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Division of Reactor Inspection and Safeguards

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Licensee: Florida Power & Light Company

Facility Name: St. Lucie Plant, Units 1 & 2

Inspection Conducted: September 23 through October 4, 1991

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EXECUTIVE SUMMARY

The Special Inspection Branch of the U.S. Nuclear Regulatory Commission performed a pilot team inspection, the Service Water System Operational Performance Inspection, at the St. Lucie Plant, Units 1 and 2, during the period September 23 through October 4, 1991.

The inspection included a mechanical design review; detailed systems walkdowns; review of system operation, maintenance, and surveillance; and assessment of quality assurance and corrective actions related to the system. The team also assessed the licensee's implementation of actions required by Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," as well as system unavailability to gain additional insights for probabilistic risk assessment application. At St. Lucie, the service water system is the intake cooling water (ICW) system.

After inspecting the ICW system in detail, the team concluded that the system would be capable of performing its safety function if called upon to do so. However, the team identified several deficiencies and weaknesses in addition to certain strengths. These are discussed in the following paragraphs.

The licensee had not adequately tested the alignment of each unit's spare ICW C pump to the A or B header in order to demonstrate that the header fulfilled the Technical Specification operability requirements when taking credit for the standby C pump. Despite this, on numerous occasions the licensee had taken credit for the operability of a header which included the inadequately tested C pump.

In the Unit 1 inservice testing program, the licensee provided justification for not performing valve stroke time testing for the ICW temperature control valves by proposing alternate quarterly exercising of the valves. The NRC approved this relief request, but the licensee had not performed the alternate quarterly exercising to date. The licensee also deleted certain manual valves from its testing procedures but neither revised its approved program nor informed the NRC of these changes. The Unit 2 valve program has never included any test provisions for the temperature control valves, even though these valves have been part of the Unit 1 program since at least 1981.

The team found several discrepancies in the content of the Final Safety Analysis Reports (FSARs). In one instance, the licensee had not properly updated the Unit 2 FSAR with plant modification information and in several instances the licensee had submitted incorrect and incomplete FSAR information regarding the functions of safety-related system components at the time of the units' licensing. These findings particularly raise questions regarding the quality of the licensing basis documents for Unit 1. The licensee stated that the design basis documentation program would review the accuracy of the FSAR content. In addition, the team questioned the thoroughness of the licensing-basis review performed in implementing Generic Letter 89-13 requirements.

In several instances, the team noted that some incorrect information was included in the operator training material on the ICW system. Individually, these items did not represent a significant problem, especially considering that the operators were proficient in system operations. However, as a group, the inaccuracies represented a weakness in the process to maintain the training materials current. The team considered the licensee's Generic Letter 89-13 review in this area to be deficient.

The licensee's program exhibited strengths in the maintenance area where procedures and training materials were good, and personnel exhibited their knowledge of the material. The inspection program for the ICW piping internals also represented a strength. Given the harsh environment of sea air and sea water, the overall material condition of equipment was very good.

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1.0 INSPECTION SCOPE AND OBJECTIVES

From September 23 through October 4, 1991, the Nuclear Regulatory Commission (NRC) staff performed an announced pilot Service Water System Operational Performance Inspection (SWSOPI) at the St. Lucie Plant, Units 1 and 2. The inspection focused on the mechanical design, operational control, maintenance, and surveillance of the service water system (SWS). In addition, the team evaluated quality assurance and corrective action program aspects related to the SWS. The primary objectives of the SWSOPI were to:

(a) assess the operational performance of the SWS through an in-depth review of mechanical systems' functional design and thermal hydraulic performance; operating, maintenance, and surveillance procedures and their implementation; and operator training on the SWS;

(b) verify that the functional designs and operational controls of the SWS are capable of meeting the thermal and hydraulic performance requirements and that SWS components are operated in a manner consistent with their design bases;

(c) assess the licensee's planned or completed actions in response to Generic Letter 89-13; and

(d) assess the unavailability of the SWS resulting from planned maintenance, surveillance, and component failures.

The team has characterized its findings within this report as deficiencies, unresolved items, or observations. Deficiencies are either (a) the apparent failure of the licensee to comply with a requirement or (b) the apparent failure of the licensee to satisfy a written commitment or to conform to the provisions of applicable codes, standards, guides, or accepted industry practices when the commitment has not been made a legally binding requirement. Unresolved items involve a concern about which more information is required to ascertain whether it is acceptable or deficient. Appropriate items will be reviewed by the NRC regional office for any enforcement actions. Observations are items considered appropriate to call to licensee management attention, but which have no apparent direct regulatory basis.

2.0 DETAILED INSPECTION FINDINGS

2.1 Mechanical Design Review

The mechanical design review of the St. Lucie intake cooling water (ICW) system -- the system that performs the service water system function -- included determination of whether the system's design basis, design assumptions, calculations, analyses, boundary conditions, and models met licensing commitments and regulatory requirements and were capable of meeting the thermal and hydraulic performance specifications during accident or abnormal conditions. The team also reviewed the system's seismic qualification, its design vulnerabilities, its flooding mitigation characteristics, and a sample of implemented modification packages.

2.1.1 System Description

The ICW system for each St. Lucie unit is comprised of two safety-related, independent header systems designated A and B and a nonessential header serving the turbine cooling water (TCW) and steam generator blowdown systems. The ICW system was designed to remove heat from the essential and nonessential headers and transfer it to the plant's ultimate heat sink, the Atlantic Ocean. The two essential headers remove heat from the component cooling water (CCW) system through the CCW heat exchangers (CCWHXs) and, because they are 100% redundant, only one header would be required to remove the accident heat load. The significant heat loads on the CCW loops include the containment fan coolers, the shutdown cooling heat exchangers, and safety-related pumps.

Figure 1 depicts the Unit 1 ICW system. The main difference between Units 1 and 2 is that the Unit 2 pump cross-tie valves 21165 and 21211 are normally open and closed, respectively. Each safety-related train includes a submerged pump; a basket strainer; a single-pass, shell-and-tube CCWHX; a flow meter; an air-operated temperature control valve (TCV); a restriction orifice; concrete-lined, carbon-steel piping; and various butterfly isolation valves and pressure and temperature indicators.

The ICW system sea water flows through the CCWHX tubes while the CCW system demineralized water passes through the shell-side of the CCWHX. The ICW flow through each CCWHX is controlled by an air-operated temperature control valve (TCV) downstream of each CCWHX (TCV-14-4A and TCV-14-4B). These are butterfly valves which have a closed limit of 25% open on Unit 1 and of 8% open on Unit 2, and the Unit 1 valves have a maximum open limit of 50% open.

The nonessential portion of the ICW system draws sea water directly from the A and B safety-related headers. Upon receipt of a safety injection actuation signal (SIAS), valves MV-21-2 and MV-21-3 close to isolate the nonessential loads and valves FCV-21-3A and FCV-21-3B (Unit 1) and valves MV-21-4A and MV-21-4B (Unit 2) close to isolate the lubricating water flow to the circulating water pumps.

In addition to the A and B pumps, a C pump is also available and can be manually aligned to either of the two ICW trains. On Unit 1 the C pump is normally aligned to the B header; on Unit 2 the C pump is normally aligned to the A header.

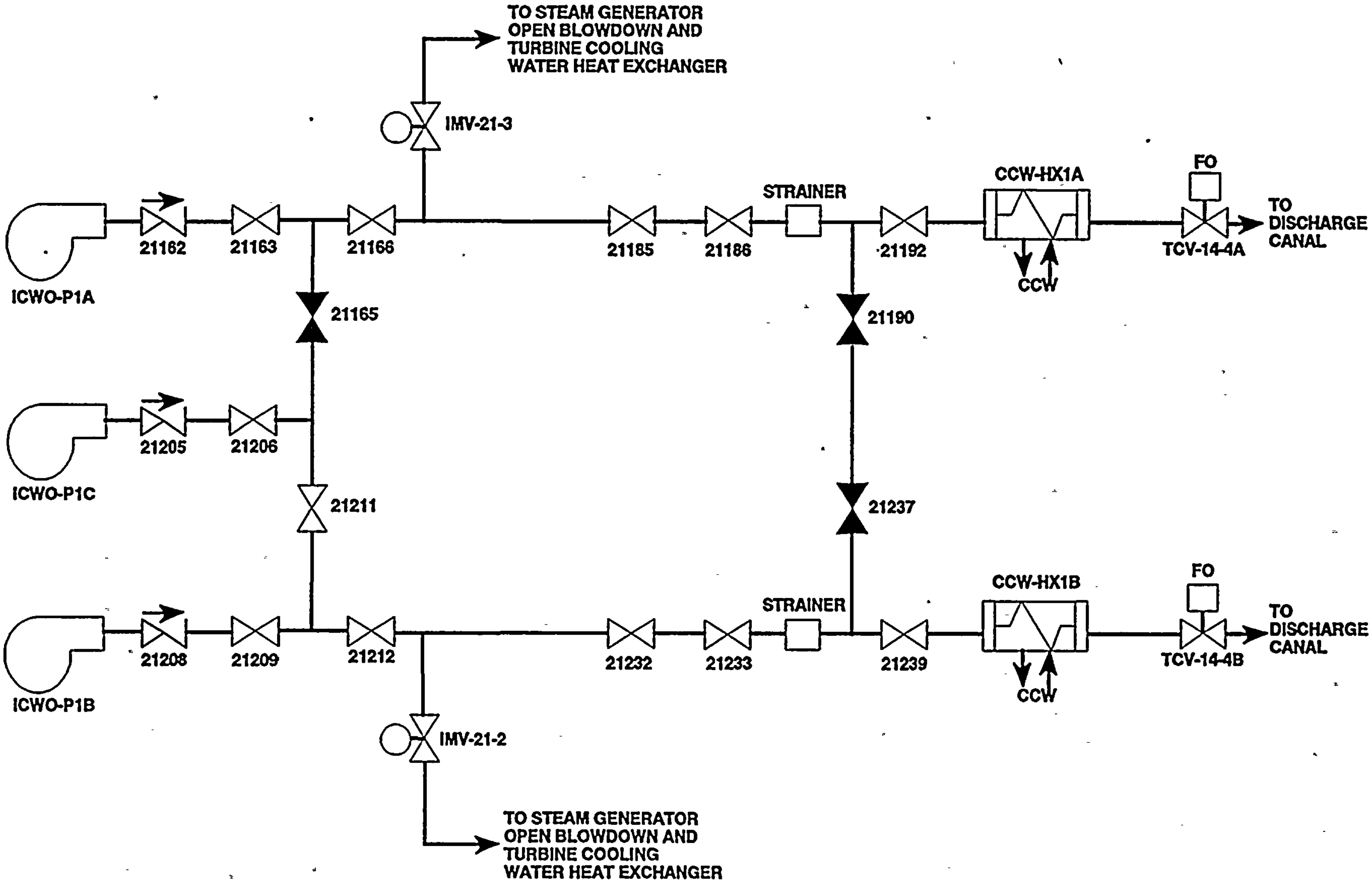

Figure 1 St. Lucie 1 Intake Cooling Water System

Approximately 1200 feet off shore, three reinforced concrete pipes below the surface of the Atlantic Ocean, two with a 12-foot and one with an 16-foot inside diameter, draw seawater into the plant's intake canal. The submerged ICW pumps draw water from the intake canal, pump it through the ICW headers, and return it to the Atlantic Ocean via a discharge canal. Should the ocean intake become obstructed, the Indian River is available as an alternate water source independent of the intake piping.

The lubricating water system for the ICW pumps is a two-train system that pipes water from the discharge headers of the ICW pumps, through two Zurn strainers in series, to the tube enclosing the pump shaft and water-lubricated bearings. Each train is capable of supplying all three pumps. This lubricating water system also supplies flow to the circulating water pumps. The licensee was in the process of replacing this external lubrication system with a self-lubricating system internal to the pumps (see Section 2.1.5 for further discussion). The modification was completed on pumps 2A and 1A and was near completion on pump 1C.

2.1.2 Design Review Details

2.1.2.1 Component Cooling Water Heat Loads

The team selected two sample heat loads on the CCW system for audit to assess the accident heat load adequacy. The selected loads were the high-pressure safety injection (HPSI) pump and the containment fan coolers. The first was chosen because the licensee classified it, and the heat loads of five other safety-related pumps, as negligible, and the second was chosen because it represented a substantial heat load.

The HPSI pump heat load was classified as negligible in a Unit 1 calculation summary dated June 12, 1970. When the team questioned the basis for assuming these heat loads negligible, the licensee quantified the pump's contribution to the total CCW heat input in a new calculation showing a load of 0.27×10^6 BTU per hour for the A HPSI pump and 0.33×10^6 BTU per hour for the B HPSI pump. This confirmed the heat loads were negligible in relation to the total heat load on the CCWHX which was on the order of 200×10^6 BTU per hour.

The containment fan cooling heat load represented the largest contribution to the accident heat load. In Unit 1, each CCW train supplies two single-speed fan coolers. Either all four containment fan coolers or the combination of two fan coolers and one containment spray system were credited for containment accident heat removal. In Unit 2, two double-speed fans and one containment spray system were credited for containment accident heat removal.

In reviewing the Unit 1 containment fan cooler specification (Ebasco No. FLO-8770.775, paragraph 6.2), the team noted a discrepancy between the specified design conditions for the fan coupling and shaft bearings (44 psig at 290°F) and the design condition for the enclosure of the fan cooler motor (39.6 psig at 264°F). However, all of the components are part of the same fan cooler assembly and would be subjected to the same environmental conditions. The licensee gave the team a certified, witnessed test performance curve for normal operating conditions and a certified, computed performance curve for accident conditions. These curves were extracted from the vendor's manual for the fan cooler and they demonstrated that the cooler had been tested at pressures up to 80 psig and had been environmentally tested at 300°F for 24 hours. These test conditions enveloped both sets of specified design values. The licensee explained that the two values represented maximum design conditions and loss-of-coolant-accident (LOCA) conditions, respectively.

The CCWHX heat load summary reported, in a footnote, a heat input from the magnetic jack control rod drive coolers of 2×10^6 BTU per hour which represented an unaccounted-for quantity. The coolers had been removed previously from the essential heat load list, but this information had not been appropriately reflected in the accident heat load summary. The team concluded that the CCWHX heat load summary for Unit 1 was not an accurately maintained document. (Appendix B, Observation Number 91-201-01)

The team also noted that the CCWHX accident heat load was inconsistently reported in different documents; for example, it was reported as 240×10^6 BTU per hour in the heat load calculations, 211.7×10^6 BTU per hour in the procurement specifications and the FSAR; and as 195×10^6 BTU per hour in the Electric Power Research Institute (EPRI) accident performance extrapolation study for the CCWHX. The containment accident heat load of 240×10^6 BTU per hour was an initial gross estimate to support issuance of component purchase orders. Subsequently, the licensee recalculated the containment accident heat load as 211.7×10^6 BTU per hour to account for maximum heat load demand rather than maximum design conditions. However, this calculation assumed maximum concurrent heat loads on the shutdown cooling heat exchanger and the containment fan coolers. In 1990, a more realistic approach utilizing a time-history study with proper sequencing of the fan coolers and shutdown cooling heat exchangers demonstrated that the maximum accident heat load was 195×10^6 BTU per hour; however, the documents were not updated to be consistent. (Appendix B, Observation Number 91-201-02)

The team concluded that the FSAR did not clearly identify the rationale behind the differing temperatures, pressures, and accident heat loads. In fact, these inconsistently presented values manifested themselves in the containment fan cooler specification. The team observed the need for the FSAR to be revised to correctly document the design basis. Refer to Section 2.1.4 for further discussion of FSAR discrepancies.

2.1.2.2 Component Cooling Water Heat Exchanger

The team reviewed sizing calculations, a cross-sectional sketch of the CCWHX, and the procurement specification and its specification sheets. In the area of vibration analysis, the manufacturer had used the Heat Transfer Research Institute's program of flow-induced vibration analysis to assess the potential of tube damage by fretting. The maximum vibration was established at 50% of the tube's natural frequency, which corresponded to a shell-side flow limit of 50% above design. The team concluded that these vibration provisions were acceptable.

The ICW side of the CCWHX is protected from overpressure by 3-inch relief valves which were oversized for the task of thermal relief, so that adequate relief would be provided. The large relief capacity of these valves made them susceptible to valve chatter. The licensee recognized the problem but stated that the larger size had been chosen for ease of maintenance. The CCW side of the CCWHX is adequately protected by means of relief valves installed on the containment fan coolers and shutdown cooling heat exchangers.

2.1.2.3 ICW System Hydraulic Design

The team noted a discrepancy between the minimum ICW pump suction head required according to the Unit 1 FSAR (4 feet) and the vendor's pump manual (8 feet). The licensee stated that the vendor's submergence information was in accordance with the original purchasing specification (Ebasco FLO-8770-121) which called for a minimum submergence of 4 feet at the rated capacity and of 8 feet at 125% of the rated capacity. The team accepted the clarification but concluded that the vendor's manual did not clearly define the requirements.

For protecting pumps from a maximum flow condition (i.e., pump runout), Unit 1 features a restriction orifice downstream of the TCV and a mechanical stop on the TCV which limits the butterfly valve disc rotation to 45° (50% open); Unit 2 relies on the orifice without a maximum stop for the valve. In both cases, the orifice provides back pressure and effectively prevents the TCV from having to absorb the total available pressure drop. The team reviewed the Unit 1 system flow resistance during accident conditions (with the nonessential header isolated), including the orifice and the control valve at its fully open position of 45° (50% open) to ensure that enough resistance was available to prevent a runout condition. As a result of its review, the team found that flow resistance due to the backpressure effects of the orifice and TCV prevented pump runout by limiting flow to 19% less than the 18,100 gpm pump runout flow. Low ICW pressure conditions and high pump motor current would alarm in the control room and serve as a means to alert operators to the potential for pump runout. An issue regarding pump runout during operating conditions was identified during the Unit 2 preoperational test review and is discussed in Section 2.4.1.

2.1.2.4 Common-Mode and Single-Failure Analysis

Loss-of-service-water (LOSW) events have occurred at operating reactor plants as a result of clogged intake structures. The most recent LOSW occurred at Millstone Unit 1 on October 4, 1990. In fact, St. Lucie had experienced a common-mode clogging of the intake screens in 1984 due to a massive jellyfish intrusion. The team reviewed the protective measures in place to mitigate massive common-mode clogging of all or part of the intake screening system (trash racks and traveling screens). Without specific controls in place to prevent clogging, the circulating water pumps (whose suction was located 2½ feet above the ICW pumps) could reduce the intake level sufficiently to affect ICW pump operability. The ICW pumps require 4 feet of net positive suction head for full flow. Also, excessive drawdown of the intake bay could create a high differential pressure across the traveling screens which could lead to screen failure and allow debris to enter the ICW pump suction.

The licensee had established an off-normal operating procedure -- ONOP 1/2-0620030, "Circulating Water System" -- which required that a circulating water pump be secured when a 40-inch differential level is measured across its respective traveling screen. Although the differential pressure circuitry for the traveling screens is not safety related, the team observed that the licensee was sensitive to the condition of the intake structure and frequently monitored its status. The traveling screens had also been modified to withstand a 15 foot differential level following the 1984 jellyfish intrusion.

In reviewing the specific design details and configuration for the ICW system, the team identified several design weaknesses and vulnerabilities ((a) and (d) of which are mitigated by the self-lubrication modification) that could potentially compromise the ability of the ICW system to satisfy its safety function. Specifically:

(a) The lubricating water supply to the ICW pumps was susceptible to a common-mode failure because the two trains of lube water joined in a common header. For example, certain scenarios could have prevented the flow of lube water to all ICW pumps: (1) a pipe break in the common lube water header or (2) a bearing failure on one of the ICW pumps which could have drawn excessive lubricating water and thus starved the remaining pumps. (Appendix B, Observation Number 91-201-03)

(b) The nonessential header isolation valves (MV-21-2 and MV-21-3) were located below the flood level but were not qualified for submersible operation. Operability of the ICW system could be compromised during a flood if a pipe break occurred while the TCW system headers were cross-tied. Since TCW was not safety related, this scenario is credible given the corrosive nature of the service environment. (Appendix B, Observation Number 91-201-04)

(c) The ICW strainers could only be bypassed manually making operation difficult during extreme bad weather.

(d) The Unit 1 lubricating water Zurn strainers were located below the flood level making it impossible to backwash the Zurn strainers during a flood.

The lubricating water vulnerabilities have been mitigated on Unit 1 by the self-lubrication modifications to the A and C pumps. Unit 2 remains susceptible to lubricating water vulnerabilities because only the A pump had been modified. The team also recognized that vulnerabilities associated with flooding scenarios were mitigated because the licensee would initiate action to shut down the units during impending hurricane conditions. These vulnerabilities would require consideration in the development of a plant-specific probabilistic risk assessment. The licensee stated that these vulnerabilities would be considered, to the degree they remain valid, during completion of the St. Lucie Individual Plant Examination.

Action IV of the generic letter (GL) requested that licensees confirm that the SWS will perform its intended function in accordance with the licensing basis of the plant. The licensee completed a Unit 1 review and inspection (documented in an Ebasco report dated November 14, 1990) to satisfy this request. A fairly extensive walkdown of the ICW and CCW systems and validation of the as-built condition of the plant against the isometric drawings had been completed. However, design discrepancies or vulnerabilities such as those found by the team (discussed above) were not identified. Section 2.1.4 discusses additional licensing-basis discrepancies.

2.1.2.5 Stress Analysis

Unit 1 was designed to meet American National Standards Institute (ANSI) B31.7 Code stress requirements; Unit 2 was designed to meet Section III, Subsection C of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. The ICW piping was classified as ASME Class 3 and seismically qualified to both the operating-basis earthquake and the design-basis earthquake as described in FSAR Section 3.7.

The PIPESTRESS 2010 computer program was used to conduct the piping stress analysis of the seismically qualified portion of the system. The program provided calculated stress intensities in accordance with the applicable ASME or ANSI Code. The team verified that the spacing of mass points in relation to input node points was adequate. Spectra enveloping was used to compensate for the inability of the PIPESTRESS 2010 program to evaluate multiple spectra input. The team identified no concerns regarding application of this methodology.

Documentation for all the floor response spectra used in the analysis was not easily retrievable. The licensee staff acknowledged this difficulty and indicated that they would develop a document containing all response spectra.

A review of a sample piping stress analysis and two support calculations showed them to be correct. However, the licensee assumed infinite support stiffness (perfect rigidity) for the St. Lucie design. The team concluded that this was acceptable because the pipe stresses are well below the allowable limits. In addition, the representative pipe supports reviewed appeared to approximate the rigidity assumption in that less than an eighth of an inch deflection under design loads would be expected.

The load combinations for stress evaluation did not include water-hammer loads. A water-hammer event occurred in Unit 1 on April 1, 1979, due to a pump trip and auto restart. An evaluation of the system's integrity concluded that the damage was confined to the non-safety-related portion of the system. The essential portion of the system was protected by vacuum breakers and both the TCW and steam generator open blowdown heat exchanger TCVs had built-in minimum open stops minimizing water-hammer effects. To avoid recurrences of similar events, the licensee installed vacuum breakers at the high points of the nonessential portion of the Unit 1 system, upstream of the turbine and blowdown coolers. The Unit 2 system had already been designed with adequate protection. This solution was documented in the report, "Intake Cooling Water System Surge Pressure Study." In addition, the licensee modified the system startup/shutdown procedure so that the TCVs would be 30% open before starting the ICW pump. The team concluded that water-hammer effects were appropriately evaluated and mitigated.

2.1.3 Component Cooling Water Heat Exchanger Heat Transfer Test

Action II of the GL requested that licensees conduct a test program to verify the heat transfer capability of heat exchangers cooled by open-cycle service water systems. The licensee completed the initial heat transfer test of the Unit 2 CCWHXs during the Fall 1990 outage and planned to complete the Unit 1 test during the Fall 1991 outage. The licensee followed the Electric

Power Research Institute (EPRI) guidance, "Heat Exchanger Performance Guidelines for Service Water Systems," June 1990, for completing the test and evaluating the test data. From the test, the licensee expected to determine the actual heat transfer capabilities and the best cleaning cycle for the heat exchangers. The EPRI methodology used actual operating data measured in two tests: a pre-outage test with a fouled heat exchanger and a post-outage test with a clean heat exchanger. The data collected were used to determine the overall fouling resistance at the time of the test with normal operating flows. The pre- and post-outage test parameters were then used to extrapolate the heat transfer performance during accident conditions. Although it did not specifically review and validate the EPRI methodology, the team did verify that the licensee had implemented the EPRI methodology accurately.

The team reviewed the results of the heat transfer test and, given the uncertainties such as instrument inaccuracies and the required extrapolation inherent with the test methodology, the team concluded that the heat transfer capability of the CCWHXs was marginal at the end of an operating cycle. For example, on CCWHX 2A, the projected heat transfer for the 211.7×10^6 BTU per hour condition was 217.37×10^6 BTU per hour, representing a margin of less than 3%. This margin is within the instrument inaccuracy assumed in the EPRI methodology which is at best 5%. (The 211.7×10^6 BTU per hour case is used as illustration because that is the current design information in the FSAR against which performance must be measured.) Therefore, the licensee's current practice of cleaning the CCWHXs during each refueling outage may not be sufficient to ensure that the CCWHXs can accommodate the design accident conditions due to the small margin noted during the test. The test results also indicated that the CCWHX cleanliness factor was degraded beyond the 85% that was credited in the FSAR. The licensee indicated that it planned to further review its test data by evaluating the worst-case cleanliness factor in combination with the worst-case flow conditions experienced or anticipated. (Appendix B, Observation Number 91-201-06)

Heat exchanger operability is a function of flow and heat removal capability. Operability criteria based on test results showing worst-case fouling conditions (heat removal capabilities) and heat exchanger differential pressure (indication of flow blockage) had not been established. (Appendix B, Observation Number 91-201-07) The matter of CCWHX performance monitoring is discussed further in Section 2.4.6.

2.1.4 FSAR Discrepancies

In evaluating the adequacy of system design, the team reviewed the FSAR description of the ICW system and compared it to the installed system. The following discrepancies were identified:

(a) Section 3.4.4 of the FSARs for each unit indicated that the nonessential ICW header isolation valves (MV-21-2 and MV-21-3) were qualified for submersible operation. Contrary to the FSAR description, these valves were not qualified for submersible operation. The team agreed that it was not necessary for these valves to be so qualified because even if they failed to isolate the nonessential header, the plant could be shut down safely during a flood. However, the licensee had failed to submit the correct description and subsequently revise the FSAR to contain accurate information.

(b) The TCVs did not operate as described in the Unit 1 FSAR. The FSAR indicated that these valves failed in the open position. However, the team found that TCV-14-4A and TCV-14-4B could not be opened beyond 45° (50% open). Apparently during preoperational testing, the licensee determined that it was necessary to restrict valve opening in response to hydraulic considerations, but the licensee failed to reflect this limitation in the FSAR. The open stop ensures operability of the system by preventing pump runout. The limitation is of sufficient importance that it should be noted in the FSAR to ensure that the system would function as required in its fail-safe position as addressed by Standard Review Plan (SRP) Section 9.2.1.

(c) Although the self-lubrication modification had been operational on the 2A ICW pump since April 1989, the modification was not discussed in the Unit 2 FSAR, nor in the licensee's annual submittal of plant changes pursuant to 10 CFR 50.59 requirements. Modification closeout had not been completed although the field implementation had been completed and the pump was declared operable. The licensee's processing of modifications was deficient in that it prevented timely revision of licensing documents pending completion of low-priority paperwork. The licensee reviewed other incomplete modification packages and did not identify additional FSAR discrepancies of this nature.

(d) The FSARs for Units 1 and 2 stated that the CCWHXs were designed to handle the post-design basis accident heat load with an 85% cleanliness factor. On the basis of the results of the Unit 2 heat transfer test (see Section 2.1.3), it appeared that the 85% cleanliness factor did not conservatively reflect actual operating conditions. The information currently contained in the FSAR did not reflect the worst-case cleanliness factor.

(e) The Unit 1 FSAR did not include a description of lubricating water isolation valves FCV-21-3A and FCV-21-3B which isolate the lubricating water for the nonessential circulating water pumps upon receipt of a SIAS. This did not conform to the guidance contained in SRP Section 9.2.1.III.2.a which states that the FSAR system description must contain a verification that isolation valves automatically separate nonessential parts from the essential parts of the system during an accident.

(f) Section 9.2.1.3.3 of the Unit 1 FSAR made reference to recirculation operation of the intake and discharge canals for biofouling control which was no longer valid.

(g) The FSARs were not clear, nor were they consistent with other documents, regarding heat removal requirements and design values for containment temperature and pressure. Section 2.1.2.1 gives additional details on this item.

(h) Section 9.2.7 of the Unit 1 FSAR incorrectly described the ultimate heat sink water source by discussing only two of three intake pipes.

While the above items, taken individually, were not of major safety significance, collectively these discrepancies indicated a failure to properly represent plant configuration in the FSARs. The team was concerned that the number of discrepancies found in their limited review may be indicative of a more pervasive problem. This finding is contrary to a Florida Power and Light Co. letter dated March 24, 1983, that attested to the accuracy of the Unit 2 FSAR in support of fuel load. (Appendix A, Deficiency Number 91-201-01)

The licensee stated that a design-basis documentation (DBD) program was being prepared, and that when it was completed, FSAR discrepancies would be identified and corrected. The team emphasized that the FSAR should be corrected as changes are identified in accordance with 10 CFR 50.71.

Action IV of GL 89-13 requested that licensees confirm that the SWS will perform its intended function in accordance with the licensing basis of the plant. In implementing this action of the GL, the licensee did not identify any of the FSAR discrepancies noted by the team. As such, the licensee's review did not fully satisfy the action requested by the GL. (Appendix B, Observation Number 91-201-05)

2.1.5 Modification Review

The team reviewed three modification packages: (1) the ICW pump self-lubrication modification (PCM 043287), (2) the intake traveling screen upgrade (PCM 200284), and (3) the intake cooling water TCV limit control (PCM 205-76).

As part of the self-lubrication installation, the cooling jacket surrounding the pump bearings was removed to expose the bearings to the ICW flow to directly cool the bearing. The team verified that this modification significantly reduced the possibilities of common-mode and single failures associated with the external lubricating water system. The documentation was satisfactory except that the scope of the modification was poorly described.

The intent of the intake traveling screen modification was to improve the structural resistance of the screens and was prompted by the damage these screens sustained from the jellyfish intrusion in 1984. Stiffening the screens increased the differential head resistance from 5 feet to 15 feet of water. Teeth were added to the traveling trash buckets to improve their ability to grab and remove jellylike substances. The description of this modification was incomplete, but the remainder of the documentation was satisfactory.

The TCV limit control modification incorporated a 50% open limit on the TCV downstream of each Unit 1 CCWHX. This limit was designed to provide adequate system backpressure. The documentation associated with this modification was adequate.

2.1.6 Conclusions

The team concluded that the licensee was maintaining the ICW system design in accordance with licensing commitments and regulatory requirements with the exception of one deficiency and several observations identified by the team. The licensee's failure to submit and maintain an accurate FSAR which is consistent with plant configuration was identified as a deficiency. Observations brought to the licensee's attention included several design weaknesses that had not previously been examined, the apparent need to clean the CCWHXs more frequently, and the lack of definitive operability criteria for the CCWHXs.

2.2 Operations

Plant operations were reviewed to assess the knowledge of the operators and the accuracy and completeness of procedures and training they received regarding the ICW system. In reviewing the operation of the ICW, the team performed detailed system walkdowns; reviewed the procedures for normal, off-normal, and emergency conditions; assessed the conduct of operations in the field and control room; and evaluated training manuals and lesson plans.

2.2.1 System Configuration Walkdowns

The team conducted detailed walkdowns with respect to the system flow diagrams. The walkdowns included the Unit 1 ICW system and that portion of the Unit 2 ICW system located at the intake structure. The systems were generally in very good material condition. Material condition was observed to be a function of the daily effort applied because of the salt-laden air and water environment. The licensee had established a corrosion control task force and had dedicated resources to conduct continual surveillance of exposed systems and components, activities that were required to keep systems operable. However, a number of specific degradations were found despite the licensee's extensive pre-inspection efforts. For example, the ICW areas at the intake structure and CCWHX platform showed a steady assault of salt corrosion on everything from gauge casings, bolts, piping, foundations, and supports to the concrete reinforcement itself. These were addressed by the licensee but additional ongoing attention may be warranted. Where original construction materials were changed to improve corrosion resistance, the systems and supports were resisting the corrosive environment. Ferrous items that had not been changed invariably had pitted or pocked surfaces and metal loss, and required continual painting and frequent operability evaluation. During this inspection, a 2½-inch-diameter carbon steel emergency fill line for the Unit 1 spent fuel pool was being replaced with the same kind of material, even though the original line had failed from internal corrosion. The licensee had not been proactively upgrading construction materials to achieve greater corrosion resistance. (Appendix B, Observation Number 91-201-08)

Vertically mounted gear boxes for manually operated Henry Pratt valves collected water through the position pointer hole but lacked drains. Valve SB 21185 contained more than an inch of rain water and had extensive internal rust, but remained operational. The licensee identified this type of condition about six months ago, but standards had not been developed to define the point at which gearbox internal conditions necessitated repair. In the present case, the licensee responded adequately by fully packing this outdoor vertically mounted gearbox with grease and changing the procedure (General Maintenance Procedure M-0059, Rev. 0, "Disassembly/Reassembly of Henry Pratt Type MDT 1, 2, 2S, 3, 3S, 4S, 5, 5S Manual Operators") to specifically address obtaining a snug fitup on the shaft grommet between the pointer and the gearcase to prevent water intrusion. (Appendix B, Observation Number 91-201-09)

During system walkdowns, the team identified two design inadequacies with the manual operators for the Unit 1 pump lubricating water Zurn strainers. These four strainers were located six feet below grade in a pit. In case of a flood, a manual reach rod operator was provided to allow manual strainer backflush by utilizing guide tubes to each operator. The first design inadequacy was that the guide tubes for the manual operators allowed rain water to collect in the rotary strainer gearboxes. All four gearboxes contained significant water. The gearboxes operated at very low speed and functioned despite the water. (Appendix B, Observation Number 91-201-10)

The second design inadequacy concerned the backflush drain valves. They were located just below the rotary strainers and must be opened to backflush the strainers. These valves were not included on the system drawing depicting the strainers nor in the operating instructions contained on the drawing. These valves could not be opened during flood conditions without entering the pit, contrary to the design intent. The recent installation of the self-lubrication modification to the ICW pumps minimized the safety significance of this observation. However, before the installation of the self-lubrication modification, the inability to operate the Zurn strainers could have led to the failure of redundant ICW pumps. This design weakness or the fact that it was corrected by the modification was not apparent to the licensee. (Appendix B, Observation Number 91-201-11)

Insulating flange kits were installed at locations different from those depicted on the system drawings. While these kits do not affect short-term operability, they do affect longer term electrolytic corrosion of piping, components, and fasteners because they interrupt circulating electrical currents and thus are valuable in preventing degradation. They are used at interfaces between dissimilar metals or where systems enter the ground or water. The licensee initiated work requests to replace the missing insulated flanges. Two programmatic improvements were also initiated:

(1) A standard will be written addressing the type of locations where insulating flange kits would be appropriate. Nuclear Engineering Department Standard M-3.55, Rev. 1, "Insulating Flange Installation Standard," was issued in September 1990 to address installation techniques, but did not contain location guidance.

(2) Insulating flange kit information will be removed from flow diagrams and will be depicted on the appropriate isometric drawings.

The team concluded that these improvements will reduce confusion and lead to installation of kits where needed.

2.2.2 Operations Procedures

The team reviewed numerous procedures associated with ICW system operations including those addressing annunciators, pre-start checkoff lists, the circulating water system, and station blackout.

Operating Procedure (OP) 1-0640020, "ICW System Operation," contained the preoperational valve lineup and instructions to fill and vent empty ICW system headers. The procedure contained appropriate cautions concerning maximum allowed flowrates through various tube bundles, but did not contain instructions on substituting the 1C ICW pump for the 1A pump or 1B pump. During the inspection, the licensee initiated a procedure for substituting the C pump for both units.

"Plant Annunciator Summaries," ONOP 1-0030131, Rev. 43, and ONOP 2-0030131, Rev. 30, were reviewed relative to the respective installed annunciator panels, off-normal procedures, and training material. The annunciator summaries, off-normal procedures, and operator understanding were in agreement concerning the meaning of the annunciator, the setpoints, and the appropriate corrective actions. The training literature, however, contained factual errors. Specifically, Unit 1 annunciator panel "E" and its annunciator summary had two conflicts that could have misled an operator: (1) annunciator tile E-15 was labeled "Lube Water Flow Low" while the annunciator summary was labeled "Lube Water Pressure/Flow Low" and (2) annunciator tile E-39 was labeled "Discharge Canal Water Level/Temperature Off Normal" while the annunciator summary was labeled "Discharge Canal Water Level/ [Delta] Temperature Off Normal." In both cases, the licensee concluded that the summaries were incorrect and changed them to match the installed annunciators. In addition, several minor typographical errors were found in the annunciator summaries; all were corrected during the inspection.

ONOP 1-0640030, "Intake Cooling Water System," addressed a number of off-normal conditions in a systematic manner. However, its Appendix A, "CCWHX Strainer Flush," did not identify SB 21189, one of the two backflush valves. A procedure change request (PCR) had been submitted but a temporary change was not in effect. The appendix also required that the operator ensure that the flow exceeded the minimum, but did not provide the operator with the minimum flow value. (Appendix B, Observation Number 91-201-12)

The team determined that ONOP 1-0620030, Rev. 10, "Circulating Water System," contained the necessary action levels for plugged intake screens, including power reduction, tripping off the main circulator pumps, and shutting down the plant if needed.

Action V of GL 89-13 required licensees to confirm that operating and emergency procedures that involve the SWS are adequate to ensure that safety-related equipment that is cooled by service water will function as intended. In its review of procedures, the licensee did not identify those discrepancies identified by the team. (Appendix B, Observation Number 91-201-13)

2.2.3 Operator Walkdowns

The team interviewed several non-licensed operators during rounds concerning ICW operations. The operators walked through, performed, or explained operations including starting and stopping an ICW pump, flushing the screen wash pump and describing screen operation, flushing the ICW pump lubricating water strainers (both routinely and manually), flushing the ICW strainer serving a CCWHX, performing a pre-start valve lineup, responding locally to control room alarms, and explaining local indication discrepancies.

The team interviewed several licensed reactor control operators (RCOs) and senior reactor operators (SROs) concerning control room responses to alarms and emergency conditions. The interviews emphasized the meaning of alarms, pre-assigned action levels (if any), and the integration of an ICW concern with the rest of the plant. The control room operators were knowledgeable of their assignments and those of the non-licensed operators. The control room operators correctly described alarm responses and the relationship of alarms to approved procedural actions.

2.2.4 Operations Training

2.2.4.1 Training Programs

The initial training programs for licensed and non-licensed operators were described in several administrative procedures (APs). The two primary procedures were AP 0005721, Rev. 10, "Reactor Control Operator Training and Qualification," and AP 0005740, Rev. 11, "Non-Licensed Operator Training and Qualification." These high-level procedures explicitly described the training process and contents of the training programs. These programs had all been accredited by the Institute of Nuclear Power Operations (INPO) and included theory and systems courses; numerous task-based job performance measures (JPMs) related to the system courses and tasks expected to be performed following qualification (non-licensed operator training); demonstration of skills similar to non-licensed operator JPMs (licensed operator training); examinations on theory, systems, and JPMs; on-shift training; and final operations evaluation. The training basis presented in these procedures was comprehensive and well presented.

2.2.4.2 Training Materials

The team reviewed operator training material related to the ICW system, including appropriate lesson plans, modules, and JPMs. This material covered the startup and shutdown of ICW pumps, the manual startup of the screen wash system, and operation of system strainers.

The training library was complete, and the licensee catalogued instructional material relevant to each training or requalification level in a training information management system. The library and cataloging system represented a positive control over training information and were maintained in an outstanding manner.

The training material on the ICW system for auxiliary nuclear plant operators (ANPOs), senior nuclear plant operators (SNPOs), and RCOs contained incorrect information. Though the framework for establishing and maintaining correct course content was well established in AP 005756, Rev. 3, "Systematic Training Development," the failure to properly implement this process had resulted in incorrect training material. (Appendix A, Deficiency Number 91-201-02) The following are examples identified by the team:

(a) ANPO training handout 0110010, Rev. 1, "ICW and Lube Water Systems"; SNPO training handout 0504012, Rev. 2, "Intake Cooling Water, Component Cooling Water, and Fuel Pool Cooling, Purification and Ventilation Systems"; and RCO training handout 0704201, Rev. 5, "Cooling Water Systems," described the cross-connect line upstream of the CCWHX as allowing the heat exchangers to have full flow with strainers clogged, during backflushing, and in case of a line rupture upstream. This information was incorrect because (1) one ICW pump would not supply full flow to two heat exchangers, (2) the strainers have their own bypass for backflushing, and (3) no procedure existed for cross-connecting the headers during power operation in case of a pipe rupture.

(b) ANPO training handout 0110010 contained incorrect strainer mesh sizes.

(c) ANPO training handout 0110010 did not contain the same lubricating water flow to the ICW pump lower bearings as the ANPO operating log limits.

(d) ANPO training handout 0110010 omitted discussion of 5 of 13 annunciators.

(e) The section of the RCO training handout 0704201 that addressed indicators, controls, and alarms contained numerous errors including erroneous names and missing information.

(f) Modules 0501090, "Backwash ICWS Strainer," and 0101043, "Backwash Lube Water Strainer," did not agree with the off-normal operating procedure controlling the activity.

(g) Module 0101044, "Backwash Screen Wash Strainer," contained incorrect directions regarding length of backwash and measurement of differential pressure.

Action V of GL 89-13 asked licensees to confirm that training involving the SWS is adequate to ensure that safety-related equipment cooled by service water will function as intended and that operators of this equipment will perform effectively. The team found the discrepancies in items (a)-(g) (above) despite the fact that the licensee had completed a review of operations training material in response to GL 89-13 requirements and determined that materials were adequate with certain minor revisions. (Appendix B, Observation Number 91-201-13)

AP 005766, "Training Resources, Information and Material Control," required the review of plant modifications for incorporation into training material. The team found that the 2A ICW pump was changed to a self-lubricated model in early 1989, but that training materials were not revised until November 1, 1990. Also, items (b), (d), and (e) above represented modifications to the plant that should have been incorporated into the training material. The team concluded that the training material was not being appropriately revised to reflect system changes. (Appendix A, Deficiency Number 91-201-02)

2.2.5 Conclusions

Overall, the team concluded that the licensee was operating the ICW system in an appropriate manner. By replacing corrosive components with like components in lieu of ones with a higher corrosion resistance, the licensee had not always appeared to effectively balance operability considerations against cost-effectiveness. The licensee's GL 89-13 review of training materials did not identify those deficiencies identified by the team. The licensee's failure to keep training material current, including failure to modify training material to reflect modifications made in the plant, represents a failure to adequately implement the procedures for developing and maintaining training material.

2.3 Maintenance

The purpose of the maintenance portion of the inspection was to determine whether the ICW components and piping were being adequately maintained to ensure their operability and to detect system weaknesses which required frequent attention. To make this determination, the team reviewed maintenance procedures, training programs, and maintenance histories of selected components. The team also observed maintenance activities in progress and interviewed maintenance personnel.

2.3.1 Procedures

During the course of the inspection, the team reviewed many of the licensee's procedures for performing maintenance on the ICW system. These procedures addressed predictive maintenance, calibration, system inspection and repair, motor overhaul, and disassembly and repair of pumps and valves. In general, the procedures were well written and gave sufficient detail for performing the specified tasks. A particularly positive point was that the procedures included the requirement to document as-found conditions, specific corrections, and as-left conditions, and to identify instruments used. This requirement permitted easier followup and corrective action to identified maintenance concerns.

2.3.2 Activities Observed

The team observed several maintenance activities in the field including the 1C ICW pump repair and conversion to self-lubrication, an ICW pump rotary strainer repair, a Henry Pratt manual valve operator repair, and maintenance training on a Bettis valve operator. Maintenance personnel performed these activities well. Onsite management supervision was evident and procedural guidance was appropriate. The work orders were in hand and included applicable procedures and post-maintenance test requirements. Maintenance personnel observed in the field were knowledgeable of the equipment being maintained and the administrative requirements.

2.3.3 Trending of Corrective Maintenance

The team reviewed a list of maintenance work orders for the ICW system for the past two years to identify common failures and review the licensee's solutions. The team identified few recurring equipment problems, and where they existed, further investigation found that the licensee had determined the root cause and implemented an effective solution.

One such trend involved frequent leaks and cracks in the leakoff line of the 2A ICW pump self-lubrication piping. A licensee study concluded that aluminum bronze, the material chosen for the self-lubrication modification, eroded as a result of higher-than-expected water velocities in the line. The licensee's solution was to replace the line with stainless steel piping and to complete all future modifications with stainless steel.

Another example was a failure of three of the four manual valves on the pump cross-connect header to close completely. As a result, the two headers were unable to isolate completely. Analysis showed the cause to be overtorquing of the valves by operations personnel which caused the travel stop screws to wear and break. The licensee planned to incorporate a warning against overtorquing into training courses.

2.3.4 Training

The training programs for maintenance journeymen or specialists were described in several APs. The basic APs describing this training are AP 0005748, Rev. 8, "Nuclear Maintenance Journeymen/Specialist Training Program"; AP 0005730, Rev. 6, "I&C Departmental Indoctrination Guidelines"; AP 0005758, Rev. 1, "Electrical Maintenance New Employee Indoctrination Guidelines"; AP 0005756, Rev. 3, "Systematic Training Development"; and

AP 0005757, Rev. 2, "Systematic Evaluation of Training Effectiveness." These procedures were explicit concerning the training process and subject contents of the training programs. The maintenance training program was INPO accredited and included attributes such as journeyman training, personnel certification, task-based JPMs related to the tasks expected to be performed following qualification, examinations, on-the-job training, and continuing training. The training basis was well presented and comprehensive in these administrative procedures.

The maintenance training material was thorough and of high quality. Numerous training tools such as lesson plans, text handouts, JPMs, and lesson modules existed. A computer tracking system indexed the training material by activities such as orientation, administrative training, industrial safety, and numerous equipment groups.

Action V of GL 89-13 asked licensees to confirm that maintenance practices and training involving the SWS are adequate to ensure that safety-related equipment cooled by service water will function as intended. The licensee's effort in this area appeared adequate.

2.3.5 System Unavailability

Unavailability of the ICW pumps and headers was calculated primarily for use as statistical data in developing probabilistic risk assessments and also to determine the effect of maintenance work on system reliability. The following findings were based on data from control room out-of-service logs from January 1989 to August 1991 for periods of power operation. The team found that the outage times for scheduled maintenance and unscheduled maintenance were approximately equal. Unit 1 operated with only one train of ICW unavailable 3.2% of the time while the Unit 2 train unavailability was 3.1%. On a "per header per year" basis, unavailability ranged from less than 1% to just over 3%. Pump unavailability during this period was higher than valve unavailability because of several long-term maintenance activities such as a motor overhaul or pump rebuild. The percentage of time that one of the three pumps was inoperable was 18.4% for Unit 1 and 10.8% for Unit 2.

Information on shutdown unavailability was collected for use in shutdown risk studies. The unavailability of two pumps simultaneously while the plant was in a shutdown mode was 35% for Unit 1 and 41% for Unit 2. The unavailability of one pump for Units 1 and 2 while in a shutdown mode was 50% and 47%, respectively.

2.3.6 Conclusions

The team concluded that the licensee was effectively implementing its maintenance program in relationship to the ICW system. Both the maintenance procedures and maintenance training material were well written and in order. All paperwork was in place for maintenance activities observed in the field, and the personnel were knowledgeable of both the procedures being performed and the equipment.

2.4 Surveillance and Testing

Surveillance and testing were inspected to determine if sufficient testing had been conducted to verify system design requirements and to determine if periodic surveillance and inservice testing (IST) were adequate to maintain continued operability of the system. In this regard, the team reviewed preoperational test procedures and surveillance procedures that had been completed by the licensee. The team also reviewed the licensee's IST program and implementing procedures.

2.4.1 Preoperational Testing

Preoperational testing of the ICW system was completed on Units 1 and 2 in accordance with Preoperational Test Procedure No. 1/2-0640080, Rev. 0/2, "ICW System Preoperational Procedure." The team's review of the completed preoperational test procedures focused primarily on the test scope, methodology, and results.

The Unit 1 test was completed during the period from December 1974 through December 1975, and the quality of the procedure and documented test results were reflective of the less rigorous standards being implemented at that time. For example, the procedure steps were performed out of sequence and in a fragmented manner without formal control and approval, the test director's log was not maintained as an official record with signatures intact (i.e., it had been copied over and edited so that valuable information may have been lost), and the test director's log did not supply much detail.

The Unit 2 preoperational test was completed during the period from April 1982 through February 1983 and while the quality of the procedure and documented test results had improved, some weaknesses were observed. For example, the test sequence was not formally controlled and approved, and the test director's log did not offer much detail, such as why certain retests were necessary.

The team also identified the following deficiencies which were not evaluated or considered at the time of the tests:

(a) Inconsistencies were found in the data recorded in Data Sheet No. 5 for Unit 1 when comparing the data obtained from one step to another. Representative examples included (1) the information recorded in Data Sheet No. 5 for step 12.3.8.6 of the procedure was not consistent with the valve alignment as indicated by the information recorded in the data sheet for step 12.3.4 of the procedure and (2) the differential pressure across the B CCWHX recorded in Data Sheet No. 5 for step 12.3.8.5 of the procedure was not consistent with the valve alignment as indicated by the differential pressure recorded for step 12.3.4.

(b) The minimum acceptable flow required by step 12.3.3 of the procedure was not obtained by the 1C pump during performance of steps 12.3.9.1 and 12.3.9.2.

(c) The preoperational test did not establish valve travel limitations for the CCWHX flow control valves (TCV-14-4A and TCV-14-4B), the turbine plant cooling water heat exchanger flow control valves (TCV-13-2A and TCV-13-2B), and the open blowdown heat exchanger flow control valves (TCV-34-3A and TCV-34-3B) that should be imposed in order to avoid pump runout conditions during normal operations. Failure of the air system could cause these valves to fail open and subject the ICW pumps to a common-mode failure (Units 1 and 2). Pump runout when the nonessential header would be isolated was not a concern because the maximum open limitation on the CCWHX flow control valves was 50% which was adequate to prevent pump runout in this system configuration.

(d) The preoperational test did not establish appropriate valve settings to ensure adequate lubricating water flow from the backup source in the event of failure of the normal source (Units 1 and 2).

(e) There was a significant difference in the differential pressures recorded for the ICW strainers in procedure steps 12.2.1 and 12.2.2 (Unit 2).

The team concluded that the licensee had not adequately evaluated the preoperational test discrepancies to ensure that system capabilities and limitations are adequate during all operating modes. (Appendix A, Unresolved Item 91-201-01)

2.4.2 Surveillance Procedures

Technical Specifications (TS) surveillance requirements for the ICW system and the ultimate heat sink were minimal, and for the most part were limited to valve alignment verification. Other TS surveillance requirements included verification that each automatic isolation valve actuates to its correct position upon SIAS initiation (TS 4.7.4), verification of intake water level

(TS 4.7.5.1.1), and operability verification of the barrier isolation valves (TS 4.7.5.1.2). Specific surveillance requirements did not exist for periodically calibrating instruments and verifying system flow rates.

The team reviewed Operating Procedures (OPs) 1/2-0400050, Rev. 25/11, "Periodic Integrated Test of the Engineered Safety Features," and 0360050, Rev. 11, "Emergency Cooling Water Canal - Periodic Test," relative to TS surveillance requirements. In general, the procedures appeared to be well written and provided sufficient detail for accomplishing the specified tasks. Additional comments regarding the integrated engineered safety features (ESF) test are discussed in Section 2.4.3.

2.4.3 Periodic Testing of the Engineered Safety Features

The licensee performed an integrated ESF test each refueling outage in order to satisfy certain TS surveillance requirements and to demonstrate operability of ESF systems and components. The team reviewed the procedure for performing this test for both units, OP 1/2-0400050. The integrated ESF test appeared to demonstrate proper operation and operability of ICW components with the following exceptions:

(a) The integrated ESF test did not adequately test operation of the C pump. The C pump can be aligned to either train A or train B during periods when the A or the B pump is inoperable, thereby restoring operability of the affected train.

The integrated ESF test for both units was conducted by initiating the SIAS condition for the C pump by using the train A SIAS contact. Since the 1C pump was normally aligned electrically and mechanically to the B train, this configuration did not test the train A power logic and circuit interlock features for the pump and failed to test the train B SIAS contact. For the 2C pump, which was normally aligned electrically and mechanically to train A, this configuration did not test the train B power logic and circuit interlock features for the pump and failed to test the train B SIAS contact. Thus the C pump was not demonstrated operable on either train in Unit 1 or on train B in Unit 2.

Due to the failure to adequately test the C pumps, satisfactory assurance was not provided that these pumps would initiate on receipt of a SIAS when at standby. Further, the team learned from the limiting condition for operation (LCO) logs for 1989 to August 1991 that the C pump was credited for Unit 1 ICW system operability on numerous occasions (see Appendix E) and was credited for Unit 2 system operability for the periods April 14-22, 1990, May 20-25, 1990, and March 21-29, 1991. The 1C pump was relied on entirely between July 31 and August 2, 1990 when both the 1A and 1B pumps were inoperable. Although the C pump was functioning in these instances, in a loss of power event an acceptable degree of certainty did not exist that the actuation circuitry to restart the C pump would work due to the lack of testing.

The licensee stated that the C pump would be tested appropriately before being credited for future ICW system operability on Units 1 and 2 and that the ESF test procedures would be revised to incorporate the missing elements of testing C pump alignment to trains A and B for Unit 1 and train B for Unit 2. (Appendix A, Deficiency Number 91-201-03)

(b) TCW isolation valves MV-21-2 and MV-21-3 were required to close upon SIAS initiation. The Unit 1 integrated ESF test procedure directed that these valves be shut before initiation of the integrated test, and required separate testing of these valves later in the procedure. As such, the integrated ESF test on Unit 1 did not fully test the ICW system response during SIAS actuation which could allow such problems as water-hammer or pressure fluctuations to go undetected. The licensee stated that the Unit 1 integrated ESF testing sequence would be reviewed. (Appendix B, Observation Number 91-201-14)

2.4.4 Inservice Testing of Pumps and Valves

The team found that the IST program, as submitted to the NRC, was not being adhered to in two areas. The Unit 1 program submittal, dated January 3, 1990, specified that manual valves SB-21211 and SB-21165 on the cross-tie of the ICW pumps would be exercised on a quarterly basis. However, subsequent to submitting the program, the licensee removed the test requirement for these valves from plant procedures when it determined that testing was not required. The licensee did not appropriately revise the program nor submit it once revised to the NRC. The licensee committed to remove the SB-21211 and SB-21165 valves from the program. The second inconsistency involved incorrect information in Relief Request No. VR-35 which sought exemption from stroke time measurement requirements for TCV-14-4A and TCV-14-4B. The licensee proposed an alternative testing of quarterly exercising of the valves as justification for the relief request, but actually tested them only during cold shutdown. In this case, approval of the relief request was based on incorrect information. The licensee committed to correct both errors in the next program update.

The team considered the failure of the licensee to notify the NRC of changes to its IST program as unacceptable and the current testing procedures a deviation from the approved program. In a letter from James Partlow, NRC, to all licensees on October 25, 1989, NRC specified that the burden is on the licensee to ensure that NRC has the current IST program as implemented at the site even if that requires a licensee to send multiple update submittals throughout the year. (Appendix A, Deficiency Number 91-201-04)

The team also found that the TCVs were not included in the Unit 2 IST program and, as such, had not been appropriately tested since the plant's licensing in 1983. These valves are required to be tested for fail-safe operation in accordance with Section XI of the ASME Boiler and Pressure Vessel Code, Subsection IWV-3415. The licensee had been testing the Unit 1 TCVs since 1981. At the time of the inspection, the licensee had previously identified this discrepancy and planned to include the two valves in the next Unit 2 program update and to begin implementation at the next outage. (Appendix B, Observation Number 91-201-15)

The IST program for the ICW pumps was complete. The recorded data for pump and valve tests performed for the last two years was complete and followup actions for failed tests were satisfactory.

2.4.5 Intake Structure and ICW Piping Inspection

Action III of the GL requested that licensees establish a routine inspection and maintenance program for open-cycle SWS piping and components to ensure that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of the safety-related systems supplied by service water. In general, the licensee's program for inspecting the intake structure and ICW system piping internals was very good with certain minor observations noted.

The licensee's ICW piping inspection focused primarily on the internal condition of the system and, during previous outages, 100% visual inspections of all safety-related ICW piping and components were completed, with the exception of cross-connect piping and piping that was not accessible because of operational constraints. The licensee performed this inspection each refueling outage with contractor support. The team reviewed several of the contractors' reports, including photographs, areas repaired, and recommendations, and found that the reports were comprehensive and well done.

The licensee was planning to examine less than 100% of the ICW piping in future inspections. This change in scope may be acceptable if properly managed. However, it was not consistent with the licensee's response to the generic letter. (Appendix B, Observation Number 91-201-16)

The licensee's inspection program placed little emphasis on evaluating the condition of small-bore pipes, valves, and instrument lines. The team felt that additional attention should be paid in this area. This recommendation is consistent with an earlier one from the Independent Safety Engineering Group (see Section 2.5.2).

The licensee had not established a formal method of addressing and evaluating contractor recommendations regarding ICW piping inspections. The licensee also had not established a formal program to inspect and evaluate the condition of buried piping. The licensee stated that it would address inspection of buried piping at a future date after considering experience gained at the Turkey Point plant.

2.4.6 Biofouling Control and Surveillance During System Operation

The licensee continually injected hypochlorite solution into the ICW pump suction during pump operation. However, because of the State of Florida's environmental regulations, the licensee was not able to inject enough hypochlorite to completely eliminate organism growth in the ICW system. Therefore, surveillance and periodic cleaning of the CCWHXs were necessary. In this regard, the team observed the following weaknesses:

(a) The licensee scheduled the CCWHXs for cleaning each refueling outage. Depending on organism growth rate and accumulation, more frequent cleaning may be warranted as evidenced by the results of the Unit 2 CCWHX heat transfer test (discussed in Section 2.1.3). The licensee currently has not established appropriate criteria for monitoring degradation and determining operability of the CCWHXs during the operating cycle. (Appendix B, Observation Number 91-201-07)

(b) The licensee monitored residual chlorine in the ICW system after it passed through the CCWHXs in order to effectively manage hypochlorite injection. The licensee did not recognize this activity as an important element in the program to control biofouling, and it was not included as part of the formal program to address GL 89-13 recommendations. (Appendix B, Observation Number 91-201-17)

Action I of the generic letter requested that licensees implement and maintain the ongoing program of surveillance and control techniques to significantly reduce the incidence of flow blockage problems as a result of biofouling. The licensee's actions in this regard appeared to be acceptable in most respects. However, the absence of specific criteria for monitoring degradation and operability of the CCWHXs during the operating cycle is a significant weakness.

2.4.7 Conclusions

In general, the team concluded that the licensee's performance in the area of surveillance and testing was satisfactory. However, the team's findings included failure to adequately test the ICW C pumps during the integrated ESF test and failure to adequately maintain the IST valve program. Additionally, the absence of appropriate and well-defined criteria for monitoring degradation of the CCWHXs during the operating cycle was a weakness. To the licensee's credit, the team also found that the licensee's programs for inspecting the ICW system and components was a strength.

2.5 Quality Assurance and Corrective Actions

The team evaluated the licensee's assessments and technical audits of the ICW system. The corrective action tracking system was reviewed to ensure adequate treatment of ICW items. The team's review also focused on a review of the ICW operational history as contained in nuclear plant reliability data system (NPRDS) reports and maintenance work requests to assess the adequacy of root-cause evaluations.

2.5.1 Root-Cause Evaluations

The team reviewed a list of all NPRDS entries on the ICW system from June 1989 through September 1991. The list comprised 21 entries of which 16 had indicated the cause as indeterminate or described it in indefinite terms such as "most likely" or "most probable." In its attempts to clarify the followup root-cause actions for these entries, the team found that little documentation existed. Nonetheless, the licensee's resolution of these items appeared appropriate.

The team reviewed certain programs that could identify ICW-related items for root-cause analysis. The repetitive rework program flagged an individual component that had required rework on related items four or more times within the previous 12 months. The team observed that the program's usefulness was limited because (a) it could not search for failures involving other similar components and (b) the failure criteria of 4 times in 12 months was set at too high a threshold to identify all failure trends of interest. (Appendix B, Observation Number 91-201-18)

The licensee's root-cause training course, "Problem Identification and Correction," was comprehensive, and its plant-specific employment of St. Lucie examples, terminology, and processes was of particular benefit.

To further aid the licensee in its root-cause assessments, maintenance personnel provided their opinion of the cause of failure on the work order. The licensee also utilized AP 0005760, Rev. 1, "St. Lucie Plant Implementation Guidelines of the ASME Section XI Repair and Replacements Program," to document root-cause evaluations related to repair and replacement of Section XI components. Management directive was another means by which root-cause analysis could be initiated, typically for significant events or failures. These programs appeared adequate.

2.5.2 Quality Assurance and Independent Safety Engineering Group Reports

The team reviewed several QA and Independent Safety Engineering Group (ISEG) reports related to the ICW systems. The QA reports consisted of in-depth audits and activity surveillances. QA performed nine activity surveillances related to the ICW system, including installation of new ICW lubricating water filters, strainer replacement, periodic test of the emergency cooling water canal, and relining of ICW valves. All field activities, as observed by QA, were satisfactory. The team identified no concerns in this area.

Two QA audits were reviewed. In 1988, the licensee audited the Unit 2 ICW system components and documentation to verify the system's capability to perform its safety function. The audit had a comprehensive scope and identified five findings, all of which had been resolved. The present report and a second audit of Technical Specification 3/4.7, "Plant Systems," did not note findings identified by the team as discussed in Section 2.5.3.

The team reviewed four ISEG reports, including surveillance report ISV-89-007 on the ICW system dated August 18, 1989. That report contained 20 recommendations, all of which had been resolved to ISEG's satisfaction. The plant did not implement one recommendation -- to set up a small valve maintenance program to ensure routine repair and upkeep. The ISEG ultimately agreed with the plant's decision. The team made a similar observation in Section 2.4.5. The team concluded that ISEG recommendations were being appropriately tracked and implemented and noted no concerns in this area.

The team's review of the corrective action request tracking system for items related to the ICW system identified no concerns.

2.5.3 Comparison of Findings

In comparing its findings to the licensee's own assessment of system status, the team identified areas where the licensee had not identified items the team had noted. For example, the 1988 QA audit identified pump performance discrepancies in the Unit 2 preoperational tests but did not identify additional items observed by the team as discussed in Section 2.4.1. The QA audit on Technical Specification 3/4.7 did not identify the shortcomings in the ESF test procedure regarding operability of headers, including the C pump (Section 2.4.3). In addition, the licensee's preparation of an update to the Unit 1 IST program scheduled for October 1991 submittal failed to identify the incorrect relief request information stating more frequent testing of the TCVs than was actually done and the incorrect inclusion of manual cross-tie valves which the licensee had not been testing for approximately 2 years (Section 2.4.4). An ISEG finding regarding the need for a small valve maintenance coincided with a similar team observation.

Numerous differences in findings existed between the licensee's and team's reviews associated with GL 89-13. These differences included team findings associated with training material, licensing-basis documentation, procedures, and lack of CCWHX operability criteria.

It appears that the licensee's assessment programs, in particular those related directly to GL 89-13 implementation, were not sufficiently in-depth or comprehensive to identify items found by the team. (Appendix A, Observation Number 91-201-19)

2.5.4 Conclusions

In its review of the licensee's QA and corrective action programs, the team concluded that both were functioning adequately, but more attention to detail was needed; few of the findings noted in this report were identified in either of the audits completed by the licensee or through other licensee review activities. In addition, the team observed that the licensee's repetitive rework program was limited because failures of similar components could not be identified easily through a search and the failure criterion itself did not appear strict enough to flag all failure trends of interest.

3.0 EXIT MEETING

On October 4, 1991, the team conducted an exit meeting at the St. Lucie Plant site. The NRC and licensee personnel attending this meeting are listed in Appendix C. The licensee did not identify as proprietary any materials given to the inspection team. During the exit meeting, the team summarized the scope and findings of the inspection.

APPENDIX A

SUMMARY OF INSPECTION FINDINGS

DEFICIENCY 91-201-01

Finding Title: Incomplete and Inaccurate FSAR Discussions (Section 2.1.4)

Description of Condition:

The team identified a number of discrepancies with the Units 1 and 2 FSARs' discussions regarding the ICW system.

1. Valves MV-21-2 and MV-21-3 are not qualified for submersible service. This conflicts with Sections 3.4.4 of the FSARs for Units 1 and 2 which state that the motor operators for the intake cooling water header isolation valves (MV-21-2 and MV-21-3) were upgraded (Unit 1) or qualified (Unit 2) for submersible service.

2. The component cooling water temperature control/isolation valves, TCV-14-4A and TCV-14-4B, fail to the open position upon loss of instrument air. Neither a description of these valves or their safety function is included in the Unit 1 FSAR component cooling water system section.

3. The Unit 1 lubricating water isolation valves (FCV-21-3A and FCV-21-3B) isolate the nonessential lubricating water header upon receipt of a safety injection actuation signal (SIAS) to ensure adequate lube water supply to the intake cooling water pumps. The Unit 1 FSAR did not include a description of these valves or their safety function.

4. The Unit 1 FSAR referenced recirculation operation between the discharge and intake canals for biofouling control in Section 9.2.1.3.3. Unit 1 did not have this capability.

5. The 2A ICW pump self-lubrication modification had been operational since April 1989 but had not been included in the Unit 2 FSAR annual update nor in the annual submittal of plant changes pursuant to 10 CFR 50.59 requirements.

6. Section 9.2.7 of the Unit 1 FSAR incorrectly described the ultimate heat sink water source by discussing only two of the three intake pipes.

Requirements:

10 CFR Part 50.34(b) states in part "The final safety analysis report shall include information that describes the facility,

presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems and components...and shall include...a description and analysis of the ...components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefore, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations."

10 CFR Part 50.71(e) states in part "Each person licensed to operate a nuclear power reactor...shall update periodically, as provided in paragraphs (e)(3) and (4) of this section, the final safety analysis report (FSAR) originally submitted as part of the application for operating license, to assure that the information included in the FSAR contains the latest material developed... The updated FSAR shall be revised to include the effects of all changes made in the facility or procedures as described in the FSAR...revisions shall be filed no less frequently than annually and shall reflect all changes up to a maximum of 6 months prior to the date of filing..."

10 CFR 50.59 (b)(2) states "The licensee shall submit...a report containing a brief description of any changes, tests, and experiments, including a summary of the safety evaluation of each. The report must be submitted annually..."

<u>References</u>:

1. PCM 043287, "ICW Pump Self-Lubrication Modification"
2. Standard Review Plan Section 9.2.1, "Station Service Water System"

DEFICIENCY ITEM 91-201-02

Finding Title: Inadequate Training Material (Section 2.2.4.2)

Description of Condition:

A program for establishing and maintaining correct course content was established in Administrative Procedure 005756, Revision 3, "Systematic Training Development." Administrative Procedure 005766, "Training Resources, Information and Material Control," required the review of plant modifications for incorporation into training material. These procedures were not being followed adequately to prevent discrepancies in the training material. The following discrepancies were identified:

1. ANPO Training Handout 0110010, Revision 1, "Intake Cooling Water and Lube Water Systems," contained incorrect strainer mesh sizes.

2. ANPO Training Handout 0110010; SNPO Training Handout 0504012, Revision 2, "Intake Cooling Water, Component Cooling Water, and Fuel Pool Cooling, Purification and Ventilation Systems"; and RCO Training Handout 0704201, Revision 5, "Cooling Water Systems," described the cross-connect line upstream of the component cooling water heat exchanger as allowing the heat exchangers to have full flow with strainers clogged, during backflushing, and in case of a line rupture upstream. This information was not correct because one intake cooling water pump could not supply full flow to two heat exchangers, the strainers have their own bypass for backflushing, and no procedure existed for cross-connecting the headers during power operation in case of a pipe rupture.

3. ANPO Training Handout 0110010 did not contain the same lubricating water flow to the intake cooling water pump lower bearings as the ANPO operating log limits.

4. ANPO Training Handout 0110010 omitted discussion of 5 of 13 annunciators.

5. The section of the RCO Training Handout 0704201 that addressed indicators, controls, and alarms contained numerous errors including erroneous names and missing information.

6. Modules 0501090, "Backwash Intake Cooling Water System Strainer," and 0101043, "Backwash Lube Water Strainer," did not agree with the off-normal operating procedure controlling the activity.

7. Module 0101044, "Backwash Screen Wash Strainer," contained incorrect directions regarding length of backwash and measurement of differential pressure.

8. PCM 043287, "ICW Pump Self-Lubrication Modification," was implemented in early 1989 but training materials were not revised until November 1, 1990.

Requirements:

10 CFR 50, Appendix B Criterion V states in part "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures or drawings..."

Administrative Procedure 005756, Revision 3, "Systematic Training Development," establishes a program for maintaining correct course content.

Administrative Procedure 005766, "Training Resources, Information and Material Control," requires the review of plant modifications for incorporation into training material.

References:

1. Administrative Procedure 005756, Revision 3, "Systematic Training Development"
2. ANPO Training Handout 0110010, Revision 1, "Intake Cooling Water and Lube Water Systems"
3. SNPO Training Handout 0504012, Revision 2, "Intake Cooling Water, Component Cooling Water, and Fuel Pool Cooling, Purification and Ventilation Systems"
4. RCO Training Handout 0704201, Revision 5, "Cooling Water Systems"
5. Module 0501090, "Backwash Intake Cooling Water System Strainer"
6. Module 0101043, "Backwash Lube Water Strainer"
7. Module 0101044, "Backwash Screen Wash Strainer"

DEFICIENCY ITEM 91-201-03

Finding Title: ICW Pump C and Header Operability (Section 2.4.3)

Description of Condition:

The licensee credited the ICW pump C as operable without having adequately demonstrated the pump and its associated actuation circuitry as operable.

Operating Procedure No. 1/2-0400050, Rev. 25/11, "Periodic Integrated Test of the Engineered Safety Features," did not adequately test the operability of the C pump. In the case of Unit 1, the procedure initiated the SIAS condition for the C pump using the train A SIAS contact while the pump was aligned electrically and mechanically to train B. This configuration did not demonstrate the operability of the C pump on either train A or train B. In Unit 2, the C pump was only tested while aligned to train A such that the train B power logic and circuit interlock features and the SIAS contact were not tested. In summary, the C pump was not tested and could not be proven operable on either trains A or B in Unit 1 or train B in Unit 2.

Due to the failure to adequately test the C pumps, satisfactory assurance was not provided that these pumps would initiate on receipt of a SIAS when at standby. Further, for the period January 1989 to August 1, 1991, Unit 1 train A or train B was considered operable based on the presumed operability of the C pump during 19 periods (see Appendix E) and Unit 2 train B was considered operable when utilizing the C pump during 3 periods (April 14-22 and May 20-25, 1990 and March 21-29, 1991). The 1C pump was relied upon entirely between July 31 and August 2, 1990 when both the 1A and 1B pumps were inoperable. Although the C pump was functioning in these instances, in a loss of power event an acceptable degree of certainty did not exist that the actuation circuitry to restart the C pump would work due to the lack of testing. Therefore, the licensee, for the time periods mentioned above except the last case, was required to enter the applicable Technical Specification ACTION statement. In the last case, no pumps were considered operable and the Unit should have entered TS 3.0.3.

Requirements:

10 CFR 50, Appendix B, Criterion XI, "Test Control," states, in part, "A test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures..."

Units 1 and 2 Technical Specifications 3.0.1 state "Compliance with the Limiting Conditions for Operation (LCO) contained in the succeeding specifications is required during the OPERATIONAL MODES or other conditions specified therein; except that upon failure to meet the Limiting Conditions for Operation, the associated ACTION requirements shall be met." Units 1 and 2 Technical Specifications 3.7.4 both state "At least two independent intake cooling water loops shall be OPERABLE."

Reference:

1. Operating Procedure No. 1/2-0400050, Rev. 25/11, "Periodic Integrated Test of the Engineered Safety Features"

DEFICIENCY ITEM 91-201-04

Finding Title: Inservice Testing IST Deficiencies (Section 2.4.4)

Description of Condition:

1. The Unit 1 program submittal, dated January 3, 1990, specified that manual valves SB-21211 and SB-21165 on the cross-tie of the ICW pumps be exercised on a quarterly basis. However, soon after submitting the program, the licensee removed the test requirements for these valves from plant procedures when it determined that testing was not required. The licensee did not appropriately revise the program nor submit it once revised to the NRC.

2. The license submitted Relief Request Number VR-35, Rev. 2, for Unit 1 by letter dated January 3, 1990, to exempt the performance of stroke time measurements of temperature control valves TCV-14-4A and TCV-14-4B. The staff approved the relief request on an interim basis based on the licensee's proposed alternate testing which included quarterly valve exercising and fail safe testing. However, the licensee had not performed the quarterly tests as stated in its relief request.

Requirement:

Technical Specification 4.0.5 states in part "...Inservice inspection of ASME Code Class 1, 2, and 3 components and inservice testing ASME Code Class 1, 2, and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50, Section 50.55(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50, Section 50.55(g)(6)(i)..."

Reference:

1. Unit 1 IST Program submitted to NRC by letter dated January 3, 1990

UNRESOLVED ITEM 91-201-01

Finding Title: Preoperational Test Review (Section 2.4.1)

Description of Condition:

In its review of the Units 1 and 2 preoperational tests of the intake cooling water system, the team identified several test anomalies which did not appear to have been evaluated by the licensee at the time of the test. The licensee should thoroughly review the results of these preoperational tests to ensure that system capabilities are known and that the following test anomalies can be explained:

1. Inconsistencies were found in the data recorded in Data Sheet No. 5 for Unit 1 when comparing the data obtained from one step to another. Representative examples included (1) the information recorded in Data Sheet No. 5 for step 12.3.8.6 of the procedure was not consistent with the valve alignment as indicated by the information recorded in the data sheet for step 12.3.4 of the procedure and (2) the differential pressure across the B component cooling water heat exchanger recorded in Data Sheet No. 5 for step 12.3.8.5 of the procedure was not consistent with the valve alignment as indicated by the differential pressure recorded for step 12.3.4.

2. The minimum acceptable flow required by step 12.3.3 of the procedure was not obtained by the 1C pump during performance of steps 12.3.9.1 and 12.3.9.2.

3. The preoperational test did not establish valve travel limitations for the component cooling water heat exchanger flow control valves (TCV-14-4A and TCV-14-4B), the turbine plant cooling water heat exchanger flow control valves (TCV-13-2A and TCV-13-2B), and the open blowdown heat exchanger flow control valves (TCV-34-3A and TCV-34-3B) that should be imposed in order to avoid pump runout conditions. Failure of the air system could cause these valves to fail open and subject the intake cooling water pumps to a common-mode failure (Units 1 and 2).

4. The preoperational test did not establish appropriate valve settings to ensure adequate lubricating water flow from the backup source in the event of failure of the normal source (Units 1 and 2).

5. There was a significant difference in the differential pressures recorded for the intake cooling water strainers in procedure steps 12.2.1 and 12.2.2 (Unit 2).

Requirement:

10 CFR 50, Appendix B, Criterion XI, "Test Control" requires, in part, that test results be documented and evaluated to ensure satisfactory completion of test requirements.

Reference:

1. Preoperational Test Procedure No. 1/2-0640080, Rev. 0/2, "Intake Cooling Water System Preoperational Procedure," performed December 1974 through December 1975 for Unit 1 and April 1982 through February 1983 for Unit 2

APPENDIX B

SUMMARY OF OBSERVATIONS

1) Observation Number 91-201-01, "CCWHX Heat Load Summary" (Section 2.1.2.1)

2) Observation Number 91-201-02, "Variations in Accident Heat Loads" (Section 2.1.2.1)

3) Observation Number 91-201-03, "Lube Water Header" (Section 2.1.2.4)

4) Observation Number 91-201-04, "Pipe Break of TCW Header" (Section 2.1.2.4)

5) Observation Number 91-201-05, "GL 89-13 Review for Conformance with Licensing Basis" (Section 2.1.4)

6) Observation Number 91-201-06, "CCWHX Cleaning" (Section 2.1.3)

7) Observation Number 91-201-07, "Heat Exchanger Operability Criteria" (Sections 2.1.3 and 2.4.6)

8) Observation Number 91-201-08, "Attention to Corrosion Control" (Section 2.2.1)

9) Observation Number 91-201-09, "Standards for Gearbox Internals Repair" (Section 2.2.1)

10) Observation Number 91-201-10, "Rotary Strainer Gearbox Flooding" (Section 2.2.1)

11) Observation Number 91-201-11, "Design Failure Regarding Zurn Strainer Manual Operation" (Section 2.2.1)

12) Observation Number 91-201-12, "ONOP 1-0640030 Discrepancies" (Section 2.2.2)

13) Observation Number 91-201-13, "Procedures and Training Review for Action V of GL 89-13" (Sections 2.2.2 and 2.2.4.2)

14) Observation Number 91-201-14, "Failure to Fully Test ICW System Response" (Section 2.4.3)

15) Observation Number 91-201-15, "Failure to Include TCVs in Unit 2 IST Program" (Section 2.4.4)

16) Observation Number 91-201-16, "Revise GL Response on Inspection" (Section 2.4.5)

17) Observation Number 91-201-17, "Hypochlorite Injection as a Program Element" (Section 2.4.6)

18) Observation Number 91-201-18, "Repetitive Rework Program Limitations" (Section 2.5.1)

19) Observation Number 91-201-19, "Assessment Programs" (Section 2.5.3)

APPENDIX C

ATTENDANCE SHEET

EXIT MEETING - OCTOBER 4, 1991

Name	Title
Licensee Personnel	
G. J. Boissy	Plant Manager
R. L. Church	Chairman, ISEG
T. P. Coste	QA Supervisor
J. A. Dyer	QC Supervisor
P. L. Fincher	Training Manager
R. Gouldy	Principal Engineer
R. E. Grazio	Director, Nuclear Licensing
R. Gross	Manager, Outside Services
W. Hagan	Nuclear Plant Supervisor
A. T. Hall	NLO Training Supervisor
J. Hosmer	Director, Nuclear Engineering
J. Krumins	Nuclear Engineering
C. F. Leppla	Instrumentation and Controls Supervisor
L. McLaughlin	Plant Licensing Manager
L. W. Neely	ICW System Engineer
L. Pabst	Nuclear Engineering
C. A. Pell	Director, Nuclear Administrative Services
M. D. Pottorff	Operations Coordinator
T. E. Roberts	Engineering
M. D. Shepherd	Operations Training Supervisor
D. Stewart	Technical Staff
D. H. West	Technical Department Supervisor
J. West	Operations Supervisor
D. M. Wolf	Site Supervising Engineer
NRC Personnel	
S. A. Elrod	Senior Resident Inspector
A. F. Gibson	Director, DRS, RII
R. A. Gramm	Section Chief, RSIB
E. V. Imbro	Branch Chief, RSIB
M. A. Miller	Team Leader, RSIB
J. A. Norris	Sr. Project Manager, NRR
F. Nuzzo	Consultant, AECL
M. A. Scott	Resident Inspector
D. M. Skay	General Engineer (Intern), RSIB
J. E. Tatum	Senior Reactor Engineer, SPLB

APPENDIX D

ACRONYMS AND ABBREVIATIONS

ANPO	auxiliary nuclear plant operator
ANSI	American National Standards Institute
AP	administrative procedure
ASME	American Society of Mechanical Engineers
CCW	component cooling water
CCWHX	component cooling water heat exchanger
DBD	design-basis documentation
EPRI	Electric Power Research Institute
ESF	engineered safety feature(s)
FSAR	Final Safety Analysis Report
GL	generic letter
HPSI	high pressure safety injection
ICW	intake cooling water
INPO	Institute of Nuclear Power Operations
ISEG	Independent Safety Engineering Group
IST	inservice testing
JPM	job performance measure
LCO	limiting condition for operation
LOCA	loss-of-coolant accident
LOSW	loss of service water
NRC	Nuclear Regulatory Commission
NPRDS	nuclear plant reliability data system
ONOP	off-normal operating procedure
OP	operating procedure
PCR	procedure change request
QA	quality assurance
RCO	reactor control operator
SIAS	safety injection actuation signal
SNPO	senior nuclear plant operator
SRO	senior reactor operator
SRP	Standard Review Plan

SWS	service water system
SWSOPI	Service Water System Operational Performance Inspection
TCV	temperature control valve
TCW	turbine cooling water
TS	Technical Specifications

APPENDIX E

1C ICW PUMP OPERABILITY DATA*

START DATE	STOP DATE	TRAIN AFFECTED
01/17/89	01/18/89	B
01/18/89	01/18/89	B
01/19/89	01/19/89	B
05/11/89	05/12/89	B
07/11/89	07/11/89	B
07/20/89	07/21/89	A
07/21/89	07/22/89	B
08/07/89	08/07/89	B
08/09/89	08/09/89	B
08/13/89	08/13/89	A
08/17/89	08/17/89	B
08/24/89	08/29/89	A
12/13/89	12/13/89	B
01/19/90	01/19/90	B
06/07/90	06/07/90	A
07/29/90	09/24/90	A
03/01/91	03/01/91	B
07/10/91	07/10/91	B
07/19/91	07/29/91	A

*Operable on either train A or train B.