continue to be capable of removing decay heat from the reactor." Following a flooding event, cooling is temporarily provided by the diesel-driven fire pump located in a flood protected building. However, restoration of the SWS within the NRC-specified 2-hour time is necessary to ensure the availability of the fire protection system to perform its intended function. The existing SWS intake structure design and flood response procedures were adequate for flooding below the 22-foot level, but for flooding above this level, the recovery procedure proposed by the licensee to meet the design basis requirements was inadequate in that: (1) the ability to restore operability of the SWS within the estimated 2-hour period, following a flooding event of the SWS intake structure, was not tested; (2) the need to and the steps that are required to restore operability of the SWS within two hours were not included in the applicable plant procedure; and (3) the steps required to initiate manual blowdown of the SW strainers were not included in the applicable plant procedure.

The finding was considered to be a performance deficiency because, in November 1997, the design modification, M2-96058, initiated to relocate the blowdown solenoid valves above the flood level, incorrectly located the valves below the 28-foot level. Also, during the 1998-99 design recovery of Unit 2, the licensee failed to identify the discrepancies between the design bases of the intake structure and the flood recovery procedure as well as the incorrect mounting location of the blowdown solenoid valves.

The finding was considered to be more than minor because it impacted the ability of the SWS to protect against an external factor, the intake structure flooding. The SWS deficiency affected the objectives of the Mitigating System cornerstone because, following a flooding event, the Millstone, Unit 2, procedural requirements did not assure that restoration of the system occurred within the specified two-hour limit and the existing design did not assure the availability of the blowdown solenoid valves. Therefore, the deficiencies could prevent the SWS from functioning following a flooding of the intake structure beyond the 22-foot elevation.

Inspection Manual Chapter (IMC) 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations" was used to assess the safety significance of this finding. Since the findings were design deficiencies of the SWS, which did not result in a loss of function, the finding screened to Green in Phase 1, Step 1, for Mitigating Systems. Based on the results of the Phase 1 Significance Determination Process (SDP), the team determined that the significance of SWS deficiencies was very low (Green).

Enforcement

10 CFR 50 Appendix B, Criterion III, Design Control, requires, in part, that measures be established to assure that the design basis for safety-related structures, systems and components are correctly translated into specifications, drawings, procedures and instructions. The Criterion also requires that the design control measures provide for verifying or checking the adequacy of the design. Contrary to these requirements, the 2-hour restoration requirement of the SWS, following a flooding event, was not included in the system restoration procedure and the mounting location of the blowdown solenoid valves was below the flooding level. In 1998 and 1999, during the design recovery of Unit 2, the licensee's review of the SWS design bases failed to identify these discrepancies. However, because of the very low safety significance of this issue, and because the findings were entered into the Millstone corrective action program, the issue was treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy, issued on May 1, 2000 (65 FR 25368). **(NCV 50-336/02-12-02)**

.3 <u>Service Water System Design</u>

The team's review of the design and surveillance procedures for the SWS identified a number of potential deficiencies that questioned the performance capability of the system. This issue was unresolved pending Dominion's completion of system Hydraulic studies.

The deficiencies were primarily the result of the very low margin for system degradation predicted in SWS hydraulic calculation 99-120, such that small changes in the system configuration, e.g., increase of system resistance, cross-leakage between the trains, etc., potentially reduce the predicted flows below their acceptance values. In their operability determination Dominion concluded that the SWS was degraded but operable and that, for ultimate heat sink (UHS) temperatures below 60°F, the system could be relied upon to perform its safety related function following a design basis accident (DBA). The details of the potential deficiencies identified by the team follow:

1. Calculation 00-067, Revision 00, "Analysis of X-18A and X-18B Thermal Performance Test Results," established the acceptability for cleaning the reactor building closed cooling water (RBCCW) heat exchangers (HXs) every three months in lieu of performing thermal performance testing. The results of this calculation were used to revise the licensee's GL 89-13 commitments from testing to cleaning and monitoring the increase in HX macro fouling (pressure drop vs. flow). The calculation results were obtained by comparing the test derived micro fouling to a micro fouling acceptance criterion that had been calculated assuming a SW flow of 7,500 gpm, a RBCCW heat load of 166 Mbtu/hr, and a HX tube plugging of 10%. The three-month HX cleaning period was based on the results of the micro fouling test which indicated a margin of 2.91% over the acceptance criterion after four and half months of service.
   Although the team identified no concerns with the commitment change, they observed that: (1) Calculation 006-ST97-C-023, Revision 01, "Updated CONTRANS LOCA Containment Peak Pressure/Temperature Analysis for Millstone Unit 2," predicted a maximum heat load of 198 MBtu/hr on the RBCCW HX using the same flow, 10% plugged tubes, and virtually the same micro

fouling and (2) Calculation 006-ST97-C-019, Revision 01, “RBCCW Peak Temperature Analysis for Millstone Unit 2,” predicted a maximum heat load of 213 MBtu/hr on the RBCCW HX using the same flow, 10% plugged tubes and virtually the same micro fouling.

2. The SWS supplies water to four non-safety-related branches as well as to the safety-related loads. During a loss of coolant accident (LOCA), the branch that supplies water to the non-safety-related turbine building loads is isolated from the safety-related portions of the SWS by a safety related valve that is automatically closed. However, the branches that supply water to the other non-safety-related loads, i.e., the sodium hypochlorite, the lubricating water to the circulating pumps, and the strainer blowdown, do not contain a safety-related isolation valve. Instead, they contain a safety-related flow limiting orifice that limits the loss of water inventory in the event of a catastrophic failure of the non-safety-related piping and/or components.

   The team’s review of hydraulic calculations 99-120 and 99-05 determined that the licensee, in calculating the SWS flow rates for LOCA mitigation, had assumed no increase in flow rates through the non-safety-related portions of the system following both large and small LOCAs and, therefore, that (a) the pressure boundary of the non-safety-related piping would remain intact and (b) the non-safety-related components downstream of the flow limiting orifices, e.g., pressure reducing valve 2-SW-99, would not fail in a manner that was detrimental to the safety-related portion of the system. This was a reversal of the position taken in the initial SWS flow calculations where the post-LOCA flow downstream of the orifices were calculated assuming a loss of the non-safety-related piping.

   The revision of the SWS hydraulic calculations occurred in 1991 -1992 when, to assure sufficient post-LOCA flow to the safety-related SWS loads, the licensee decided to rely on the integrity of non-seismic piping downstream of the orifices and on the ability of non-safety-related pressure reducing valve 2-SW-99. This change was justified in position paper NL-92-573, “Service Water System Limited Current Licensing Basis - Millstone 2,” and, later, in technical evaluation (TE) M2-EV–99-0030, “Technical Evaluation for Crediting the Pressure Boundary Integrity of Non-Safety Grade Portions of the Service Water System During a LOCA Event.”.

   In the TE supporting safety evaluation the licensee concluded that the change (for crediting the non-safety-related portions of the system) was not an unreviewed safety question based on their reply to NRC question 5.39 pertaining to offsite radiation doses during the licensing of the plant. However, the team’s review of the referenced question and answer (Q&A) and follow-up Q&A 6.16.4 found that, for a LOCA event, the NRC requested the licensee to evaluate offsite radiation doses assuming a loss of all seismic Category 2 piping. This implied that the licensee’s analysis should assume a seismic event concurrent, although not simultaneously, with a LOCA. The licensee did not consider the event outside their licensing bases and provided the requested information. Therefore, Q&A 6.16.4 did not support the licensee’s position pertaining to crediting non-safety-related, non-seismic SWS components for a LOCA mitigation. Additionally, the TE and the supporting safety evaluation addressed only (passive) pressure boundary components, whereas the team's review identified that there was at least one active, non-safety-related, non-seismic component (pressure control valve 2-SW-99) which had been credited in the calculated flow rates.

In conjunction with this review, the team also observed that a change to UFSAR Section 9.7.2.1.2, which states "The postulation of a LOCA concurrent with a seismic event is outside the design basis...," and supporting documentation may require additional review and/or clarifications by Dominion.

3. Calculation 99-005 assumed that there is no leakage across the cross-train isolation valves. Because of the limited margin that is available from the flow model, such an assumption could have a significant impact on the ability of the system to supply the required flow when only one train is available. Leakage across the cross-train isolation valves was not being verified in the field.

In addition to the above SWS issues, the team identified the following discrepancies in the Dominion translation of the design flow distribution requirements determined in the calculation 99-005 into the system throttle valve procedure EN 21203. These discrepancies impact in varying degree the design capability of the SWS system.

4. Section 3.3 of calculation 99-005 states: "All heat exchangers are assumed to be clean and the SWS strainer is assigned a nominal pressure drop of 2 psid since it will be operating clean with the backwash lines open. Existence of these conditions should be confirmed prior to performing the test procedure." Procedure EN 21203 required that only the differential pressure (dP) across the RBCCW HX be recorded. No other HX or strainer dP was being recorded. In addition, the procedure did not contain an acceptance criterion for the dP across the RBCCW heat exchanger.

5. Section 6.5.3 of calculation 99-005 states: "Changing tide levels have a direct impact on the deliverable flows in SWS. The test flows established above were based upon a 0 ft tide level. If testing is performed at another tide level, the required test flows will change. To quantify this change, the Facility 1 Minimum TCV Position case was rerun with tide levels of +1 ft, -1 ft, -2 ft and -3 ft. Note that these tide levels should include the effects of the traveling screens (-30") if the Circulating Water pumps are operating..." Procedure EN 21203 provided directions to adjust the flow only if the sea level was less than +1 ft. Neither the calculation nor the procedure addressed flow correction for levels greater than +1 ft and no bases were provided for selecting the +1 foot level. Additionally, the procedure provided no direction for level adjustment with a maximum level drop across the traveling screens.

6. Calculation 99-005 did not establish flow acceptance criteria for any branches other than the RBCCW Hxs.

7. The location of the flow measuring devices was such that the flow measurement errors may exceed the 5% used in the Dominion's calculations.

8. The hydraulic system model was not re-benchmarked following major system changes.

The lack of an up-to-date and accurate flow model, the discrepancy between the RBCCW heat loads identified in various calculations, the potential losses in SWS inventory through non-safety-related branches and unmonitored valves, the uncertainty of flow measurement and the lack of acceptance criteria in system Procedure EN 21203 rendered the performance capability of individual branches and of the SWS undetermined. This item is unresolved pending appropriate evaluations and resolution of the above findings by Dominion and review by the NRC. **(URI 50-336/02-12-03)**

Dominion issued several CRs to address the identified discrepancies. Also, based on their conclusion that the SW system was operable with UHS temperatures below 60°F, Dominion imposed a restrain on the CR resolution date and required that the discrepancies be resolved before April 1, 2003, when the UHS temperature is expected to approach the stated UHS temperature limit.

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed a sample of condition reports associated with the AFW and SW systems, as identified in Attachment 1, to verify the licensee was identifying issues at an appropriate threshold, entering them in the corrective action program, and taking appropriate corrective actions.

b. Findings

The findings described in the above paragraphs indicated a weak identification and corrective action process implementation. For instance, several opportunities arose to evaluate the need for cooling the AFW pump motor bearings, yet such evaluation never occurred. In the case of the SW intake structure flooding, the licensee recognized that the blowdown valves should be raised above the maximum postulated flooding level and initiated a modification to do so, but during the modification process the licensee failed to confirm the maximum flooding level.

4OA6 Meetings, Including Exit

.1 Management Meeting

The team presented the inspection results to Mr. S. Scace and other members of the licensee's staff at an exit meeting on November 22, 2002. The team verified that the inspection report does not contain proprietary information.

ATTACHMENT 1
SUPPLEMENTAL INFORMATION

Key Points of Contact

Dominion Nuclear Connecticut, Inc.

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P. Baumann, Jr	Supervisor, Component Engineering
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K. Wallace	Electrical System Engineer

Nuclear Regulatory Commission

L. Doerflein	Chief, Systems Branch, RI DRS
W. Lanning	Director, Division Reactor Safety
M. Schneider	Senior Resident Inspector, Millstone

List of Items Opened, Closed, and Discussed

Opened

50-336/02-12-03	URI	Performance Capability of the Service Water System

Opened/Closed

50-336/02-12-01	NCV	Design Control - Operability of the Motor-Driven Auxiliary Feedwater Pumps.
50-336/02-12-02	NCV	Design Control - Availability of Service Water System Following a Flooding Event.

List of Acronyms

AC or ac	Alternating Current
AEC	Atomic Energy Commission
AFW	Auxiliary Feedwater
AOP	Abnormal Operating Procedure
CR	Condition Report
DBD	Design Basis Document
DC or dc	Direct Current
DCP	Design Change Package
EOP	Emergency Operating Procedure
ft	Foot or Feet
HELB	High Energy Line Break
HX	Heat Exchanger
IMC	Inspection Manual Chapter
IST	In-Service Testing
LOCA	Loss of Coolant Accident
MDAFW	Motor Driven Auxiliary Feedwater
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OD	Operability Determination
OP	Operating Procedure
P&ID	Piping and Instrumentation Drawing
psid	Pounds per Square Inch Differential
Q&A	Question and Answer
RBCCW	Reactor Building Component Cooling Water
SDP	Significance Determination Process
SE	Safety Evaluation
SER	Safety Evaluation Report
SW	Service Water
SWS	Service Water System
TDAFW	Turbine Driven Auxiliary Feedwater
TE	Technical Evaluation
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
URI	Unresolved Item

Documents Reviewed

Design Bases Documents

DBS-2322	Design Basis Summary, Auxiliary Feedwater System, Rev. 2, July, 1999.
DBS-2326A	Service Water System, Rev. 1, June 22, 1998.

Procedures

AOP 2563	Loss of Instrument Air, Rev. 009-01.
AOP 2565	Loss of Service Water, Rev. 004
AOP 2580	Degraded Voltage, Rev. 002
C PT 1405	4.16 kV & 6.9 kV Motor and Surge Capacitor Test, Rev. 0
C PT 1410	5 kV & 8 kV Cable Tests, Rev. 000-02
C SP 750	Battery Weekly and Quarterly Surveillance, Rev. 000
DC 4	Procedure Compliance, Rev. 006-04
EN-21244	Inspection and Testing of Lined Service Water Piping and Components, Rev. 001-01.
EOP 2541	Standard Appendices, Rev. 4.
IC-2417S	Calibration and Maintenance of Service Water D/P Switch, Rev. 001-04
MP-14	OPS-GDL02, Attachment 3, Operating Practices, Sheet 54
MP-2701F	L1AL1BL1C Service Water Pump Discharge Strainers Lubrication Information Sheet, January 29, 1992.
MP-2713F	Service Water Strainer L1AL1BL1C Maintenance, Rev. 003, April 4, 2002
MP-2721C	Protection and Restoration of Service Water Pump Motor during a PMH, Rev. 7, September 19, 2001.
OP 2316A	Main Steam System, Rev. 031-03.
OP 2322	Auxiliary Feedwater System, Rev. 024-11.
OP 2326A	Service Water System, Rev. 020-07.
OP 2346A	Emergency Diesel Generators, Rev. 024-04, October 11, 2002.
SP 2402D	Steam Generator Level Calibration
SP 2402M	Functional Test of Steam Generator Level and Auto - Aux. Feedwater Initiation Logic, Rev. 008-10, October 1, 2002.
SP 2610A	Motor Driven AFP and Recirculation Check Valve IST, Rev. 001-04, October 25, 2002.
SP 2610A	TDAFP and Recirculation Check Valve IST, Rev. 000-07, August 22, 2002.
SP 2610A	AFW Manual Actuation and Flow Verification, Rev. 4, March 25, 2002.
SP 2610A	Motor Driven AFW Pump Operability Tests, Rev. 007-01, October 23, 2002.
SP 2610A	Motor Driven AFW Pump Operability Tests, Rev. 010-01, October 9, 2002.
SP 2610A	Motor Driven AFW Pump and Recirculation Check Valve IST, Rev. 001-05, October 9, 2002.
SP 2610B	TDAFP Flow Verification, Rev. 5, April 1, 2002.
SP 2610C	Auxiliary Feedwater System Valve Operability Tests, Rev. 011-01, October 16, 2002.
SP 2610C	2-FW-43A and 2-FW-43B Valve Stroke and Timing IST, Rev. 1, August 27, 2002.

SP 2610C	Auxiliary Feedwater System Lineup Verification, Rev. 019-05, October 2, 2002.
SP 26101	Automatic AFW Start Signal Test, Rev. 000-02, March 11, 2002.
SP 2612B	C Service Water Pump Operability Test, Rev. 010-04, January 22, 2002.
SP 2612C	Service Water System Lineup and Valve Test, Facility 1, Rev 007, March 25, 2002.
SP 2612C	Service Water Facility 1, Rev. 030-04, August 7, 2002
SP 2612C	Service Water Valve Quarterly Test, Facility 1, Rev. 000-07, March 12, 2002.
SP 2612E	Service Water System Manual Valve Operability Test.
SP 2613G	Integrated Test of Facility 1 Components, Rev. 009-06
SP 2660	AFP Turbine Trip Throttle Valve Exercise Test, Rev. 3, October 11, 2002.
SP 2660	AFW Pump Turbine Overspeed Trip Test, Rev. 004-01, March 8, 2002.
SP 2670	Saltwater Cooled HX D/P Determination, Rev. 008-09, February 5, 2002.
SP 2736E	Battery Service Test, Rev. 010-04
SP 2736F	Battery Performance Test, Rev. 008-01

<u>Program Instructions</u>

PI-6	MP-24-MOV-PRG, Thermal Overload Sizing Evaluation, Rev. 04

<u>Design Change Notices/Packages/Engineering Change Requests</u>

25203-ER-97-0176	Auxiliary Feedwater System - Design Inputs, Rev. 1, December 23, 1997.
DCR M2-98095	Power TDAFW Pump Steam Valve from Either Facility Z1 or Z2
DCR M2 99005	AFW System Upgrades
DM2-00-0139-01	Replace Impellers of Auxiliary Feedwater Pump P9B, April 5, 2001.
DM2-00-0304-00	Auxiliary Feedwater Pumps P-9A/B, P4 Post-Modification Test Plan Revision, May 9, 2000.
DM2-00-0348-00	Auxiliary Feedwater Pump P4 IDP Nonconformance, May 26, 2000.
DM2-00-0363-99	Auxiliary and Main Feedwater Control and Isolation Issues, May 13, 1999.
DM2-00-0613-98	AFW Equipment As-Built Differs from Drawings, April 6, 1998.
DM2-00-0728-99	P9A & P9B Auxiliary Feedwater Pump Water Collection System, June 28, 1999.
DM2-00-1707-98	P9 A & B Auxiliary Feedwater Pump Motor End Bell Repair and Cooling Line Removal, October 7, 1998.
DM2-00-1755-98	Service Water Pump P5B Motor Replacement, 4160V Relay Setting Changes
DM2-01-0304-00	Auxiliary Feedwater Pumps P-9A/B, P4 Post-Modification Test Plan Revision, May 19, 2000.
DM2-01-0728-99	P9A & P9B Auxiliary Feedwater Pump Water Collection System, October 19, 1999.
DM2-02-0304-00	Auxiliary Feedwater Pumps P-9A/B, P4 Post-Modification Test Plan Revision, May 19, 2000.
DM2-02-0728-99	P9A & P9B Auxiliary Feedwater Pump Water Collection System, January 6, 2000.
MMOD-M2-98034	Replacement of the Service Water Flow Instruments, F-6471 & F-6472
MMOD M2 98103	Trip TDAFW Pump Room Ventilation on High Temperature
PDCR 2-7-90	Installation of Thermal Overload Relays on Motor Operated Valves

<u>Calculations</u>

89-78-883 ES	MP2 Target Thrust / Torque Calculation for 2-SV-4188, Rev. 03, CCN 01
92-LOE-141E2	Calculate the Delta-P versus Flow Relationship for Primary Flow Elements (annubars) FE-6397/6389, August 7, 1992.
92-028-1064E2	Calculated Flowrate Versus Differential Pressure for MP2 Service Water Transmitters FT-6433, FT-6434, FT-6435, Rev. 0.
92-090	Calculation of Minimum Required EDG Flow(Air Cooler, Oil Cooler, Jacket Cooler), Rev. 1, February 16, 1999.
92-135	Minimum Required SWS Cooling Flow for EDG Heat Exchangers Based on an SWS Inlet Temperature of 75F, Rev. 0, Change 1, July 20, 1999.
92-135	Minimum Required SWS Cooling Flow for EDG Heat Exchangers Based on an SWS Inlet Temperature of 75F, Rev. 0, February 12, 1999.
94-053	SWS Maximum Allowable SWS Temperature to the EDG Heat Exchangers @ 1800 kW and 2750 kW Electrical Load Levels With 5% Tubes Plugged in each Unit, Rev. 0, August 10, 1994.
97-121	MP2 Emergency Diesel Generator Service Water Flow Loop Accuracy Calculation (FE-6389/FE-6397), February 26, 1999.
97-ENG-02053 M2	Attachment B, Flow Summary Tables
97-ENG-01774 E2	Battery 201A and Charger Electrical Verification, Rev. 01, CCN 21
97-ENG-01775 E2	Battery 201B and Charger Electrical Verification, Rev. 01, CCN 18
97-ENG-01841 E2	MP2 Thermal Overload Relays for MOVs on Safety Related MCCs, Rev. 1, CCN 20
97-ENG-1912 E2	4.16 kV Switchgear Relay Settings, Rev.01
97-SBO-02078-M2	Loss of Ventilation During SBO, Rev. 01, February 19, 1999.
98-ENG-02605E2	Determination of Pressure Differential to Flow Rate Relationship for Flow Element FE-6397.
98-ENG-02621-M2	Determination of the Instrument Air Requirement for Certain Safety Related Valves, Rev. 3, May 1999.
98-ENG-02678 E2	Appendix F, Load Table
98-TBV-02643-M2	Turbine Driven Auxiliary Feedwater Pump Room Ventilation, Rev. 0, December 4, 2001.
98-TBV-02682-M2	Motor Driven Auxiliary Feedwater Pump Room - Maximum Prevailing Room Temperature, Rev. 0, September 17, 1998.
02-AOV-03081-M2	Millstone Unit 2 System Level Design Basis review for AFW AOV's 2-FW-43A & 43B, Rev. 0, March 19, 2002.
AUXFDP-1275M2	HELB-Auxiliary Feedwater Pump Area, Rev. 3 December 15, 1997.
AUXFDP-1275M2	HELB-Auxiliary Feedwater Pump Area, Rev. 3-01, November 16, 2001.
PA79-126-1027 E2	Emergency Diesel Generator Loading, Rev. 2, CCN 04
PA89-078-272 E2	MP2 MOV Voltage Drop Calculation, Rev. 0, CCN 45

<u>Work Orders</u>

M2-92-14064	M2-96-02156	M2-99-11593	M2-00-18413
M2-92-18583	M2-96-02484	M2-00-03981	M2-00-19135
M2-94-00887	M2-98-11014	M2-00-04123	M2-01-03878
M2-94-06506	M2-99-00345	M2-00-04131	M2-01-07942
M2-95-02877	M2-99-01884	M2-00-10374	M2-02-05046
M2-95-03995	M2-99-01893	M2-00-10992	M2-02-08211
M2-95-07871	M2-99-07047	M2-00-15659	M2-02-13564

Drawings

General Arrangement Drawings

25203-27011	Turbine Building at El 54'6", Rev. 10
25203-27012	Turbine Building at El 31'6", Rev. 10
25203-27015	Auxiliary Building Plan at EL 36'6" and 38'6", Rev. 23
25203-28006	Local Control Panels C63 & C21
25203-29060	Composite Drawing of Model LCT Series Relief Valve
25203-34056	Auxiliary Building Plan at EL 36'6" and 38'6", Rev.14

Piping & Instrument Drawings

25203-26002 Sh.1	Main Steam from Generators P&ID, Rev. 60
25203-26005 Sh.1	Condensate System P&ID, Rev. 30
25203-26005 Sh.2	Feed System P&ID, Rev. 43
25203-26005 Sh.3	Condensate Storage and Aux. Feed P&ID, Rev. 48
25203-26008 Sh.1	Circulating Water P&ID, Rev. 67
25203-26008 Sh.2	Service Water P&ID, Rev. 79
25203-26008 Sh.3	Service Water to Vital AC Switchgear, Cooling Coil and AC Chillers, P&ID, Rev. 24
25203-26008 Sh.4	Screen Wash and Sodium Hypochlorite, Rev. 22
25203-26011 Sh.1	Fire Protection P&ID, Rev. 38

Single Line Diagrams

25203-30001	Main Single Line, Rev. 20
25203-30023	Single Line Diagram 125VDC System-Turbine Battery, Rev.6
25203-30024	Single Line Diagram 125VDC Emerg. & 120VAC Vital System, Rev. 21
25203-30001	Main Single Line Diagram, Rev.20
25203-30005	Single Line Meter and Relay Diagram 4.16KV Emerg. Buses 24C, 24D (A3,A4), Rev. 15
25203-30005	Single Line Meter and Relay Diagram 4.16KV Emerg. Buses 24E(A5), Bus 24G(A7), Rev. 9

Schematic Diagrams

25203-30044 Sh.3	Schematic Diagram 4.16KV Bus 24C, Rev.2
25203-30044 Sh.8	Schematic Diagram 4.16KV Bus 24D, Rev.2
25203-30044 Sh.8	Schematic Diagram 4.16KV Bus 24D,E, Rev.9
25203-30044 Sh.12	Schematic Diagram 4.16KV Bus 24E, Rev.6
25203-32012 Sh. A	Control Switch Development, Rev. 4
25203-32012 Sh. B	Control Switch Development, Rev. 6
25203-32012 Sh. C	Control Switch Development, Rev. 5
25203-32012 Sh. D	Control Switch Development, Rev. 1
25203-32012 Sh. E	Control Switch Development, Rev. 4
25203-32012 Sh. F	Control Switch Development, Rev. 4
25203-32012 Sh.11	Auxiliary Feedwater Pump MP9A, Rev. 11

25203-32012 Sh.12	Auxiliary Feedwater Pump MP9B, Rev. 10
25203-32012 Sh.13	Aux. F.W. Pump Disch. Isol. MOV HV5275 (2-FW-44), Rev. 9
25203-32012 Sh.21	Aux. Feedwater Cont. Valve HV5276 2-FW-43A, Rev. 13
25203-32012 Sh.22	Aux. Feedwater Cont. Valve HV5279 2-FW-43B, Rev. 14
25203-32012 Sh.22A	Aux. Feedwater Cont. Valve HV5279 2-FW-43B, Rev. 5
25203-32012 Sh.27	Aux FW to STM GEN 1 ISO SOV HV5421 (2-FW-12A), Rev. 3
25203-32012 Sh.28	Aux FW to STM GEN 1 ISO SOV HV5422 (2-FW-12B), Rev. 3
25203-32012 Sh.44	Automatic Initiation for Auxiliary Feedwater Facility Z1, Rev. 8
25203-32013 Sh.5	Service Water Cooling Water Pump MP5A, Rev. 13
25203-32013 Sh.6	Service Water Cooling Water Pump MP5B, Rev. 15
25203-32013 Sh.7	Service Water Cooling Water Pump MP5C, Rev. 13
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25203-32013 Sh.16	Service Water Cooling Water Pump Discharge SOV-HV6482, Rev. 3
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25203-32013 Sh.19	TBCCW Heat Exchanger Cooling Water Inlet SOV-HV6438, Rev. 7
25203-32013 Sh.20	TBCCW Heat Exchanger Cooling Water Inlet SOV-HV6439, Rev. 7
25203-32013 Sh.21	Diesel Generator Cooling Water Heat Exchanger Supply and Bypass Valves, Rev. 12
25203-32013 Sh.22	Diesel Generator Cooling Water Heat Exchanger Supply and Bypass Valves, Rev. 12
25203-32013 Sh.36	Service Water Strainer Drive Motor MLIA, Rev. 12
25203-32013 Sh.37	Service Water Strainer Drive Motor MLIC, Rev. 11
25203-32013 Sh.38	Service Water Strainer Drive Motor MLIB, Rev. 11
25203-32013 Sh.39	Service Water Strainer Drive Motor MLIB Power Supply Crossover, Rev.5
25203-32013 Sh.40	RBCCW Heat Exchanger Cooling Water Outlet SOV-TV6308, Rev. 9
25203-32013 Sh.41	RBCCW Heat Exchanger Cooling Water Outlet SOV-TV6307, Rev. 11
25203-32013 Sh.42	RBCCW Heat Exchanger Cooling Water Outlet SOV-TV6306, Rev. 10
25203-32013 Sh.43	RBCCW Heat Exchanger Cooling Water Outlet SOV-TV6307, Rev. 9
25023-32020 Sh.7	Auxiliary Feedwater Turbine Steam Stop Valve HV4189, Rev. 7
25023-32020 Sh.8	Auxiliary Feedwater Turbine Steam Stop Valve HV4191, Rev. 6
25203-32020 Sh.14	STM GEN 1 Blowdown Line Isolation Vlv HV4246 (2-MS-220A), Rev 13
25203-32020 Sh.15	STM GEN 2 Blowdown Line Isolation Vlv HV4248 (2-MS-220B), Rev. 13
25203-32020 Sh.49	Steam Gen. Aux. Feed Pump Turbine H21 MOV SV4188 (2-MS-464) Schematic, Rev. 8
25203-32023 Sh.67	Vital AC Switchgear Room Cooling Control Valve PV6925, Rev. 4
25203-32023 Sh.68	Vital AC Switchgear Room Cooling Control Valve PV6926, Rev. 4
25203-32023 Sh.60	Vital AC Switchgear Room Cooling Control Valve PV6927, Rev. 4
25203-39047 Sh.9	Safety Feature Actuation System
25203-39047 Sh.11	Safety Feature Actuation System
25203-39047 Sh.13	Safety Feature Actuation System
25203-39047 Sh.16	Safety Feature Actuation System

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25203-28105 Sh.2A	Engineered Safety Logic Actuated Equipment Tabulation, Rev. 4
25203-28105 Sh.2C	Engineered Safety Logic Actuated Equipment Tabulation, Rev. 2
25203-28105 Sh.21	Auxiliary Feedwater Pumps, Rev. 4
25203-28105 Sh.22	Auxiliary Feedwater Control Valves, Rev. 11

25203-28105 Sh.22A Auxiliary Feedwater Control Valves, Rev. 2
25203-28105 Sh.22B Auxiliary Feedwater Control Valves, Rev. 4
25203-28105 Sh.23 Automatic Auxiliary Feedwater Initiation, Rev. 6
25203-28108 Sh.21 Service Water Cooling Pumps, Rev. 6
25203-28108 Sh.21A Service Water Cooling Pumps Alarms, Rev. 0
25203-28108 Sh.22 Service Water Discharge Valves, Rev. 3
25203-28108 Sh.23 RBCCW Heat Exchanger Cooling Water Inlet Valves, Rev. 1
25203-28108 Sh.24 RBCCW & TBCCW Cooling Water Valves, Rev. 5
25203-28108 Sh.25 RBCCW & TBCCW Cooling Water Valves, Rev. 5
25203-28108 Sh.26 Diesel Engine CW Heat Exchanger Supply & Bypass Valves, Rev. 8

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25203-28500 Sh.370A	LT1113A & LT1123A Stm. Gen. Level Loop Diagram, Rev. 3
25203-28500 Sh.370B	LT1113 & LT1123 Stm. Gen. Level Auto AFW Initiation (Z1) Loop Diagram, Rev. 2
25203-28500 Sh.370C	LT1113 & LT1123 Stm. Gen. Level Auto AFW Initiation (Z2) Loop Diagram, Rev. 2
25203-28500 Sh.371	LT1113B Steam Generator Level Loop Diagram, Rev. 11
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25203-28500 Sh.372	LT1113C Steam Generator Level Loop Diagram, Rev. 11
25203-28500 Sh.372A	LT1113C & LT1123C Stm. Gen. Level Loop Diagram, Rev. 2
25203-28500 Sh.373	LT1113D Steam Generator Level Loop Diagram, Rev. 12
25203-28500 Sh.373A	LT1113D & LT1123D Stm. Gen. Level Loop Diagram, Rev. 2
25203-28500 Sh.374	LT-1114A Steam Gen. No. 1 Wide Range Level Loop Diagram, Rev. 4
25203-28500 Sh.375	LT-1114B Steam Gen. No. 1 Wide Range Level Loop Diagram, Rev. 4
25203-28500 Sh.380	LT-1123A Steam Generator Level Loop Diagram, Rev. 10
25203-28500 Sh.381	LT-1123B Steam Generator Level Loop Diagram, Rev. 9
25203-28500 Sh.382	LT-1123C Steam Generator Level Loop Diagram, Rev. 10
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25203-28500 Sh.604A	AFW Flow Cont. Valve HV5279 Loop Diagram, Rev. 2
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25203-26008 Sh.2	Service Water Piping and Instrument Diagram, Rev. 79
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Wiring Diagrams

25203-39220 Sh.2E	Auto Initiation of Aux. Feedwater Instrument Wiring Diagram Cabinet RC30A-1, Rev. 1
25203-30022 Sh.3GA	125 VDC Distribution Panel DV20 Summary

Relay Setting Sheets

25203-30108, Sh.6	4.16 kV Bus 24C Relay Settings
25203-30108, Sh.15	4.16 kV Bus 24D Relay Settings
25203-30108, Sh.18	4.16 kV Bus 24E Relay Settings

Motor and Pump Data

25203-29008, Sh.38	AFW Pump 9A Performance Curves
25203-29008, Sh.39	AFW Pump 9B Performance Curves
25203-29008, Sh.44	AFW Pump Motor Data Sheet
25203-29008, Sh.45	SW Pump Motor Data Sheet
25203-39009, Sh.11	AFW Pump Motor Outline
25203-39009, Sh.13	AFW Pump Motor Speed-Torque Curve
25203-39009, Sh.11	SW Pump Original Motor Outline

Condition Reports

	CR-02-04698	CR-02-12295	M2-99-1937
CR-00-01630	CR-02-05356	CR-02-12317	M2-00-2185
CR-01-00338	CR-02-07249	CR-02-12481	M2-00-2311
CR-01-01159	CR-02-07685	CR-02-12490	M2-00-2469
CR-01-04840	CR-02-07758	CR-02-12491	M2-00-2662
CR-01-05385	CR-02-08043	CR-02-12507	M2-00-2718
CR-01-06277	CR-02-08209	CR-02-12508	M2-00-2763
CR-01-07833	CR-02-08553	CR-02-12509	M2-00-2776
CR-01-08574	CR-02-11774	CR-02-12510	M2-00-2782
CR-01-09504	CR-02-11979	CR-02-12511	M2-00-2935
CR-01-09657	CR-02-11997	CR-02-12513	M2-00-3105
CR-01-11325	CR-02-11997	CR-02-12532	M2-00-3127
CR-01-11453	CR-02-12005	CR-02-12552	M2-00-3129
CR-01-11791	CR-02-12025	CR-02-12562	M2-00-3169
CR-01-12161	CR-02-12052	CR-02-12563	M2-00-3236
CR-02-02711	CR-02-12128	CR-02-12617	M2-00-3375
CR-02-03503	CR-02-12204	AR-98019928	M2-00-3419
CR-02-03803	CR-02-12240	M2-98-3072	M2-00-3426
CR-02-03858	CR-02-12295	M2-98-2970	M2-01-0089

System Health Reports

MP2-AFW	Auxiliary Feedwater System 2322, 2nd Quarter 2002, July 10, 2002.
MP2-SWS	Service Water System 2326A, 4th Quarter, 2000, January 3, 2001.

Operability Determinations

OD-MP2-001-02	SG pressure below T.S. requirement for Terry Turbine surveillance, September 12, 2002.
OD-MP2-017-02	2-FW-5B operator did not fully stroke closed, September 12, 2002.
OD-MP2-020-00	Excessive seal leakage on TDAFW pump during post modification test, DM2-02-0304-00, May 28, 2000.
OD-MP2-021-00	Oil viscosity for AFW pump P9A too high, June 16, 2000.
OD-MP2-025-99	TDAFW Pump Motor Speed Changer operates faster than design documents specify, March 30, 1999.
OD-MP2-030-02	Past failures of service water thermal relief valves questions the operability of the RBCCW HXs and vital switchgear room coolers, November 5, 2002.
OD-MP2-032-02	Motor driven AFW pump motor bearing oil temperature acceptability, Rev. 0, November 6, 2002.
OD-MP2-060-01	Outboard bearing oil for AFW pump P9B contains ferrous and silicone material, April 18, 2001.
OD-MP2-081-01	Manual speed control knob for TDAFW pump may generate excessive torque, August 29, 2001.
OD-MP2-087-01	Oil viscosity for AFW pump P9B too high, November 20, 2001.

Technical Evaluations

ERC 25203-ER-0105	Diesel Loading Calc Input - Max Brake Horsepower
ERC 25203-ER-0176	Auxiliary Feedwater System - Design Inputs
M2-EV-00-0040	Technical Evaluation for Unavailability Monitoring Requirements for NRC Performance Indicators (AFW), Rev. 0, July 22, 2000
M2-EV-00-0056	Technical Evaluation for P9A - Coastdown time, outboard bearing frequency and possible internal rubbing; P9B - Discolored sump oil and orientation of outboard bearing; P4 - Mechanical seal leakage, Rev. 2, May 22, 2002
M2-EV-02-0024	Technical Evaluation for Turbine Drive AFW Pump Mechanical Seal - Allowable Leakage, Rev. 0, May 22, 2002
M2-EV-98-0060	Service Water Flow Instrumentation Technical Evaluation
M2-EV-98-0167	Technical Evaluation for Auxiliary Feedwater System Performance, Revision 1, February 26, 1999
M2-EV-99-0046	Technical Evaluation For Motor Driven AFW Pump Cycling Requirements During Turbine Building HELB, Rev. 0, February 24, 1999
M2-EV-99-0075	Mobil DTE Heavy Medium - Use in P9AM and P9BM Motors
SP-M2-EE-352 EQR 119-01	Equipment Qualification Record for Weidmuller SAK Series Glass Filled Phenolic Terminal Blocks, Rev. 1
SP-M2-EE-352 EQR 136-01	Equipment Qualification Record for 5 kV Power Cable, Rev. 1

Specifications

7604-E-15	5000 and 8000 Volt Power Cable

Miscellaneous Documents

-	Maintenance Rule (a)(1) evaluation for the Auxiliary Feedwater System (2322), Rev. 0, December 20, 2001
-	Record of Eddy Current Inspection of Vital Chiller X-182, June 25, 2001
-	RBCCW Temp Trend Chart from11/14/01 through 11/18/01
4004-D1258 LA	Canadian General Electric Motor Outline for Replacement SWP Motor
8200830941	Ingersoll-Rand Speed-Torque Curve for AFW Pump - Valve Closed
8200830942	Ingersoll-Rand Speed-Torque Curve for AFW Pump - Valve Open
7141.5005	Babcock & Wilcox Typical SW Pump Performance Chart
25203-29016, SH 12	Babcock & Wilcox Speed-Torque Curve for SW Pump
25203-29016, SH 23	Babcock & Wilcox SW Pump Performance Chart
25203-29016, SH 31	Babcock & Wilcox SW Pump Performance Chart
25203-29016, SH 32	Babcock & Wilcox SW Pump Performance Chart
25203-300-067	VTM Installation, Operation and Maintenance of SW Pump Motors
AFW-00-C	MP2 AFW System Description, August 31, 1999
DTCR-0201N001	Damaged Tube Condition Report, RBCCW Unit C, June 27, 2002
DTCR-0201N001	Damaged Tube Condition Report, RBCCW Unit B, May 28, 2002
DTCR-0201N001	Damaged Tube Condition Report, Vital Chiller X181A/B, Jan 3,2002
ER-98-0111	MP2 Turbine building High Energy Line Break Results, Rev. 2, February 23, 1999
FSAR 10.4.5	Condensate and Feedwater System, March 2001.
JPM-040	Shift Auxiliary Feedwater Pump Suction to Firewater, Rev. 7, July 21, 1999
JPM-085	Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump, Rev. 9, October 24, 2000
JPM-108	Motor Driven AFW Pump Operability Test, Rev. 5, November 3, 1999.
JTK-C8	Specification for Duplex Strainers for Service Water System, Rev. 1, Aug. 2, 1979
LER 2001-005-0	Turbine Driven Auxiliary Feedwater Pump Inoperable Without Meeting Action Statement Requirements, August 23, 2000
MPS-ENG-02-005-01	Field Observation: Review of Progress in Addressing 2R13 Refueling Outage Oversight Level 1 CRs on AFW, March 21, 2002
MPS-MNG-01-010-05	Field Observation: Observation of Management Review Team Presentation of MP2 Terry Turbine Root Cause Investigation, June 19, 2001
MPS-MNG-01-017	Quarterly Surveillance - Managing the Asset, July - September 2001, October 30, 2001
MPS-MNG-01-018-05	Field Observation: Follow-up on Unit 2 Terry Turbine AFW Pump P4 Seal Leakage, CR M2-00-01630, December 19, 2001
MPS-MNG-01-023	Quarterly Surveillance - Nuclear Engineering, October - December 2001, January 28, 2002
OM-1987	Part 1, Requirements for Inservice Performance Testing of Nuclear Power Plant Pressure Relief Devices

PD 043115.03	Record of Eddy Current Inspection of Vital Chillers X181A, X181B, X183, May 2000
PD 04388	Record of Eddy Current Inspection of RBCCW, Unit A, November, 2000
VTM 25203-300-049	Installation , Operation and Maintenance of Custom 8000 Horizontal Induction Motors, Rev. 1, October 1998
VTM 25203-365-010	Installation , Operation and Maintenance of Motor and Turbine Driven Auxiliary Feedwater Pumps, August 1998