FPL

Turkey Point Nuclear Plant

Service Water Operational Performance Inspection (SWOPI)

Self Assessment

Final Report

TURKEY POINT NUCLEAR PLANT
SELF-ASSESSMENT REPORT

DATE: July 14, 1995

TITLE: SERVICE WATER OPERATIONAL PERFORMANCE INSPECTION (SWOPI)

DATES OF ASSESSMENT: March 6 through March 31 and May 15 through May 19, 1995

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EXECUTIVE SUMMARY

A self-assessment of the Turkey Point Service Water systems was performed in the months of March and May of 1995. Service Water at Turkey Point is composed of the Intake Cooling Water (ICW), and open system, and the Component Cooling Water (CCW), a closed system. Over 2,000 hours were expended assessing the areas of Operations, Design, Maintenance, Testing, Quality Assurance, and Corrective Action. All areas of NRC Temporary Instruction 2515/118, Revision 1, "Service Water System Operational Performance Inspection", were evaluated. The guidance contained in Inspection Procedure 40501, "Licensee Self-Assessments Related to Safety Issues Inspections", was followed to conduct the assessment. No immediate operability concerns were identified. Noted strengths include:

- The knowledge level of plant personnel reflects a high level of sensitivity to ICW and CCW systems.
- The CCW heat exchanger performance monitoring program provides timely and accurate performance information which is widely used by many plant groups.
- The materiel condition of the ICW and CCW systems reflects the high level of importance placed on these systems by plant personnel.
- Preventive maintenance conducted on the ICW and CCW systems is effective in maintaining the long term reliability of the plant equipment. The program ensures scheduled activity execution and results monitoring.

Key areas for improvement include:

- The capability of the plant to avoid fouling of the ICW basket strainers
- Procedural guidance for prevention of ICW pump runout
- Valve position verification testing
- Corrective action tracking
- CCW system throttled valve identification

A summary of the assessment follows.

The system's ability to meet thermal and hydraulic performance requirements was confirmed. Frequent basket-strainer backwashing and cleaning was noted, and is indicative of either problems with basket strainer design or, as subsequent Plant investigation indicates, degraded screen wash components. Recent corrective actions seem to be providing positive results. The cooling canal system was reviewed, and the canal area and cleaning practices were considered acceptable.

Facility drawings and procurement specifications were reviewed, and a facility walkdown was conducted by the entire Self Assessment Team. The drawings and specifications were found to be consistent with the design basis, NRC requirements, and licensing commitments.

A review of the system and specific modification packages identified no single active failure

vulnerabilities. However, a potential single passive failure mechanism beyond design basis was identified. A plant modification planned for the Fall, 1995 refueling outage will eliminate this vulnerability. Additionally, one small segment of underground cast iron pipe was identified which had not been inspected. Any corrosion-related leakage in this segment of pipe could not be detected by external indication. However, this segment represents a very small percentage of the underground piping, the rest of which has been inspected and found to be in very good overall condition.

The effectiveness of design features installed to minimize biofouling were challenged during a severe intake of grass and algae on March 8 and 9, 1995. Large quantities of grass and algae accumulated in the CCW and Turbine Plant Cooling Water (TPCW) basket strainers. Backwashing of the baskets was not sufficient to clean the strainers and mechanical cleaning was repeatedly required. More significantly, the traveling screens did not prevent the carry over of grass and algae. Recent restoration of the screen wash nozzle deflectors seems to have improved the performance of the traveling screens/screen wash system.

Features for the timely detection of ICW flow degradation were evaluated. Though no direct control room indication of ICW flow exists, other control room indications of flow degradation are available.

ICW Pump runout concerns were identified. Although calculations limit acceptable ICW pump flow to no more than 19,000 gpm, plant operating procedures did not fully address this limit. A Night Order and procedure changes were issued to effectively eliminate this concern.

The UFSAR and several modification packages were reviewed with regards to seismic qualification of safety related equipment. Only minor concerns were identified. Several modification packages which had been implemented on the ICW and CCW systems were reviewed to assure that the 10CFR50.59 evaluations were adequate. The evaluations were found to be sufficient, and the packages contained appropriate guidance to revise the necessary procedures.

A walkdown of the ICW system and accessible portions of the CCW system was conducted and the results compared to the Plant Operating Drawings. In general the equipment materiel condition was very good with only minor discrepancies being identified during the walkdown.

ICW and CCW alarm response, operating, off-normal, and emergency procedures were reviewed. The operating procedures contained appropriate detail to assure that system alignment is maintained in accordance with the design and the other procedures were also adequate in maintaining system configuration and function.

The implementation of the procedures was appropriate, with only two exceptions. First, operators were not reading fluctuating indicators in a consistent manner, resulting in an additional uncertainty beyond that assumed by the designers. A training bulletin standardizing the proper method of reading fluctuating gauges was issued, eliminating this concern. Secondly,

subsequent to the initial procedure revision made in response to the ICW pump runout concern, it was observed that the revised procedures did not provide enough direction to the operators. Procedures were subsequently revised to add the necessary guidance.

Operator training was reviewed. With one exception, the quality of the training material was good, with no significant differences between the plant and training materials. Lesson plans were complete. The exception concerned certain intake-related scenarios which were not included in the training scenario library. New scenarios were developed, tested with licensed operators, and added to the scenario library.

The implementation of valve alignment verification procedures was assessed. Although the procedures clearly identify which valves are to be checked, the verification process was inconsistent. A review of Condition Reports identified 16 valve mispositionings over the last two years. The current practice of heavy reliance on position indicators and other non-manipulative methods for verification, along with the inconsistent verification methods, was a contributor to the number of mispositioned valves. Procedures for positive valve position verification have since been implemented, resolving this concern.

ICW and CCW procedure walkdowns were conducted and procedures were found to be satisfactory. Operator understanding of procedures was verified through observation of operator performance on the plant simulator.

Operators were interviewed to determine the adequacy of their technical knowledge of the ICW and CCW systems. Non-licensed operators were observed and questioned while they performed their inspections and line-up tasks in the field. A control room operating crew was observed on the plant simulator during three scenarios which challenged their knowledge of the ICW system and skills at system operation. Overall, the operators knowledge level was good.

Operational controls for traveling screens and circulating water pumps were reviewed. Appropriate procedural guidance was found for protection from level drawdown in the intake wells. The off-normal operating procedures establish the requirements to shutdown circulating water pumps in an intake with developing differential levels. The shutdown requirements were demonstrated during both the plant grass intake event and plant simulator scenarios.

Several maintenance activities in progress were observed. The work orders associated with these jobs were reviewed, and with one exception, no weaknesses were observed. The exception concerned corrosion discovered during disassembly of the 4B ICW pump. Corrosion on pump column sections and the motor stand was evident, but clear inspection criteria for evaluating corroded components was not provided. After the sections were cleaned and coated, the team observed that the degradation was as much as 30% of the wall thickness in some places. This was subsequently dispositioned by Engineering as acceptable. Procedure changes have since provided the needed inspection criteria.

A review of equipment history showed that system components are being adequately maintained.

However, several recurring equipment problems were identified. The ICW header valves, as well as the cross-tie valves, appear to have a problem with flow induced flutter. Also, a review of maintenance records indicates that the ICW pump discharge check valves have been found in a degraded condition a number of times and in some cases have required replacement with new valves. Current preventive maintenance practices sufficiently address these issues.

Some examples of incomplete corrective actions and delays in dispositioning degraded components were noted. Process improvements for implementing corrective actions through the Plant Manager's Action Item (PMAI) list were implemented to strengthen this area.

Interviews with Maintenance personnel revealed that they were, in general, very knowledgeable. Some individuals demonstrated knowledge well beyond maintenance practices and were aware of potential impacts on the systems due to possible failures.

The surveillance programs, in general, were acceptable. No concerns were identified with the programs and procedures used to verify the ICW/CCW heat exchangers heat removal capability. Although periodic inspections of the screen wash system were conducted, the system was not performance tested to verify its effectiveness. The plant has initiated an effort to review and assess the effectiveness of the screen wash system.

A review of the Probabilistic Safety Assessment (PSA) assumptions concerning the ICW system and selected CCW components showed that the ICW pumps and CCW heat exchanger unavailabilities were within the assumptions of the PSA. However, the increased frequency of strainer backwashing and cleaning had not been identified because ICW out-of-service times had not been effectively trended. Plant personnel are now evaluating the best method for out-of-service logging and trending for both the Maintenance Rule and PSA update.

The In-service Test (IST) program for pumps and valves was reviewed. The CCW and ICW pumps and system valves are tested in accordance with the program and approved procedures.

The quality verification and corrective action process was observed through the review of the operational history of the ICW and CCW systems. A review of 32 Licensee Event Reports concerning ICW or CCW revealed a number of malfunctions and incidents for which corrective actions were verified to be in place. Although repeat events had occurred in the past, the lack of recent events is indicative of effectiveness of those actions.

In general, causal factor evaluations appear to be reasonable and consistent with good judgement. However, the Human Performance Enhancement System (HPES) evaluation may not have been fully utilized on valve mispositionings. In the sixteen mispositionings reviewed, including eight involving communications and personnel error, an HPES evaluation was requested only three times. Valve mispositioning events were identified as an adverse trend in April of 1995 and a CR was generated. Operations management, in response to the CR has since completed a detailed investigation of valve mispositioning events and corrective actions have been taken.

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1.0 Purpose and Scope

A Service Water System Operational Performance Self-Assessment of the Turkey Point Nuclear Plant was conducted from March 6 through March 31, 1995 and from May 15, 1995 through May 19, 1995. Nuclear Regulatory Commission (NRC) Inspection Manual Temporary Instruction (TI) 2515/118, Rev. 1, "Service Water System Operational Performance Inspection", was used to conduct the assessment. A Self Assessment Plan was submitted to the NRC in June of 1994, and was conditionally accepted in August of 1994.

The purpose of this assessment was to:

- Assess Turkey Point's planned or completed actions in response to Generic Letter 89-13, "SWS Problems Affecting Safety-Related Equipment," dated July 18, 1989.

- Verify that the Intake Water Cooling (ICW) and Component Cooling Water (CCW) systems are capable of fulfilling their thermal and hydraulic performance requirements and are operated consistent with their design basis.

- Assess the ICW and CCW operational controls, maintenance, surveillance and testing, and personnel training to ensure these systems are operated and maintained so as to perform their safety-related functions.

The scope of this assessment included the complete ICW system and selected components and flowpaths of the CCW system. Other plant programs were assessed as they applied to these systems to determine whether these programs were implemented in a manner to operate, support and maintain the ICW and CCW systems consistent with the design basis.

2.0 Introduction

This report contains the results of the Turkey Point Service Water System Self-Assessment, including opinions and conclusions of the assessment team. Conclusions and findings have been summarized in the next Section.

The outline of the report is organized by functional area and follows the general format of TI 2515/118.

The self-assessment team issued 282 Information Requests for Plant response to specific questions. An Unresolved Assessment Question (UAQ) was issued when the response to an issue did not adequately address the team's questions or a corrective action was required. A UAQ Cross Reference is attached as Appendix A and a UAQ Summary is attached as Appendix B.

3.0 Conclusions and Findings

During the assessment, 30 UAQ's were issued to the plant. As of June 30, 1995, all 30 UAQs were closed and require no further action, other than follow-up on the effectiveness of the corrective action taken. No UAQs resulted in either an immediate operability concern or a condition requiring NRC notification. However, the events surrounding the intake of grass and algae on March 9, 1995 did result in LER 95-003 and was the subject of UAQ #7.

The conclusions of the self-assessment are summarized below:

Noted strengths include:

- The knowledge level of plant personnel reflects a high level of sensitivity to ICW and CCW systems.
- The CCW heat exchanger performance monitoring program provides timely and accurate performance information which is widely used by many plant groups.
- The materiel condition of the ICW and CCW systems reflects the high level of importance placed on these systems by plant personnel.
- Preventive maintenance conducted on the ICW and CCW systems is effective in maintaining the long term reliability of the plant equipment. The program ensures scheduled activity execution and results monitoring.

The ICW and CCW systems meet their thermal and hydraulic performance requirements. The design change process adequately maintains the design basis and drawings reflect the as-constructed configuration. Single failure analyses demonstrate that no credible active component failure would prevent the systems from performing their design function. However, the ICW basket strainers did become degraded during a severe grass/algae intake, resulting in ICW flow which was less than the minimum required.

Off-normal procedures were acceptable, with the exception of the operation of a circulating water pump (CWP) and an ICW pump within the same well during severe grass/algae intakes and thus aggravating debris carryover. A new off-normal operating procedure (ONOP) was generated during the self-assessment to satisfy this concern. Training and operator knowledge are acceptable. During this assessment, additional simulator scenarios were developed, and training concerning severe grass/algae intakes was strengthened.

Maintenance history for the SWS indicates that components have been generally reliable. However, maintenance procedures used to conduct inspection of ICW pumps which have been removed from service lacked inspection criteria concerning observed corrosion. Procedure changes have since added the necessary inspection criteria.

Surveillance and testing programs established for the ICW and CCW systems are acceptable and continue to demonstrate the systems will operate as designed.

Completed actions taken in response to Generic Letter 89-13 were found acceptable.

Some examples of incomplete corrective actions and delays in dispositioning degraded components were noted. Process improvements for implementing corrective actions through the Plant Manager's Action Item (PMAI) list were implemented to strengthen this area.

Findings

1. Plant response to a substantial grass & algae intake event was not sufficient to maintain the required minimum ICW flows.

   On 3/9/95, a large grass & algae intake resulted in degraded ICW system performance. During this event, the ICW Basket Strainers fouled to the extent that minimum required ICW flow was lost for approximately 43 minutes during which time the plant entered Technical Specification 3.0.3. This condition was not prevented by following current plant procedures. This event was reported to the NRC in LER 95-003.

   A number of contributors to this event were apparent. The traveling screen and screen wash systems did not appear to be sufficiently removing debris. The basket strainers themselves appeared to have inadequate backwash capability. Procedural guidance did not exist which would preserve ICW flow through the shutdown of circulating water pumps. UAQ # 7 was issued to address these concerns. Additionally, out-of-service data for the basket strainers indicated that backwashing and mechanical cleaning had become increasingly frequent evolutions over the last three years. UAQ # 9 was issued to address degraded basket strainer performance.

   In response to these concerns, the plant formed a team to investigate root causes. On June 1, 1995, this team issued their final report which concluded that screen wash spray nozzle deflector plate performance was the single greatest identifiable contributor to the increase in basket strainer cleanings. In response to this report, all screen wash spray nozzle deflector plates have been replaced and procedures have been revised to periodically inspect these plates and replace as necessary. A new off-normal operating procedure 3/4-ONOP-011, "Screen Wash System/Intake Malfunction", was issued in May, 1995 which directs that, if necessary, an ICW pump will be operated in the same well as an idle Circulating Water pump to eliminate the mechanism for debris carryover into the ICW system.

   The corrective actions taken in response to these issues were considered acceptable by the SWOPI Self Assessment Team, and UAQ's # 7 & 9 were closed.

2. Sufficient controls to protect ICW pumps from excessive runout were not present in existing plant procedures.

Calculation PTN-BFJM-86-036 was reviewed which limited the maximum acceptable ICW pump flow to 19,000 gpm. The required NPSH would exceed the available NPSH at flows above 19,000 gpm. Letter JPE-PTPO-88-74, dated February 12, 1988, requested the plant to review the guidelines provided in the letter and revise the affected plant procedures as appropriate. A review of plant procedures determined that the procedures did not limit single pump flowrates to 19,000 GPM. UAQ# 5 was issued to address this concern. In addition, although a need existed for operator training on single pump runout conditions, simulator training exercises did not include scenarios in which a one-pump condition existed. UAQ # 19 was issued to address the lack of these scenarios.

In response to this issue, a Night Order was issued immediately, and changes to procedures 3/4-ARP-097.CR, "Control Room Annunciator Response", and 3/4-OP-019, "Intake Cooling Water System", were initiated to provide operators with guidance to protect the ICW pumps against runout conditions. However, when these procedure revisions were practiced on the simulator, some additional weaknesses were observed in that the procedure did not clearly indicate how flow was to be throttled. UAQ # 25 was issued to address these additional weaknesses. Subsequent procedure revisions provided the necessary clarity.

The corrective actions taken in response to these issues were considered acceptable by the SWOPI Self Assessment Team, and UAQ's # 5, 19, & 25 were closed.

3. Procedures for valve position verification do not require position testing as a positive means of verifying valve position.

Unless a change of position is required, only passive observation of the valve indicators, along with system parameter observation, is performed. An extensive review of Plant Condition Reports for the last two years yielded 16 reported mispositionings. On 3/9/95, root valve 3-50-446 to PI-3-1520, 3B CCW heat exchanger inlet pressure, was found in the closed position. This valve should have been in the open position for the plant conditions at the time.

Although procedures clearly control which valves are to be checked, aligned and verified, the process for verification of each valve in the field varies among operators observed. Operators stated they would not unlock a valve to check position. Operators rely solely on the mechanical position indicator to ascertain valve position confirmation on many valves, including all butterfly valves. UAQ #13 was issued to address these concerns.

In response, a change to procedure 0-ADM-031, "Independent Verification", was issued to require a "hands on" method of verification if at all possible and provides alternative methods to be used when "hands on" is not possible. A change to procedure 0-ADM-200, "Conduct of Operations", was also issued to provide management expectations for both valve manipulation and verification. In addition, Operations Department Instruction ODI-CO-018, "Valve Manipulation Expectations", was written to provide a program for

Operations Supervision to monitor and train on valve manipulations.

The corrective actions taken in response to this issue were considered acceptable by the SWOPI Self Assessment Team, and UAQ #13 was closed.

4. Weaknesses in the corrective action process have resulted in certain incomplete corrective actions, delays in the dispositioning of degraded components, and certain Condition Report documentation not being maintained as QA records.

   Condition Report action items are sometimes closed out based on the initiation of a Plant Manger's Action Item (PMAI). However, PMAI due dates can be extended without Plant General Manager approval. Procedure 0-ADM-518, Revision Date 10/6/94, "Condition Reports", states in part: The Plant General Manager (PGM) is responsible for approval of...due date extensions. However, Condition Report 94-554 was closed and incomplete corrective actions (pump disassembly) were entered into the PMAI tracking system. Two extensions to corrective action due dates were granted (7/27/94 to 11/29/94 and then 11/29/94 to 4/1/95) without Plant General Manager approval. The second extension was approved by the section supervisor and department manager after the item was overdue.

   The graphite packing was identified as one root cause for the corrosion of the 4B ICW pump shaft. Supplement 1 of Condition Report 94-554, Engineering Justification and MET 94-146 both recommend replacement of graphite impregnated packing with braided teflon packing. PMAI-94-09-072 tracked an action item for an Item Equivalency Evaluation (IEE) to be issued for the replacement packing. The PMAI response referenced an existing evaluation (FPLP-91-G039 R/1). However, this evaluation provides approval for graphite packing, <u>not</u> graphite-free packing. The PMAI was closed out with this corrective action incomplete. Since this issue was identified, braided teflon packing has been approved as a replacement and is being installed in the pumps.

   These issues were addressed on UAQ # 15. In response, changes to Administrative Procedure 0-ADM-054, "PMAI Corrective Action Tracking Program", were implemented in April of 1995 requiring originator and appropriate plant management approval of PMAI corrective action close-out and due date extensions of CR related PMAI corrective actions. These changes also require documents related to CR related PMAI corrective actions to be transmitted to QA Records for retention. Administrative Procedure 0-ADM-518, "Condition Reports", clarifies the requirements for operability assessments to be completed within three working days regardless of whether a new CR or a CR supplement is issued.

   The corrective actions taken in response to this issue were considered acceptable by the SWOPI Self Assessment Team, and UAQ #15 was closed.

5. Contrary to plant policy, several throttled CCW valves were found without yellow painted handwheels.

It is plant policy to consistently identify all valves in the CCW system which must be maintained in a throttled condition. The required method of identification is (1) yellow painted handwheels, and (2) permanent plastic caution tags.

Some valves had permanent yellow tags with a required percent open position listed which was marked out with grease pencil to another distinct number listed and initialed by the STA from 1986. This issue was addressed by UAQ # 24.

In response, a complete walkdown of all throttled valves in the CCW system on both units was performed. All throttled valves were found in their correct positions, but approximately 50% of these valves did not have yellow handwheels. All non-conforming handwheels were subsequently painted yellow.

The corrective actions taken in response to this issue was considered acceptable by the SWOPI Self Assessment Team, and UAQ # 24 is considered closed.

4.0 Audit Details

4.1 Mechanical Design Review and Configuration Control

4.1.1 Design Basis

Objective

Determine that design bases and functional requirements for the SWS and each active component are met during accident or abnormal conditions.

Results

The SWOPI Team reviewed the ICW and CCW Design Basis Documents, the appropriate sections of the Updated Final Safety Analysis Report (UFSAR), and numerous calculations and engineering evaluations to determine the adequacy of the ICW/CCW design bases. Two potential concerns were noted and subsequently resolved.

The design basis of the CCW system takes credit for the CCW piping inside containment (closed system inside containment) to the Normal Containment Coolers (NCCs) as the first barrier for containment isolation. The second barrier is the supply and return line motor operated isolation valves. Closed systems require protection against High Energy Line Break (HELB), but no formal HELB analysis could be found by the SWOPI Team. UAQ #28 was issued to address this concern. The response to UAQ #28 determined that the existing design provides whip restraints on main steam and feedwater piping to preclude impact of dynamic loads (due to pipe break) to nearby piping, and the concern was considered resolved.

A review of the design basis documentation determined that a formal single failure vulnerability evaluation had not been performed for the CCW system and UAQ #30 was issued to address this concern. The response to the UAQ provided applicable references to the FSAR and DBDs which document the applicable single-failure General Design Criteria (GDCs) that the CCW system was built to. The Design Basis Document (DBD) addresses select individual single active failure vulnerabilities, while other single failure evaluations are available through the corporate mainframe database. This documentation was reviewed by the SWOPI Team and due to the vintage of the Turkey Point license, was considered acceptable. UAQ #30 was closed and the issue was considered resolved.

Other minor document discrepancies were also noted. These discrepancies and their respective resolutions were tracked via UAQ #21, and were considered resolved upon completion of the document correction activities.

The team reviewed the design basis (design temperature and pressure, and setpoints) for the CCW system relief valves which protect the system from overpressurization in the event of a primary system leak in the CCW system. No concerns were noted.

The team reviewed the CCW piping drawings, design criteria, and physical configuration to ensure construction and design were in accordance with acceptable standards and codes. No concerns were noted in this area.

4.1.2 Licensing Commitments

Objective

Determine if the SWS system is in accordance with the plant's licensing commitments, regulatory requirements, and FSAR.

Results

Submittals to the NRC and the UFSAR were reviewed to assure that the design of the system complied with licensing and regulatory commitments. The review identified no commitments which were not met.

A review of Technical Specifications shows that T.S. 4.7.2 requires that two heat exchangers and one pump be verified capable of removing design basis heat load at least once per 12 hours. The design basis heat removal capability of 120×10^6 BTU/hr is verified by 3/4-OSP-019.4 approximately every four hours.

Minor discrepancies were identified with respect to the UFSAR. Page 6.3-6 of the UFSAR does not accurately describe the normal ECC return flow and bypass flow operation. This issue was addressed on UAQ #21 and subsequently closed after corrections were initiated.

4.1.3 Thermal and Hydraulic Performance

Objective

Determine if the system will meet the thermal and hydraulic performance requirements.

Results

The ICW/CCW systems are designed to remove a peak accident heat load of 120 X 10^6 BTU/hr. This heat load is rejected to the ultimate heat sink via the Emergency Containment Coolers during the injection phase and the RHR heat exchangers during the recirculation phase using one 100% capacity CCW pump, one 100% capacity ICW pump, and two 50% capacity CCW heat exchangers.

To determine the system thermal and hydraulic performance requirements, the design of the Emergency Containment Coolers, the RHR heat exchangers, the CCW heat exchangers, the ICW pumps, the CCW pumps, the CCW basket strainers, the intake traveling screen system and the cooling canal system were reviewed.

Emergency Containment Coolers

The ECCs were each designed to remove 60 X 10^6 BTU/hr. The original design calculation for ECC capacity was not initially located and UAQ #27 was issued. The response to this UAQ provided the original design calculation which was reviewed with no concerns and the UAQ was considered closed.

ECC tubes are admiralty brass and maximum recommended flow velocities for continuous operation, per the Heat Exchanger Institute Standard for Power Plant Heat Exchangers is 8.5 feet per second. During normal plant operation, ECCs at Turkey Point are subjected to very low flow (normally 200 gpm) and are not continuously operated. Maximum flows under emergency operation are expected to be 3600 gpm (approximately 11.5 feet per second) for one week and 3200 gpm (approximately 10.2 feet per second) for one month. Based on maximum wear rate in the range of 0.3 to 0.5 mills per year, tube wall thickness will not be reduced below the minimum. As part of the inspection program, periodic eddy current testing is performed to substantiate ECCs tube integrity. There were no concerns in this area.

RHR Heat Exchangers

RHR heat exchangers are designed to remove 29.4 x 10^6 BTU/hr. each during normal cooldown assuming 125°F CCW supply temperature. Lower CCW

temperature and higher tube side temperature will result in higher heat load. During LOCA recirculation phase, heat transfer may approach 83.1 x 10^6 BTU/hr. with sump water temperature of approximately 250°F and CCW temperature of 125°F, conditions bounded by design. There were no concerns in this area.

CCW Heat Exchangers

Unit 3 currently operates with the original CCW heat exchangers. The CCW heat exchangers on Unit 4 were replaced in 1989 with nearly identical vessels. The thermal and hydraulic performance of both the original and the replacement heat exchangers was reviewed.

The design requirements and prescribed operating parameters for the Unit 3 ICW/CCW heat exchangers are contained in Westinghouse Heat Exchanger Instruction Manual (N154) and Heat Exchanger Specification Sheet AH-CC512. The design values were as follows:

CCW In: 160°F
CCW Out: 125°F
ICW In: 95°F
ICW Out: 110°F
CCW side Fouling Factor: 0.0005
ICW side Fouling Factor: 0.001
Maximum CCW flow rate: 10,000 gpm (< 7 feet / sec.)
Rating: 60.0x10^6 BTU/hr.

The Unit 4 CCW heat exchangers were replaced in 1989 via PC/M 88-263. The replacement CCW heat exchanger procurement specification sheet was reviewed with no concerns noted.

Two CCW heat exchangers (50% capacity each) are required to remove the design basis heat load. Though calcium carbonate and biological fouling are not explicitly addressed in the design, the heat exchangers are regularly maintained to accommodate accident heat loads without affecting the margin between the actual MHA heat load (112 x 10^6 BTU/hr) and the design capacity heat load (120 x 10^6 BTU/hr).

Design basis heat removal capability of the CCW heat exchangers is established based on an on-going performance monitoring and testing program. Key variable parameters affecting the heat transfer capability are: (1) ICW flow rate, (2) ICW temperature, (3) tube fouling and (4) number of tubes plugged. Tube cleaning is achieved by hydrolasing. The cleaning schedule is determined based on a predetermined condition of these parameters. See Section 4.1.20 and Section 4.4

for more information on heat exchanger performance.

The team reviewed documentation that shows the CCW heat exchanger discharge CCW temperature does not exceed the 125^{0}F limit established by the design basis performance of the ECCs during post-accident operation.

The original heat exchanger shell side flow rate capacity was 3.42×10^6 lbm/hr. The replacement heat exchangers (Unit 4 only) have maximum flow rate capacity of 4.00×10^6 lbm/hr. The higher flow rate was accounted for in the flow balance analysis on the CCW system side of the heat exchanger. The heat exchanger design also ensured that the higher shell side flow rate does not result in excessive tube vibration. No concerns related to CCW heat exchangers were noted.

ICW Pumps

Procedure 3/4-0SP-019.1 is used to perform periodic performance tests on ICW pumps. A sample review of the performance tests showed that the 3C ICW pump test results (2-24-94) demonstrated pump performance consistent with the pump test curves. The Net Positive Suction Head (NPSH) available adequately meets the NPSH required. However, a concern was addressed via UAQ #5 for potential pump runout in certain system configurations with one pump operation that may result in vortexing or loss of NPSH. This concern is addressed in Section 4.1.13, Pump Runout.

The team reviewed the Johnston Vertical Pump Installation, Operation, and Maintenance Manual (A1810). The team reviewed a December 8, 1986 letter from Johnston Pump to FPL; observed "Note: Insure normal operating temperature of motor is achieved before vibration checks are taken." A subsequent review of the IST procedures determined that specific guidance is provided to ensure the pump motors achieve normal operating temperature before vibration readings are taken. The pump curves enclosed in the manual generally agree with the pump curves currently used by the plant.

Different NPSH required values have been observed in various documents (DBD, pump curves, vendor correspondence, calculations). The Plant response to Information Request #99 addresses this issue stating that NPSH required curves were conservative and the actual required NPSH at 19,000 gpm is 36.5 feet.

The response to Information Request #94 indicates that adequate pump submergence is built into the design at the lowest water level (-) 4' 5" based on hurricane conditions.

CCW Pumps

Calculations are on record that demonstrate one pump and two CCW heat exchangers have been analyzed for various operating configurations, and that flows and head are within the design limits. Calculations also demonstrate adequate NPSH available under a pump runout condition and a hypothetical temperature of 180^{0}F.

The ability of the CCW pump motors to start and accelerate at the minimum expected grid voltage and the protective relay settings were reviewed. Also, the emergency diesel generator loading calculations were reviewed to determine if more than one CCW pump could be loaded onto an Emergency Diesel Generator (EDG) and if the EDG could support this. The review determined that only one CCW pump could be loaded on each EDG. No concerns were noted with any of these issues.

<u>Basket Strainers</u>

The Assistant Nuclear Plant Supervisor (ANPS) log indicates that the ICW system basket strainers are frequently backwashed (approximately twice/shift). Operations and Maintenance personnel indicate that the basket strainer partial backwashing operation is not fully effective, therefore full flow backwashing is the preferred method. The basket strainer design shows that the basket strainers are not baskets, but rather a corrugated semi-circular screen. The partial backwash system operates by directing two 4" lines at a semi-circular screen. The design does not appear adequate to clean screen areas away from the immediate vicinity of the 4" pipes.

No technical or vendor manual exists for the ICW basket strainers. The DBD states that the basket strainer design ΔP at 16,000 gpm is 1.5 psid. Under normal operating conditions, with a clean basket strainer, the ΔP is observed at around 0.7 psid at about 10,000 gpm flow. The basket strainer appears to be marginally sized considering that some ingress of small debris is likely to be present. This material ingress contributes to frequent backwash requirements. The apparent design limitations of the basket strainers were addressed on UAQ #9. The response to this UAQ indicated that a Plant task team had been formed to investigate root causes. On June 1, 1995, this team issued their final report which concluded that screen wash spray nozzle deflector plate performance was the single greatest identifiable contributor to the increase in basket strainer cleanings during power operations. In response to this report, all screen wash spray nozzle deflector plates have been replaced and procedures have been revised to periodically inspect these plates and replace as necessary. This corrective action has apparently reduced the fouling rate of the basket strainers significantly as of this report. The need for further corrective action may therefore be contingent on the long term performance of the restored screen wash system.

Ultimate Heat Sink

The ultimate heat sink (UHS) for Turkey Point consists of a canal system which runs approximately 165 miles. The total canal water surface area is approximately 4000 acres. This design surface area was based on the required thermal performance of the cooling canal system which is based on the thermal loading of the four units (2 fossil and 2 nuclear) (approximately $14x10^9$ BTU/hr. at 100% load factor). The design heat removal capability exceeds the heat load during the MHA. Therefore, it was concluded that the Turkey Point UHS was adequately designed.

As part of the design review, drawing 5610-C-1168 Rev. 9, Cooling Canal System Layout was reviewed and compared to the maintenance and berm restoration activities currently in progress on the cooling canal system. The drawing shows the canals should be approximately 200 feet wide and the berms to be 90 feet wide. No requirements were established for the berm slope. Further review by Engineering concluded that no specific design basis or criteria is necessary for berm slope, as long as the berms do not reduce the surface area of the canals or collapse and block the flow of water. The team determined that the maintenance and berm restoration activities currently in progress on the cooling canal system are consistent with the system design and no concerns were noted.

After the 3/9/95 grass/algae intake event, SWOPI Team members inspected the cooling canals twice by boat, on 3/10/95 and on 3/15/95 and once by helicopter on 3/17/95. Aerial photographs of canal maintenance and berm restoration activities, as well as concentrations of floating grass and algae were taken. These were provided to station management for their use.

4.1.4 Design Output Documents

Objective

Determine if the associated design output documents such as calculations, engineering evaluations, and procurement specifications are consistent with the design bases.

Results

The team reviewed numerous calculations, engineering evaluations and procurement specifications for the ICW and CCW systems. Notable issues or concerns are detailed below.

The Unit 4 CCW heat exchangers were replaced in 1989. The Unit 4 CCW Heat Exchanger Instruction Manual from the manufacturer did not provide design

information or specification sheet. UAQ #21 included this minor concern and steps were taken to revise the technical manual to include the specification sheet, resolving the concern.

The review of the Engineering Evaluation of Loss of the Intake Cooling Water System uncovered an issue related to the ICW inlet temperature. The purpose of this evaluation was to verify that the plant could be brought from full power operation to hot shutdown in the event of a complete loss of all ICW coincident with a LOOP. The evaluation assumed an initial ICW inlet temperature of 95°F. Since the Technical Specifications permit ICW inlet temperatures up to 100°F, Information Request #153 was issued asking whether the program should be initialized at 100°F to maximize the temperatures of the containment and associated systems. The response provided the basis for using 95°F for ICW inlet temperature and relates the maximum temperature of 100°F to fouling factor adjustment. This was considered an acceptable response.

The review of calculation PTN-BFJM-86-036 determined that maximum pump flow was limited to 19,000 gpm to meet the pump NPSH required. Procedural guidance to protect against pump runout was not found in the operating procedures. This issue is discussed in Section 4.1.13.

Bechtel calculation M-12-183-010, "HX3 and HX4 Computer Code Verification, Rev. 0" was reviewed for methodology, including the provision for considering the number of plugged tubes, fouling factors, and instrumentation uncertainty. The SWOPI Team concluded that the CCW heat exchanger performance monitoring program is based on sound engineering principles and is well controlled.

Calculation EC 145, Rev. 5 dated 6/4/91, PSB-1 "Voltage Analysis for Electrical Auxiliary System" was reviewed. The capability of one CCW pump motor starting during degraded grid condition was also reviewed. No concerns were noted.

4.1.5 Plant Drawings

Objective

Determine if ICW and CCW systems drawings are consistent with applicable design documents, NRC requirements, and licensing commitments.

Results

The team performed system walkdowns and sampled ICW/CCW configuration drawings and found that the drawings were generally consistent with applicable design documents, NRC requirements, and licensing commitments. Minor drawing discrepancies were noted and addressed on UAQ #21. These issues, listed below, were all addressed by appropriate corrective action processes and considered closed by the SWOPI Team.

A review of drawing 5613-M-3030 sheet 5 incorrectly indicated CCW total flow through the RCP thermal barrier cooling coils to be 25 gpm. The total flow is actually 75 gpm. The response to Information Request #262 indicated that drawing 5613-M-3030 sheet 5 would be revised via Change Request/Notice (CRN) M-8302 to correct the flow indicated through MOV-3-716B. This CRN was issued 5/23/95.

Drawing 5613-P-596-S sheet 3 contained dimensional discrepancies noted during the walkdown of the CCW system. The response to Information Request #231 indicated that the correct dimensions had been used in the associated stress calculation and CRN M-8301 would be issued to revise the drawing. The CRN to the drawing update Minor Engineering Package (MEP) was issued on 6/9/95.

The current revision of drawing 5613-P-596-S sheet 2 did not show the one inch chemical pot feeder CCW supply line coming off the elbow just upstream of valve 3-712B. The response to Information Request #232 indicated that a CRN to the drawing update MEP would be issued to revise the drawing. The CRN was issued on 6/9/95.

MOVs were not correctly identified on drawings 5613-P-613-S sheet 1 and 5613-P-612-S sheet 1. The response to Information Request #279 indicated that a CRN would be issued to correct these drawings. A CRN to the drawing update MEP was issued on 6/9/95.

Drawing 5613-P-633-S sheet 2 showed the distance to the supports on either side of valve 3-50-350 to be 12' 4 1/4". Actual dimensions were measured to be of 7' 10". Also, the field configuration shows valve 3-50-

350 next to the "T" at point 52 and the drawing shows a spool piece between the valve and the "T". The first concern was that an unanalyzed stress condition may exist and UAQ #8 was issued to address that concern. The response to the UAQ indicated that the piping stress calculations had been performed using the correct dimensions. UAQ #8 was considered closed. Engineering issued CRN-M-8262 to correct the drawing discrepancy.

4.1.6 Service Water System Operation

Objective

Determine if SWS operation is in accordance with design documents.

Results

A review of flow balancing test results determined that plant procedures were required to provide action to shutdown one CCW pump under certain conditions if two CCW pumps were operating with two CCW heat exchangers in service. The action was to prevent shell side flow from exceeding the maximum permitted flow to the operating CCW heat exchangers. A review of the operating procedures indicated that this required action was not specifically addressed. UAQ #29 was issued to address this concern. The response to this UAQ indicated that for most conditions, the proper procedural guidance and actions were in place. However, a procedure change was initiated to add a statement to the Precautions and Limitations section of procedure 3/4-OP-050, "RHR Normal Operating Procedure" to incorporate these required actions. UAQ #29 was then considered closed.

Additional details of ICW/CCW operation are contained in Section 4.2.

4.1.7 Single Active Failure Vulnerabilities

Objective

Evaluate single active failure vulnerabilities of the SWS system and the resulting impact on interfacing system components.

Results

The thermal barrier rupture of an RCP will result in high pressure and temperature in portions of the CCW system piping. A review of the piping design documentation showed the system to be adequately designed for this condition between and including the upstream check valve and the downstream

manual isolation valve. However, a review of the RCP thermal barrier tube rupture design basis event raised a question of whether the manual isolation valve 3/4-736 could be closed against RCS pressure in the event the motor operated containment isolation valve failed to close. UAQ #26 was written to address this issue. The response indicated that the valve assemblies are designed to close against the design pressure which is RCS pressure following the failure of the RCP thermal barrier. Based on the design information, FPL determined that the valve is manually closable within the required time, but a valve wrench may be required. Procedures 3/4-ONOP-041.1 were revised to provide directions to operators to close manual valve 3/4-736 if MOV-3/4-626 cannot be closed. UAQ #26 was then considered closed.

During design evaluations performed under the Thermal Power Uprate Project, a potential single failure of a solenoid valve was identified which could result in some section of CCW piping exceeding its analyzed temperature. The solenoid valves, SV-3/4-2923, 4, 5, are on the ECC/CCW return line. This discrepancy was identified by Engineering, independent of the SWOPI. Engineering performed the operability assessment and developed the required corrective actions per CR 95-411, and concluded that no actions were required for Unit 3, and none were required on Unit 4 prior to the next refueling outage.

PC/M 88-346, "Turbine Plant Cooling Water Isolation Valve Modification", was issued in 1988 to address the single active failure of control valve CV-3/4-2201 to close. This modification provides for the addition of new replacement power operated valves located upstream of the TPCW heat exchangers that will close on a Safety Injection Actuation Signal (SIAS). The PC/M was reviewed by the SWOPI audit team and the Electrical Engineering Chief and no single active failure concerns were noted.

The team reviewed the potential for primary system leakage into the CCW system. This review included the excess letdown heat exchanger, the non-regenerative heat exchanger, and the RCP thermal barrier heat exchanger. No concerns were noted.

4.1.7a Single Passive Failure Vulnerabilities

Objective

Evaluate credible single passive failure vulnerabilities.

Results

Common Discharge Valve

The three CCW heat exchanger ICW outlets are cross connected to a common discharge pipe (above ground and buried portions) via CV-3/4-2202 and a bypass valve, 3/4-50-406. CV-3-2202 is bound closed due to a corroded actuator and credit for full ICW flow is taken via the bypass butterfly valve, 3-50-406, which is locked in the open position. Engineering Evaluation JPE-LR-87-45 concluded that the bypass valve 3-50-406 is capable of passing the ICW flow discharged from the CCW heat exchangers. A postulated passive failure (separation of the disc from the valve stem) of the single bypass butterfly valve (3-50-406), though not part of the licensing basis, could lead to loss of ICW flow through the CCW heat exchangers. This valve is susceptible to flow oscillation and has required repair to correct a loose operator parts. Past failures of other non-identical ICW butterfly valves have resulted in degraded ICW flow, such as the inadvertent valve closure discussed in Section 4.1.11, and the event discussed below.

L-89-454 dated 12/18/89 was reviewed. On 7/13/89, ICW flow to the Unit 4 CCW heat exchangers was degraded due to a failure of 4-50-308. The valve was found to be in the partially opened position and the valve disc was separated from the valve stem due to the fatigue failure of the upper two valve taper pins. The valve was subsequently replaced with an upgraded design thus eliminating the observed failure mode.

The design and actual plant configuration of bypass valve 3/4-50-406 is such that maintenance on the valve disc cannot be performed in any unit operating mode, as ICW is required to be in service at all times. The potential for in-service valve degradation coupled with the inability to perform maintenance on this valve was addressed on UAQ #11. Current plans to replace CV-3-2202 with a spool piece during the Fall 1995 refueling outage will eliminate the postulated passive failure concern. UAQ #11 was considered closed contingent upon the completion of this modification.

Buried Common Discharge Pipe

The three CCW heat exchanger outlets are cross-connected and connected to a common discharge pipe which is cement-lined cast iron pipe above-ground and

concrete reinforced pipe underground, except for a small portion immediately downstream of the CCW heat exchangers. This common discharge pipe is not included in the piping inspection program because it cannot be isolated, and is a required flowpath in all plant operating modes. UAQ #3 was initially issued because it was thought that this underground piping was all cement-lined cast iron, which could corrode without detection through inspection. Corrosion could conceivably lead to a through wall leak of the discharge piping. The initial response to the UAQ indicated that this common piping was not cement-lined cast iron, but reinforced concrete. The UAQ was then closed.

Subsequently, the 6-7 foot section immediately downstream of the CCW heat exchangers was discovered to be cement-lined cast iron. UAQ #3 was reopened to address the original concern of undetected corrosion.

The subsequent response to UAQ #3 indicated that experience with inspection results of other buried cement-lined cast iron piping have been utilized to characterize the condition of this portion of the piping. Inspections to date have not revealed any significant wall thickness reduction associated with cast iron piping. External corrosion has not been observed. Based on known corrosion rates and the piping inspections to date, future corrosion of this underground piping resulting in flow degradation is not considered a concern. UAQ #3 is considered closed.

4.1.8 Interfacing Systems

Objective

Evaluate the effect on SWS operability of failures to interfacing systems, such as instrument air.

Results

Failure of components serviced by the instrument air system was reviewed. The review determined that the air operated or control valves which can impact ICW/CCW operation significantly, fail in the conservative direction.

The SWOPI Team reviewed the ability of MOVs to isolate all non-essential loads in the event of an actuation signal. Included in this review was the individual power sources to each MOV. No concerns were noted. Also, the potential for electrical failures was reviewed and no concerns were identified.

The high head safety injection (HHSI) pump bearing coolers and the boric acid evaporators utilize a cross-tied CCW system between the two units. This configuration was reviewed with no concerns noted.

4.1.9 Common Mode Failures

Objective

Examine potential common mode failures from piping corrosion, fouling of common intakes or traveling screens.

Results

Piping Corrosion

Inspections of buried piping in ICW system have been ongoing since 1983 to assess the piping conditions. Inspections are regularly scheduled during refueling outages to monitor degradation rate and assess the performance of corrective actions. Very few corrosion cells penetrating the cement liner have been observed. External corrosion has not been observed. A review of the Turkey Point Intake Cooling Water System Piping Inspection Guidelines document, standard STD-ESI-92-002, contains acceptance criteria for pipe and lining condition. However, the basis for this criteria was not referenced. UAQ #6 was issued to address this concern. The response to this UAQ determined that the standard would be revised to include a basis with the appropriate references. This corrective action was closed via PMAI 95-03-156. The UAQ was then considered closed.

The CCW system is a closed system inside containment and uses demineralized water with corrosion inhibiter (Sodium Molybdate). Water chemistry is periodically checked. Therefore, piping corrosion does not appear to be a concern.

Fouling of Intake and Travelling Screens

Common mode failure of the intake or the traveling screens to the extent that the ICW function would be impaired during shutdown conditions is highly unlikely. However, the potential for impacting circulating water pump capability and consequently plant operation exists. UAQ #7 addresses the grass/algae concern that could degrade flow capability of the ICW system if optimum performance of travelling screens and screen wash system is not assured. Additionally, alternative procedural guidance is needed to select the appropriate combination of circulating water pumps and ICW pumps when travelling screens and screen wash systems are rendered ineffective. Subsequent to the event of March 9, 1995 (ICW low flow condition), the plant formed a team to investigate root causes. On June 1, 1995, this team issued their final report which concluded that screen wash spray nozzle deflector plate performance was the single greatest identifiable contributor to the increase in basket strainer cleanings. In response to this report,

all screen wash spray nozzle deflector plate have been replaced and procedures have been revised to periodically inspect these plates and replace as necessary. A new off-normal operating procedure 3/4-ONOP-011, "Screen Wash System/Intake Malfunction", was issued in May, 1995 which directs that, if necessary, an ICW pump will be operated in the same well as an idle circulating water pump to eliminate the mechanism for debris carryover into the ICW system. The SWOPI Team considers operation of an ICW pump in a stagnant well to be a sufficient response which would preclude recurrence of the ICW low flow condition. UAQ # 7 is therefore considered closed.

4.1.10 Silting and Biofouling Design Features

Objective

Determine the effectiveness of any design features installed to minimize silting and biofouling of the piping and components

Results

Silting of the ICW system in not a concern at Turkey Point due to the coral rock/limestone characteristics of the cooling canal system which serves as the ultimate heat sink. High flow velocities of the fluid medium also serve to prohibit silting.

Macro biofouling of the ICW/CCW heat exchangers is not a major problem due to the self-contained cooling canal system. However, micro-fouling in the form of slime is present and is controlled by hydrolasing at intervals determined by the heat exchanger performance monitoring program.

No concerns were identified.

4.1.11 Detection of Flow Degradation

Objective

Verify that features are provided for timely detection of flow degradation.

Results

Control Room flow indication for the ICW system consists of ICW pump discharge header low pressure alarms and ICW pump ampere indication. Traveling screen ΔP is indicated and high ΔP alarms are annunciated in the control room. Indication for basket strainer ΔP and ICW/CCW heat exchanger ICW flow is available locally in the CCW heat exchanger room and is monitored

as part of the operator rounds.

During maintenance on valve 3-50-310 in January of 1995, the valve went closed. Control room operators were unaware of the valve closure until maintenance personnel notified the control room, resulting in the valve remaining closed for about 15 minutes. This was addressed on UAQ #14. The response to this UAQ indicated that more frequent monitoring of local flow indication would be initiated during such maintenance evolutions. The UAQ was closed based on this corrective action.

Control Room flow indication for the CCW system consists of CCW header flow indication and the CCW pump discharge header low pressure alarm. CCW supply temperature indication is also available in the Control Room. No concerns in this area were generated.

4.1.12 Flow Balancing

Objective

Verify that flow balancing has been conducted during various system operating modes.

Results

The team reviewed Temporary Procedure 391, "Intake Cooling Water Flow Test" performed October 9 and 16, 1987. The purpose of the procedure was to determine the flow characteristics of the ICW system under various system configurations with CV-3-2202 or CV-3-2201 isolated. The test, with the system in "normal" condition, shows total ICW flow of 18,200 gpm for the 3A pump, 20,000 gpm for the 3B pump, and 19,150 gpm for the 3C pump during one pump operation. However, the procedure does not indicate the position of CV-2201. A review of the test shows the system to be adequately balanced. Pump runout is a concern in the situation of one pump operation. This is discussed in detail in 4.1.13. The team also reviewed the results of Special Test 85-02, "Intake Cooling Water System Performance Test", approved on August 30, 1985. No concern were noted.

The team reviewed the CCW system flow balancing Safety Assessment Submittal and one concern was noted. Special Test 86-05 was performed to position valves for establishing flow balance to provide assurance that minimum CCW flows to required safety related components are met under the most limiting CCW system alignment. During testing, it was determined that operating two CCW pumps with only two CCW heat exchangers in service would result in exceeding the maximum design flow rates through the CCW heat exchangers. Therefore, plant

procedures must be in place to shut down one pump under these conditions. A review of plant procedures determined that this was not sufficiently addressed. Therefore, UAQ #29 was written to address this concern. The response to this UAQ indicated that for most conditions, the proper procedural guidance and actions were in place. However, a procedure change was initiated to add a statement to the Precautions and Limitations section of procedure 3/4-OP-050, "RHR Normal Operating Procedure" to incorporate these required actions. The UAQ was then considered closed.

Also it was verified by testing that minimum and maximum flow rates to safety-related components are within the design requirements of the components. Instrument inaccuracies for testing were appropriately used.

The team concluded that design assumptions are consistent with the flow balance, and pressure drops are monitored sufficiently during normal operations to ensure they are maintained within prescribed limits.

The team reviewed the CCW system for conditions favorable for waterhammer. No evidence of such conditions were found. Also, the team reviewed the potential for waterhammer in the ECCs in the event of a LOOP/LOCA. No waterhammer concerns were noted.

4.1.13 Pump Runout

Objective

Verify that pump run-out conditions are not present with minimum number of pumps operating with worst case alignment of non-safety related loads.

Results

Calculation PTN-BFJM-86-036 was reviewed which limited the maximum acceptable ICW pump flow to 19,000 gpm because the required NPSH would exceed the available NPSH at flows above 19,000 gpm. Letter JPE-PTPO-88-74, dated February 12, 1988, requested the plant to review the guidelines provided in the letter and revise the affected plant procedures as appropriate. A review of plant procedures determined that the procedures did not limit one pump operation flow to 19,000 gpm. UAQ #5 was issued to address this concern.

In response to this issue, a night Order was issued immediately, and changes to procedures 3/4-ARP-097.CR, "Control Room Annunciator Response", and 3/4-OP-019, "Intake Cooling Water System", were subsequently initiated to provide operators with guidance to protect the ICW pumps against runout conditions.

The corrective actions taken in response to this issue was considered acceptable by the SWOPI Self Assessment Team, and UAQ # 5 is considered closed.

No CCW pump runout concerns were noted.

4.1.14 Limits for Valve Positions

Objective

Evaluate minimum and maximum limits for valve positions and ensure these limits are properly translated into operational controls.

Results

The ICW and CCW system final flow balancing and valve positioning was determined through testing. Specifics of this issue are covered in Section 4.1.12.

The system lineup for ICW flow to CCW heat exchangers calls for all the inlet valves to be wide open. The valves on the outlet side of the ICW/CCW heat exchangers are locked in the open position. Valve CV-3/4-2201, on the outlet of the TPCW heat exchangers, is the only valve throttled to adjust flow. The valve setting is controlled by procedure 3/4-OP-019.

CCW valve position and flow balancing verification is controlled by procedure 3/4-OSP-030.9. This procedure provides guidance for verifying CCW flow through the safety-related components while the system is aligned in its most limiting accident configuration, assuming a single active failure. A review of the procedure revealed no concerns.

4.1.15 Effects of Internal Event Flooding

Objective

Determine whether or not design features are provided to mitigate the effects of flooding caused by SWS leaks.

Results

The intake structure, the ICW pumps and the CCW pumps are in an outdoor area. Any pipe failure in this area will result in water flowing to the yard storm drains.

NUREG 1275 Vol. 3 Section 3.3, "Service Water System Events Involving Flooding" was reviewed. No concerns were identified.

ICW/CCW flooding is not a concern based on the documents reviewed and the plant configuration.

4.1.16 Seismic Qualification

Objective

Review seismic qualification of safety related portion of ICW system. Verify that non-safety related portions can be isolated in accordance with the provisions specified in the system design bases.

Results

The SWOPI Team reviewed PC/M 88-346, "TPCW Isolation Valve Modification", PC/M 88-263 "CCW Heat Exchanger Replacement", PC/M 88-392 "ICW Basket Strainer Replacement", PC/M 86-024 "ICW System TPCW Heat Exchanger Isolation" and PC/M 86-210 "ICW Check Valve Replacement" with regards to seismic qualification of safety related components. No seismic qualifications concerns were noted.

The SWOPI Team reviewed UFSAR Appendix 5A. The intake structure, crane supports, ICW pumps and motors, and ICW piping from the pump discharge to the CCW heat exchanger inlets are designated as Seismic Class I per Section 2.3.4 of the DBD. The DBD states that the ICW system is seismically qualified but acknowledges that detailed documentation can not be retrieved. Engineering Evaluation JPN-PTN-SECJ-89-126, Rev. 0, "Mechanical and Electrical Equipment Lists Related to Unresolved Safety Issue (USI) A-46 (NRC GL 87-02)" was also reviewed. FPL's program examined the "B" Train Components of the ICW system. The seismic adequacy of the 3B and 4B ICW Pumps and the B ICW/CCW Heat Exchanger was established. The seismic adequacy of "A" train components was established through their similarity with "B" train components. This evaluation, along with the DBD discussions and applicable sections of the UFSAR is the best documentation readily recoverable related to seismic qualification. The documentation reviewed by the SWOPI Team was considered acceptable and no justification for pursuing this topic further was found.

The non-safety related intake screen wash system for the traveling screens is designed non-seismic.

A walkdown of the CCW surge tank area determined that the pipe hanger located just downstream of the Unit 3 RCV-3-609 was bowed and in compression. The hanger is required to support RCV-3-609 and the associated piping. Response to Information Request #251 indicated that CR 95-424 was generated to address the

condition. The Engineering evaluation determined that the hanger condition was not an operability concern. The condition was corrected by way of the CR.

The RHR heat exchangers were purchased to Westinghouse generic seismic requirements (0.5g horizontal, 0.33g vertical) which is more than adequate. Seismic design bases for Turkey Point Class I structures are simultaneous ground acceleration of 0.15g horizontal and 0.1g vertical.

4.1.17 System Modifications

Objective

Verify that 50.59 evaluation for modifications to the SWS ensure that the changes have not compromised the system design basis and have included revised maintenance requirements and procedures, operating procedures, training, and periodic testing, as necessary.

Results

The following PC/Ms were reviewed:

PC/M 88-346, "Turbine Plant Cooling Water Isolation Valve Modification"

A review of PC/M 88-346 determined that the piping may not have been analyzed to account for the weight of the new POVs. UAQ #2 was issued to address this issue. The response to the UAQ indicated that the valves had been replaced via PC/M 86-024 while the valves were still manual valves. The stress problem M08-413-03, indicates that the piping was properly analyzed, but that the drawings were not updated after PC/M 88-346 installed the valve control circuits and changed the valve identification numbers to POV-4-4882 and -4883. A CRN (C-10091) to the drawing update MEP was issued to resolve the isometric discrepancy. The UAQ was then considered closed.

PC/M 88-263, "Component Cooling Water Heat Exchanger Replacement"

No concerns were noted.

PC/M 88-392, "ICW Basket Strainer Replacement"

As documented in UAQ #9, basket strainer performance was a concern of the SWOPI Team, which could reflect on the adequacy of this modification. As discussed in Section 4.1.3, strainer performance is linked with screen wash performance during power operation. Root causes of screen wash performance problems have been addressed and appear to have resolved basket strainer

concerns. The need to further investigate the basket strainer design will be contingent on the long term performance of the restored screen wash system.

PC/M 86-024, "ICW System TPCW Heat Exchanger Isolation"

No concerns were noted.

PC/M 86-210, "ICW Check Valve Replacement"

ICW pump discharge check valves were replaced via this PC/M due to performance problems with the original valves. The replacement check valves, though performing better are not free from problems. Several broken return springs have occurred due to material fatigue. This issue was addressed on UAQ #23 and, as discussed in Section 4.3.5, the UAQ is considered closed. Although not required for operability, the springs are being considered for an improved design.

PC/M 91-044, "Replacement of Emergency Containment Coolers CCW Solenoid Valves"

These solenoid valves operate CCW valves CV-4-2903 through CV-4-2908 for ECCs. The existing valves had a history of repetitive failures. The differences between the replacement valves and the existing valves, mounting template and configuration, weights, and ambient temperature limits were sufficiently evaluated. The new mounting configuration and new stainless steel tubing did not present any adverse seismic interactions. No concerns were noted.

4.1.18 Generic Letter 89-13, Action IV

Objective

Evaluate Turkey Point's response to Action IV of GL 89-13, "confirm that the Service Water System will perform its intended function in accordance with the licensing basis of the plant."

Results

Turkey Point's responses to Generic Letter 89-13, "Service Water System Problems Affecting Safety Related Equipment" were reviewed.

Recommended Action I

Turkey Point committed to visually inspecting portions of the intake structure and piping during the 1990 refueling outage to ensure that flow blockages due to

biofouling do not occur in the future. The inspections were performed with no concerns noted. Extensive ICW crawl through inspections are conducted on each unit during refueling outages.

Recommended Action II

Turkey Point committed to determining the adequacy of the CCW chemistry control program by:

- testing or performing a visual inspection of heat exchangers cooled by CCW,
- testing the RHR heat exchangers during a period of significant load, and using this test data to validate any stainless steel heat exchanger cooled by CCW.
- visually inspecting a sample of the ECC heat exchanger tubes to verify the condition of the brass tubes.

The above activities were completed with no concerns identified.

Recommended Action III

Turkey Point committed to implementing a chemical injection system on the Unit 4 CCW heat exchangers by July 1990. In January of 1992, FPL notified the NRC of the decision to suspend operation of the chemical injection system due to stress corrosion cracking of CCW heat exchanger tubes and inlet piping erosion/corrosion. UAQ #20 was issued to address the engineering evaluation of tubing degradation. As discussed in Section 4.3.1, the response to this UAQ was accepted and the UAQ is considered closed.

Recommended Action IV

Turkey Point committed to perform monthly walkdowns on the ICW and CCW systems by the System Engineer. The walkdowns are being performed in accordance with procedure 3/4-OSP-019.2. No concerns were noted.

Recommended Action V

Turkey Point committed to a review to assure the adequacy of maintenance practices, operating and emergency procedures, and training involving the ICW and CCW systems. These items are addressed in the appropriate report sections.

4.1.19 Monitoring System Degradation

Objective

Evaluate the program for monitoring system degradation, performance trending, adequacy of engineering evaluation and operability determinations.

Results

CCW Heat Exchanger

The response to Information Request #132 provided the bases for the CCW heat exchanger fouling rates of 1.0°F/day for Unit 3 and 0.9°F/day for Unit 4. The fouling rates assigned to the CCW heat exchangers are based on experimentally derived data obtained during many implementations of Special Test 85-10, the original CCW heat exchanger performance monitoring test procedure. Trending of fouling rates began in 1987 with Temporary Procedure (TP) 396. This TP assumed fouling rates of 0.6°F/day for Unit 3 and 0.9°F/day for Unit 4.

As data was collected, the results of the data trending required the Plant to increase the fouling rate for Unit 3 to 1.0°F/day. The Plant attributed this increase to aging. Data trending showed that the assumed fouling rate of 0.9°F/day for Unit 4 was still appropriate. The Plant decided to continue this fouling rate after the installation of new heat exchangers on Unit 4 in 1988. Recent data trending indicates that the assumed fouling rates of 1.0°F/day for Unit 3 and 0.9°F/day for Unit 4 remain conservative. Recent performance tests (3/4-OSP-019.4) results indicate that the average fouling rate for Unit 3 CCW heat exchangers is 0.61°F/day. The Unit 4 data indicates the average fouling rate is 0.66°F/day.

The CCW heat exchanger tube fouling rates are based on actual plant data taken over seven years. The data is trended per the results of the CCW Heat Exchanger Performance Monitoring Program to ensure the assumed fouling rates of 1.0°F/day for Unit 3 and 0.9°F/day for Unit 4 remain valid. No concerns were noted in association with this process.

Basket Strainer

Although basket strainer backwashing and cleaning has become an increasingly more frequent evolution since 1992, station trending of ICW performance did not identify this trend. Current station focus in response to UAQ #9 concerning basket strainer performance has resulted in closer monitoring of strainer performance.

The uncertainty of the ICW flow indicators located downstream of the CCW heat exchangers are not factored into the flow readings taken for purposes of verifying the minimum flow requirement for ICW during basket strainer cleaning. UAQ #12 was issued to address this concern. The response indicated that the amount of introduced error due to the flow instrumentation is negligible considering margins in the containment heat removal analyses which is the purpose of this surveillance. Although FPL has not performed an explicit analysis quantifying these margins, low flow and/or high temperature conditions have been evaluated and the results indicate ample margin to account for instrument uncertainty. Examples of analyses which show considerable margin are Westinghouse WCAPs 12262 and 12263 and Westinghouse letter 95-JB-GL-5133, dated 4/3/95.

In addition, the Turkey Point CCW heat exchanger operability performance assessment program is in compliance with Part 21 of the ASME OM-S/G-1994 Standard and Guidelines, "Inservice Performance Testing of Heat Exchangers in Light Water Reactor Power Plants". The methodology in use at Turkey Point is the Heat Transfer Coefficient Test Method (without phase change) of the Standard, Section 6.2. Additionally, Turkey Point's treatment of uncertainty is in accordance with the standard, in particular Figure 2 and Sections 8 and 9.

It was concluded that the flow measurement instrument uncertainty need not be further quantified in the determination of operability for the time that a basket strainer would be removed from service. UAQ #12 is considered closed.

4.1.20 <u>Setpoints</u>

<u>Objective</u>

Evaluate setpoints for alarms and actuation to ensure they are consistent with the design basis and assumptions.

<u>Results</u>

FPL Nuclear Engineering Standard IC 3.17, "Instrument Setpoint Methodology for Nuclear Power Plants," revision 4, dated 3/17/93 was reviewed. Specific guidance for the Turkey Point Setpoint Program is to be included in Appendix B to this Standard, "Turkey Point Setpoint Program Plan and Specific Guidelines". However, this Appendix has not been completed. Although no specific concerns were identified due to the absence of this Appendix, the document needs to be provided. This issue was included in UAQ #21, and the response provided a plan for completion. This was accepted by the SWOPI Team.

The ICW pump discharge header low pressure alarm setpoint is 11 psig. A review of the pump curve indicates that 11 psig approximately corresponds to the

one-pump runout condition, which would alert operators to an abnormal operating condition. The setpoint therefore appears reasonable.

The CCW pump discharge header low pressure setpoint is 60 psig. A review of the basis for the setpoint revealed no concerns.

The Hi and Lo flow setpoints for FIC-3/4-626 the RCP Thermal Barrier CCW Flow are 130 and 66 gpm respectively. A review of the basis for the setpoints revealed no concerns.

The SWOPI Team reviewed the basis for the CCW pump suction high temperature alarm setpoint of 180^{0}F. The basis was appropriate and no concerns were noted.

The SWOPI Team reviewed the surge tank radiation alarm setpoint calculations to determine the basis and adequacy of the setpoints. No concerns were noted.

4.1.21 IPE Assumption Verification

Objective

Confirm that IPE assumptions concerning the ICW system and selected CCW components availabilities were valid.

Results

The SWOPI Self Assessment review concluded that the ICW pumps and CCW heat exchangers were within the assumptions of the PSA. However, the unavailability of the basket strainers was well above the assumptions of the PSA. The applicable PSA calculations for Turkey Point were rerun with the actual out-of-service hours and the resultant core damage frequency change was insignificant, less than 0.01%.

The review noted that currently, a component is not logged as being unavailable for maintenance rule baseline data if a Technical Specification (TS) Action Statement is not entered. Therefore, the cleaning of the third CCW heat exchanger is not recorded as an unavailability during the 8-16 hours required to clean the heat exchanger. Additionally, if the plant is in modes 5 or 6, the unavailability for maintenance rule baseline data is not recorded. UAQ #22 was issued to question this approach. The response to the UAQ indicated that per 0-ADM-213, "Technical Specification Related Equipment Out-of-Service Logbook", all out-of-service time for TS related equipment is logged, regardless of LCO action statements. In addition, the PSA and Maintenance Rule baseline is being established at this time using the TS related equipment out-of-service log. Any

required revisions to the unavailability assumptions will be incorporated into the PSA. UAQ #22 was then considered closed.

4.1.22 Operating Experience Feedback

Objective

Verify that industry information relevant to the SWS has been reviewed and appropriately addressed

Results

The review of the Feedback of Operating Experience Program (FOP) responses to ICW related industry experience shows that for the most part, the FOP program is effective and the responses are meaningful. Only a small number of the older FOP's reviewed required further clarification or confirmation, and are described below:

For FOP 81-175, "INPO SER 96-81 Flooding of RHR Service Water/Emergency Equipment", the Plant response indicates that the issue is not applicable to Turkey Point because it is a BWR issue. The issue was related to pump discharge air vent valves which utilize a float, regardless of NSSS type. Information Request #8 was issued to determine if Turkey Point has any such vent valves. The response to this request indicated that Turkey Point does not have float-type vent valves in the ICW or CCW systems.

FOP 86-149 "INPO SER 36-86 Emergency Service Water Pump Failure". The Plant response to this FOP stated that Turkey Point plans to upgrade the existing cast iron ICW pump suction bells with stainless steel. Plant response to Information Request #24 shows a Procurement Engineering document which identifies the suction bell material as being replaced with stainless steel.

FOP 83-119 "NRC IN 85-24 Pipe Lining Failures on ICWS", letter (no number) dated 12/23/83 states that Turkey Point does not use epoxy and therefore epoxy failures at Turkey Point are not a concern. Turkey Point has concrete piping, but uses epoxy for repair. The Plant response to Information Request #34 indicates epoxy has been used for repair of ICW piping since 1985. Subsequent inspections over the last ten years have proven the reliability and value of epoxy inside ICW piping.

FOP 84-146S1, "IEN 84-71 Graphitic Corrosion of Cast Iron In Salt Water". Letter (no number) dated 2/4/85 response to FOP states that the

"recommendations from General Engineering letter of 9/7/84 are being implemented". Plant response to Information Request #32 indicates that these recommendations have been implemented.

FOP 84-195S1, "IN 85-30 Microbiologically Induced Corrosion of Containment Service Water System". Letter PNS-CI-85-20/1 dated 2/26/85, does not specifically address the ICW system. Plant response to Information Request #15 indicated that microbiologically induced corrosion (MIC) is not a problem with the ICW piping.

FOP 85-191S2, "IN 85-96 Startup Suction Strainers Left Installed In Pumps". Letter JPE-PTPO-87-141 dated 2/10/87 requested the Plant to "field verify that temporary strainers have been removed and permanent strainers are existing". Plant response to Information Request #25 indicated that the temporary strainers were removed and that permanent strainers have been installed, where applicable, on the ICW system.

Other more recent Operating Experience reviews were appropriate.

4.2 Operations

4.2.1 System Walkdown

Objective

Perform an in-depth walkdown. Review the SWS configuration for consistency with design drawing.

Results

A careful walkdown of the ICW system was completed. Tags, valves, instruments and components in the system were compared to the Plant Operating Drawings (PODs).

The On-line Continuous Tube Cleaning System (CTCS), which is provided for each CCW heat exchanger to assist long term heat removal capability, was valved out and not in service. Discussions with operators and other plant personnel indicate that the system is not used and considered abandoned in place. Design Basis Document (DBD) 5610-019-DB-002, Rev. 3, page 10, states that due to the ineffectiveness of the on-line continuous tube cleaning system, "The system was eventually abandoned in place." Plant drawings do not currently reflect an abandoned status. This was included in UAQ #21. The CTCS is in the process of being abandoned in accordance with procedure 0-ADM-220, "Abandoned Equipment Program", and the issue was considered closed.

The root valve 3-50-446 to pressure gage PI-3-1520 was found in the closed position. This condition was brought to the attention of the Senior Nuclear Plant Operator (SNPO), and subsequently the ANPS. The valve was promptly realigned. The detection of the misaligned valve in an operating system prompted a detailed review of all valve and device mispositioning events which had occurred in recent history. This valve misalignment and other problems identified with valve positioning was identified to the plant on UAQ #13. A detailed discussion of the resolution is described in section 4.2.6.

Valve 3-50-413 was found with no hand wheel. Plant Work Order #95005082 was issued to accomplish the repair.

All temperature probes in the intake system were found tagged with two permanent tags each. One labelled each as a temperature element, and the second labelled each as a temperature indicator. No temperature indicators were installed at those locations. These tagging errors were identified on UAQ #4. In response, actions were taken to correct the tags, and the UAQ was then closed.

4.2.2 Operation Within the Design Envelope

Objective

Review the SWS alarm response procedures and operating procedures for normal, abnormal, and emergency system operations to assure the system is operated within the design envelope.

Results

Operating procedures were reviewed to ensure the design parameters have been correctly incorporated.

As discussed in Section 4.1.13, procedures did not fully describe actions to be taken to prevent run-out flow conditions when the plant was operating with only one ICW pump. The annunciator procedures were revised to address run out concerns.

The grass/algae plant shutdown of March 9th was reviewed. The review revealed that operating procedures were correctly followed and that plant power was reduced in a conservative manner. Despite the actions of the operators, ICW flow decreased to less than the design flow for a short period of time. UAQ #7 was issued to address the response of the plant to the event. The plant initiated Condition Reports and formed a response team to address the inadequate ICW flow event, which was reported to the NRC in LER 95-003. A new off-normal operating procedure 3/4-ONOP-011, "Screen Wash System/Intake Malfunction", was issued in May, 1995 which directs that, if necessary, an ICW pump will be operated in the same well as an idle Circulating Water pump to eliminate the mechanism for debris carryover into the ICW system. The SWOPI Team considers operation of an ICW pump in a stagnant well to be a sufficient response which would preclude recurrence of the ICW low flow condition. UAQ #7 is therefore considered closed.

Real time use of the new intake off-normal operating procedure was conducted when the plant ran a series of simulator exercises in licensed operator requalification training soon after the new procedure was issued. Specific feedback from the operators was gathered and a second revision was issued.

Normal operating procedures were found to contain appropriate detail to assure that system alignment is maintained in accordance with design documents. Alarm response, off-normal and emergency operating procedures, except as discussed above, also contained sufficient detail to assure that the system is operated within the design envelope.

4.2.3 Implementation of Operating Procedures

Objective

Review the implementation of operating and alarm response procedures. Assess adequacy of flow instrumentation relied upon during accident conditions.

Results

Operating and alarm response procedures accomplish their objectives. Procedures provide for normal valve alignments and pump operation. ICW flow must be verified by field operators each shift as there are no control room indications or alarms for ICW flow. Basket strainer ΔP is field verified to be within the acceptable range every four hours. There is no control room indication for basket strainer ΔP.

Several operators were observed reading the ICW header flow indicators located downstream of the CCW heat exchangers. The indication on these gages sometimes fluctuate as much as +/- 1000 gpm. The operators were questioned as to how they obtained a value from the fluctuating gages. The responses varied among the operators. This inconsistency band was reviewed together with the design group to ensure these readings did not add additional uncertainty when confirming operability (see section 4.1.11). In response to the operator technique, the plant issued a training bulletin which solidified plant policy to read both ends of the fluctuating gage reading, record both values, and compare both ends of a spectrum value range to ensure the value remained within limits. This practice was later verified in use both in the field and in log readings taken later in the inspection.

The adequacy of control room instrumentation available to automatically alert operators of ICW flow loss to the CCW heat exchangers was questioned. Control room operating crews only have access to limited ICW system performance monitoring equipment. There are no low flow alarms to indicate a low flow condition on the ICW to the CCW heat exchangers. There are no ΔP alarms to alert operators to clogging ICW strainers in the CCW system and warn them of potential loss of flow. Simulator scenarios confirmed a heavy dependency on outside operator detection and monitoring. The grass/algae event demonstrated just how quickly flow to these heat exchangers could be lost. The valve closure event previously mentioned demonstrated how difficult low flow conditions are to detect from just observance of high ICW pressure conditions. Although low flow events affecting both ICW and TPCW would be almost immediately detected through secondary plant equipment temperature indications and alarms, valve misalignments which would isolate ICW flow to the CCW heat exchangers could go undetected for up to 8 hours due to monitoring frequency. The lack of

instrumentation, combined with infrequent monitoring of local indication, was addressed on UAQ # 14. In response, changes were made to the intake off-normal operating procedure to require increased monitoring of the ICW flows and basket strainer ΔP gages during events where ICW flow could be degraded and UAQ #14 was then considered closed.

During simulator scenario performance demonstrations with one ICW pump operating, the team observed that although the operators were fully aware of the 19,000 gpm run out flow concern, the procedures did not specifically instruct the operators on the proper response.

Operator simulator training sessions were subsequently scheduled in licensed operator requalification which practiced the new one pump run-out flow mitigation strategies with the new improved simulator models. Observations of crew performance were conducted in parallel during operator crew practice sessions. Several concerns were noted related to the lack of clear operating guidance and concerns over limits on throttling flow to the CCW heat exchangers to provide additional flow to secondary equipment during one pump available conditions. These concerns were raised as UAQ #25. Subsequent procedure revisions provided the necessary clarity, and UAQ #25 was then considered closed.

A review of NRC Generic letter 89-13 commitment for Operations revealed that a review was conducted in late 1991 of 96 related procedures. Documentation indicated this review was conducted and these procedures were found to be appropriate.

4.2.4 Review of Operating Logs

Objective

Review available operating logs to determine adequacy of temperature and flow monitoring.

Results

A review was conducted of routine operator rounds and operating log sheets. Operator log data is gathered with the assistance of a hand held computerized data logger. The information is captured into the data logger and transferred to a main frame database periodically. The readings obtained by the operators are reviewed and approved by shift supervision several times a day. Each parameter logged into the data logger is compared with Min/Max acceptable ranges. The data logger will alarm to alert the operator to a reading which is outside the normal range. The local methods and control of operator readings are acceptable.

4.2.5. Operator Training

Objective

Review operator training for the SWS, focusing on the technical completeness and accuracy of the training manual and lesson plans. Ensure that the lesson plans reflect the system modifications and that the licensed operators have been trained on these modifications.

Results

Forty two training modules were identified as having a relationship to ICW or CCW systems. These modules were matrixed against the respective operator classification training programs to identify in which program each was used. Each was cross referenced with the operating procedures to verify training adequacy for each task. The quality of all the training materials reviewed was adequate. No significant differences between current plant configuration and training materials were identified.

The training material was reviewed with regards to plant modifications. The review concluded that the training material was adequate and no discrepancies between the modifications as implemented and the training materials were found. Lesson plans for the ICW and CCW system were reviewed and found to be complete and accurate with only minor discrepancies.

The PSA was reviewed for initiating and contributing factors related to ICW. This list of failures and events was compared to both simulator capability and the training scenarios already developed. The review of the procedures and simulator casualty training exercises identified some scenarios important to ICW which were not included in the simulator scenario library.

No simulator practice exercises were found which provided operator practice at managing plant operation with the sustained loss of all but one ICW pump. There were no scenarios available to practice mitigation strategies for extended operation in one pump runout flow conditions as set up on the SWOPI simulator demonstration scenarios. This issue was identified on UAQ #19.

In review of the grass/algae intake event and related training, it was discovered that the plant did not have established simulator training scenarios to train on handling travelling screen clogging. This issue was included on UAQ #19. In response to UAQ #19 and SOER 94-01, a new simulator practice exercise was created {14C-L-P} which closely models the plant grass intake event in March. It incorporates critical operating concerns and lessons learned. Also in response to UAQ #19, simulator training scenario {14DA-L-P} has been modified to

practice extended management of one ICW pump run out flow conditions. In addition, a new simulator evaluation scenario has been added. Training for all licensed operator crews on these two scenarios was being conducted during the SWOPI Team second evaluation visit. The effectiveness of these scenarios and crew performance was observed during these sessions. UAQ #19 was then considered closed.

During the procedure walkdowns in the plant simulator conducted in preparation for performance demonstrations, with one ICW pump operating, it was observed that one ICW pump operation with CV-2201 and CV-2202 full open resulted in a simulated flow of approximately 18,500 gpm. A review of the ICW pump curve determined that one pump operation should result in flows greater than 20,000 gpm. A review of Temporary Procedure 391 performed October 16, 1987, shows 20,000 gpm for one ICW pump operation. A list of six simulator deficiencies related to ICW training was submitted to the plant as UAQ #18. In response, the plant conducted its own thorough review of CCW and ICW simulator models, and generated a list of potential improvements. The training group issued multiple Simulator Work Requests to improve the ICW and CCW system models. Almost all of these improvements had already been tested and incorporated during the SWOPI Self Assessment and the effectiveness of the changes were verified satisfactory. UAQ #18 was then considered closed.

A review of NRC Generic letter 89-13 commitments revealed that a Training System Action Request ordered review of all related training materials. A needs analysis was conducted in September of 1991 of those materials. Sixteen related training materials were reviewed and these materials were found to be adequate.

4.2.6 Periodic and Post-Maintenance Valve Alignments

Objective

Review the proper implementation of procedures for verifying periodic and post-maintenance alignments of valves in the SWS, especially those valves that isolate flow to safety-related components.

Results

Valve alignment of the ICW system is performed in several conditions;

- Following every plant outage, the alignment of all valves in the system is checked by operators using a normal operating valve line-up checklist procedure.

- Monthly system flowpath checks for valve alignment of selected valves are

conducted by the responsible system engineer in accordance with 3/4-OSP-019.2. Select locked valves in the system are verified on a monthly basis by operators in accordance with 0-OSP-205.

- System alignments to support performance and surveillance testing activities are strictly controlled by periodic test procedures. Alignments are conducted by qualified operators in accordance with these procedures. Both the test line-ups and system restoration are covered in each test and surveillance procedure.

- System alignments to support maintenance activities are controlled by Equipment Clearance Orders in accordance with plant operating procedures. All safety related system valve line-ups require two independent operators to perform a valve line-up check following maintenance activities.

Field performance was observed in valve line-ups associated with system tests. The line-ups were covered appropriately by procedures. In observing post-maintenance valve line-ups, the equipment clearance was executed with a clearance order present in the hands of the operator, and the returned line up was independently verified by another operator. Actions taken by the operators were professional and showed good attention to detail. Good communications between field operators and control room staff enhanced effective operation. Functional repeat backs were evident in each communication.

Valve position verification is addressed by 0-ADM-031 "Independent Verification." The procedure offers acceptable methods of position verification (though not requiring any specifically) and urges the operator to use more than one method to verify position if available.

Although procedures clearly control which valves are to be checked, aligned and verified, the process for verification of each valve in the field varies among operators observed. Interviews with operators confirms that position testing is not a requirement. Operators stated they would not unlock a valve to check position. No positive manipulation of valves for position verification is required, and this is not routinely performed. Unless a change of position is required, only passive observation of the valve indicators or system performance is done. The Response to Information Request #85 confirmed that operators rely solely on the mechanical position indicator to ascertain valve position confirmation on many valves, including all butterfly valves.

In response to a mispositioned valve found by a SWOPI Team member, and deficiencies noted in the conduct of valve line ups, an extensive review of Plant Condition Reports for the last two years was conducted. The review yielded 16

reported mispositionings. Several of mispositioning events were in whole or in part due to difficulty determining valve positions due to mechanical failure. In some of the misalignments, hard-to-operate valves were listed as causal factors. In some cases however, no root cause other than operator error was listed. This is further discussed in Section 4.5.2.

A review of hard-to-operate valves was conducted by the SWOPI Team. Several valves located within the ICW and CCW system are considered by the operators to be hard to operate. A review of all ICW and CCW Plant Work Orders over the last two years identified 21 valves in the CCW system, and 14 in the ICW system reported as hard to operate. According to Condition Reports, "valve hard to operate" has been identified as part of the cause for four valve misalignments. No specific trend on any reoccurring or troublesome valves was discovered by trending of the data. Maintenance was readily conducted when requested. Contributing to the problems with valve verification is a significant number of reach-rod valve related misalignments due to various stem position indicators and valve bindings. The SWOPI Team concluded that repetitive hard-to-operate valves are not a repeating root cause.

The current practices of valve position verification with heavy reliance on position indicators and non-manipulation (no hands on) verification, may not prevent future valve mispositionings in the future. In response to UAQ #13, changes to procedure O-ADM-031, "Independent Verification", were initiated to require "Hands-on" valve position verification while conducting independent verification. In addition, changes to procedure O-ADM-200, "Conduct of Operation", were initiated to require "Hands-on" valve position verification as the primary means for position testing. Both of these procedure changes will require both a valve manipulator, and a second operator to actually operate the valve handwheel in the closed position to verify the position of the valve unless it cannot be physically performed.

Along with the new procedures, extensive on-shift training packages were developed which require each operator to get tested on the new procedures for valve position verification. The corrective actions taken sufficiently address valve position verification, and UAQ #13 is considered closed.

4.2.7 Accident Condition Flow Affected by Normal Alignments

Objective

Verify that required accident condition flow is not degraded during normal system operation valve alignments.

Results

Normal system valve alignments and operations were reviewed for their potential to degrade accident flow conditions. The only potential diversion path is to the TPCW system through valve POV-3/4-4882 and POV-3/4-4883.

These valves isolate during an accident and insure that sufficient ICW flow is available for the CCW system. The valves are provided with a manual jacking device to allow the operator to close the valve if required. All four of the valves have hand wheels provided on hangers near the valves so that the field operator can close the valve. The valves all have tags on them indicating that the lock nuts on the manual jack shaft must be loosened and backed off 6 inches before closing the valve. There are hooks provided near the hand wheels, apparently to hang tools to loosen the lock nuts, but there are no tools provided to allow the operator to back the lock nuts off. Actions to provide wrenches have been initiated.

Three of the valves have what appear to be abandoned solenoid valves mounted on the valve operator. This condition was included in UAQ #21 is being resolved via procedure 0-ADM-220, "Abandoned Equipment Program". This issue is considered closed.

4.2.8 Throttle Valve Positions

Objective

Review the method used to verify proper SWS throttle valve position.

Results

The CCW system is a flow balanced system for accident conditions. Many valves in the system are maintained in a throttled position. As part of start up activities following refueling, a complete CCW system flow balance is conducted using a plant approved Technical Department temporary procedure, and documented via 3/4-OSP-030.9 operations procedure. Once this balancing is completed and recorded, all the throttled valves are maintained in these set positions. All planned deviations in the CCW flow balance (such as equipment

maintenance) is evaluated by the Technical Department in advance, and another temporary procedure is written and approved to rebalance the flows to those required for post-accident loads.

Most large throttled valves have position indicators with graduated scales. Smaller valves are positioned by counting handwheel turns, counting valve stem exposed threads, or measuring actual flow.

To ensure throttled valves are properly positioned and not affected by independent verification techniques, two operators are dispatched to simultaneously witness each throttled valve positioning.

To ensure these valves are not repositioned after the plant conducts the balancing procedure, it is plant policy to clearly identify these valves with yellow painted handwheels and permanent plastic tags. Contrary to the above, a variety of markings were observed during equipment walkdowns. This discrepancy was addressed on UAQ #24. All valves observed during the walkdowns appeared to be at their required throttled positions. In response to UAQ #24, the plant promptly conducted a complete check of all throttled valve tagging and painting in the CCW system. They identified tagging or handwheel painting discrepancies on 22 of the 52 valves requiring throttling. Plant Work Orders were issued, worked and closed which correctly tagged or painted all throttled valves in the system. All other discrepant markings were removed. UAQ #24 was then considered closed.

In contrast, the ICW system is operated almost exclusively in the wide open flow condition. Primary ICW flow through CCW heat exchangers is aligned with all valves wide open, and the flow control valve bypassed and wide open. There are no valves maintained throttled on the primary side of the ICW system. The TPCW side of the ICW system is generally operated with control valve CV-3/4-2201 partially throttled, with the exception of the Summer months when the valves are operated wide open. Throttling of the secondary side ICW flow is periodically performed informally by field operators working with Control Room operators monitoring secondary equipment temperatures.

4.2.9 Seasonal Throttle Valve Adjustments

Objective

Review control of SWS heat exchanger flow variations due to changing climate (temperature) conditions.

Results

The design and set up of the flow balance of the CCW system does not rely on throttle valve adjustments to vary flow rates seasonally.

The ICW system flows are set at the wide open valve position on primary CCW system heat exchangers. The only seasonal changes in ICW flows occurs when flow to the secondary TPCW heat exchangers is adjusted.

ICW/CCW heat exchanger operability is dependent on ICW flow, temperature and heat exchanger fouling. ICW temperature varies seasonally and daily. The STA maintains a trend of ICW temperatures, and ICW/CCW heat exchanger operability is monitored per procedure 3/4-OP-019.

In its current configuration no valves in the safety side of the ICW system are throttled in response to changing plant intake and environmental conditions. Some changes are experienced in the heat of the summer, and with higher Intake Cooling Water temperatures some adjustments are made in the TPCW/ICW flows. Small adjustments are only made to the non-safety side TPCW ICW flows locally with a manual valve adjustment. No concerns were identified during this review.

4.2.10 Procedure Walkdowns

Objective

Walk through the system operating procedures and the system P&IDs. Verify that the procedures can be performed and that components and equipment are accessible for normal and emergency operation. If any special equipment is required to perform these procedures, determine if the equipment is available and in good working order. Verify that the operator's knowledge of equipment location and operation is accurate.

Results

Procedure walkdowns were conducted and generally found satisfactory. Plant Operating Drawings were reviewed and were found to be accurate, with one

exception. The exception concerned the indeterminate status of the Continuous Tube Cleaning System, which is further discussed in section 4.2.1.

No special equipment requirements were identified.

In order to observe the performance of certain procedures, three demonstration scenarios were developed and performed, with a full crew of licensed operators. The crew had no knowledge of the scenarios, and had only normal plant references available. The three scenarios were:

1. An ICW pump trip, pipe break scenario
2. Severe and progressing grass/algae intake scenario
3. ICW pump trip, one ICW pump runout, LOOP pump swap/start scenario

The crew performed professionally in all three scenarios. The crew was debriefed after all three scenarios and interviewed as to actions, adequacy of instrumentation, and adequacy of procedures.

Simulator and crew response was observed. The first sign of degraded ICW performance is turbine/generator heat up indication. This is due to limited instrumentation and indication for the ICW system and the heavier heat load which is carried by TPCW. Most of the recovery actions to correct an ICW problem are manual and in the field.

During the simulator one ICW pump runout scenario, the ICW discharge header pressure decreased to 7 psid with one pump running. A review of the ICW pump curve shows that at approximately 18,500 gpm, the pump discharge header differential pressure would be about 11.5 psid. This discrepancy with the simulator was identified on UAQ #18 which is discussed in Section 4.2.5.

4.2.11 <u>Operator Knowledge</u>

<u>Objective</u>

Interview the operators to determine the adequacy of their technical knowledge of such items as the operation of the system, its role in accident mitigation, technical specification surveillance requirements and determination of operability.

<u>Results</u>

Operators at all levels of expertise (NPS, ANPS, RO, NPO, and SNPO) were interviewed to determine adequacy of technical knowledge of the ICW and CCW systems. Field operators were observed and questioned while they performed their inspections and line-up tasks. A full control room operating crew was observed

on the simulator during three scenarios which challenged their knowledge of the ICW system and skills at system operation. Aside from the training issue discussed in 4.2.5, and the one pump runout scenario, where some of the operators stated they had not received training on the extended management of one pump flow conditions, the operators knowledge level was good.

4.2.12 Local Operation of Equipment

Objective

Review the local operation of equipment. Determine if the indication available to operate the equipment is in accordance with applicable operating procedures and instructions. Verify that the environmental conditions, such as expected room temperature, emergency lighting, and steam, assumed under accident conditions are adequate for remote operation of equipment.

Results

Extensive procedure walkdowns on the simulator and in the plant did not identify any adverse conditions that would prevent taking proper procedural actions. The off-normal operating procedure for ICW, 3/4-ONOP-019, was walked down to check available indications and environmental conditions for each watch station where local operation occurs. Local operation to backwash strainers is covered by 3/4-OP-019. Adequate indications for flow and pressure are available for these local tasks. Since all ICW equipment is located outside the Auxiliary Building away from potential high radiation fields, accident conditions would not prevent operation of system components. Adequate back-up DC lighting equipment is available for Loss of Power events to illuminate operating areas. Every area reviewed had acceptable access, environmental conditions, and equipment. Local indications and controls were adequate to support operating in accordance with procedures.

4.2.13 Operational Controls for Traveling Screens/Circulating Water Pumps

Objective

Assess operational controls for traveling screens and circulating water pumps to preclude excessive drawdown of the intake bay, with associated loss of SWS pump suction head, as a result of clogging the traveling screens.

Results

Adequate procedural guidance was found for system protection from level drawdown (developing high waterfalls) at the intake in procedure 3/4-ONOP-019.

A complete review by the SWOPI design engineers revealed that although the circulating water pump suction bell is located below the ICW pump suction bells, the NPSH requirements for the two pumps would lead to cavitation of the circulating water pumps first, thus protecting flow in the ICW loops. In addition, the off-normal operating procedures clearly define the requirements to shutdown circulating water pumps in an intake with developing differential levels due to clogging. These shutdown requirements were effectively demonstrated during both the plant grass intake event and during application of the procedure during observation of SWOPI grass intake performance simulator scenarios.

The grass/algae fouling of the ICW basket strainers led to discussions of the appropriate configuration of circulating water pumps and ICW pumps to optimize ICW basket strainer performance. As a result, procedure changes were developed to operate ICW pumps in wells with secured circulating water pumps should the traveling screen and screen wash systems become degraded.

The normal operating procedures reviewed did not clearly address or provide instructions for backwashing strainers during heavy grass uptake or address the precautionary notes needed to assess strainer operation with one of the other strainers isolated. These procedures did not recognize that when a basket strainer is isolated, the pressure drop across the other basket strainer increases due to the increased flow in that header. In response to UAQ #7, a new off-normal operating procedure, 3/4-ONOP-011, "Screen Wash System/Intake Malfunction", was issued in May, 1995 which provides additional guidance for evaluating and responding to basket strainer fouling, as well as directing that, if necessary, an ICW pump will be operated in the same well as an idle circulating water pump to eliminate the mechanism for debris carryover into the ICW system. UAQ #7 is considered closed.

4.3 Maintenance

4.3.1 System Walkdown

Objective

Perform an in-depth system walkdown to verify the as-configured system for materiel condition.

Results

In accordance with Appendix G of the Self Assessment Plan, the entire team performed walkdowns of all accessible area of the system. The following was noted:

The plant equipment for the ICW and CCW systems were inspected at the intake structure area, the CCW heat exchanger area, the fuel pool heat exchanger area, the TPCW heat exchanger area, the RHR heat exchanger and pump areas, and the pipe and valve room. All of the equipment in these areas pertaining to the ICW and CCW systems were given a detailed visual inspection. Close attention was given to the materiel condition of the equipment. All of the equipment was in generally good condition and appears to be receiving regular maintenance with the following exceptions:

The motor support stands on several of the ICW pumps were corroded at the base. This was addressed on UAQ #16 and is discussed in section 4.3.2.

ICW pump discharge check valves showed considerable corrosion on the studs. Plastic sleeves are installed over these studs for electrical isolation and these sleeves are cracked, allowing water to collect around the studs. The insulated joints of the check valves were assembled three different ways. These issues were addressed on UAQ #21 and considered resolved. One of the check valves that was removed showed wear indicating that the valve is oscillating in service and one of the closure springs was broken. This was addressed on UAQ #23 and is discussed in Section 4.3.5. UAQ # 23 is considered resolved.

There was evidence of corrosion on the surface of all the pump shafts just beyond the packing area. Subsequent investigation led to a larger issue of pump shaft corrosion and timeliness of corrective action. This issue was addressed on UAQ #1 and is discussed in Section 4.3.6. UAQ #1 is considered resolved.

The pointer on butterfly valve 3-50-308 was observed to be fluctuating, indicating that the valve was oscillating. The valve stem also moves radially about 1/32". The potential for flow induced oscillation causing excessive wear was addressed

on UAQ #10 and is discussed in Section 4.3.5.

There were traces of rust leaking from the crevice between the channel head flanges and the channel heads. This turned out to be rainwater trapped inside the flange caulking, was addressed on UAQ #21 and subsequently resolved.

Observation of the inlet end of the 3A CCW heat exchanger with the channel head cover removed for cleaning revealed that many of the tube ends are degraded. Most of the tube ends (approximately 75%) show signs of metal missing. The ends of the tubes are in most cases about 1/16th of an inch beyond the tube sheet, but in the degraded tubes much of the metal beyond the tube sheet is missing and in some cases there is no metal extending beyond the tube sheet at all. Also on many of the degraded tubes the tube metal is missing down below the tube sheet as much as 1/16th inch. In all cases the ends of the tube appear to be fractured rather than eroded or corroded. Discussions with the system engineer revealed that the tubes on the Unit 3 CCW heat exchanger were subject to stress corrosion cracking due to the use of chemical injection in the past which has been discontinued. The heat exchanger has been partially re-tubed (approximately 20%) and there have been a small number of leaks since then and they have always been on the old tubes. The condition of the Unit 3 CCW heat exchangers was addressed on UAQ #20. The response to the UAQ indicated that the condition of the tubes had been sufficiently evaluated for all bounding conditions. The UAQ was then considered closed.

4.3.2 Maintenance Work Observation

Objective

Observe maintenance in progress, including work package preparation and quality control involvement.

Results

Several maintenance jobs were observed during the course of the inspection. These include :

- The change out of an ICW pump.
- The disassembly of an ICW pump.
- The replacement of an ICW pump check valve.
- The cleaning of a CCW heat exchanger.

- The cleaning of a Screen Wash strainer.

The work orders associated with these jobs were also reviewed, and with the exception of a procedure content item discussed below, no weaknesses were observed.

Disassembly of the 4B ICW pump:

Although there was evidence of corrosion of major pump components such as the lower column sections and the motor support stand, the corrosion was not identified as a problem by either maintenance or quality control (QC) personnel. This was addressed on UAQ #16. Both conditions were subsequently evaluated and dispositioned by Condition Reports. The column sections were then sand blasted, the degradation was dispositioned as minor and the sections were coated with coal tar epoxy. After the sections were moved back to the intake structure, the team observed that the degradation was as much as 30% of the wall thickness in some places. This UAQ is discussed in the following Section.

4.3.3 Maintenance Procedure Review

Objective

Review maintenance procedures for technical adequacy. Determine if the procedures are sufficient to perform the maintenance task and provide for identification and evaluation of equipment deficiencies. Compare the procedures to the vendor manuals to identify any vendor recommendations not incorporated into procedures. Verify that important vendor manuals are complete and up to date.

Results

During the course of the inspection several maintenance procedures were reviewed. These included:

- 0-ADM-737, "Post Maintenance Testing"
- 0-PMM-019.1, "Intake Cooling Water Pump General Inspection"
- 0-PMM-019.2, "Intake Cooling Water Pump Removal and Replacement"
- 0-PMM-019.3, " Spare Intake Cooling Water Pump Overhaul"
- 0-PMM-019.8, "Intake Cooling Water Pump Discharge Check Valve Removal and Installation"

- 0-PMM-019.10, "Intake Cooling Water Butterfly Valve Operator Inspection"

The maintenance procedures provided good technical information and were adequate for the work being performed with the following exception. Procedure 0-PMM-019.3, "Spare Intake Cooling Water Pump Overhaul", states in the notes section to step 6.0 that unusual conditions that do not fall within this procedure, be identified in the remarks section of the procedure. Section 6.3.4 states that the pump parts are to be visually inspected and any irregularities are to be noted on the data sheet 3. In the case of lower column sections and motor support stands, following this procedure did not result in degraded conditions being identified as discussed above. This was addressed on UAQ #16. In response, procedures 0-PMM-019.1, "Intake Cooling Water Pump General Inspection", 0-PMM-019.2, "Intake Cooling Water Pump Removal and Replacement, "0-PMM-019.3, "Spare Intake Cooling Water Pump Overhaul, and "0-PMM-019.6, "Intake Cooling Water Pump Repacking", have been revised to include the required inspection criteria. UAQ #16 is considered closed.

Vendor technical manuals were reviewed for ICW pumps, CCW heat exchanger, CCW heat exchanger inlet basket strainers, and Henry Pratt valve operator MDT-3 and MDT-4. The information contained in the above tech manuals was properly incorporated into plant procedures.

Turkey Point's response to Action V of Generic Letter 89-13 was appropriate, except for the inspection criteria for degraded equipment, UAQ #16, previously discussed.

4.3.4 Piping Maintenance

Objective

Review the maintenance program for removal and repair of SWS piping and interface system components due to silting biofouling corrosion erosion and failure of protective coating (Generic Letter 89-13 Action III).

Results

The ICW Piping Inspection Program was reviewed with station personnel and a presentation was provided for the team on the piping inspection program. All of the underground piping from the intake to the CCW heat exchanger is cast iron pipe with cement lining. The majority of the piping from the CCW heat exchanger to the discharge canal is reinforced concrete. There is a relatively short section of cast iron piping at the discharge of each CCW heat exchanger that joins into a common header before it goes underground and mates with the

reinforced concrete piping.

While there is no program document that describes the process of how or when to select piping for inspection, there are procedures for performing the inspections and for the repair of defects. Reports exist for inspections at least back to the mid 1980s. A review of these reports show that the piping has appeared to be in good shape with very few damaged areas and no through wall defects in underground piping. Crawl through inspections have identified several corrosion cells which penetrate the cement liner and generally cause minor localized pitting of the cast iron. Additionally, corrosion is generally observed in the underground mechanical joint connections as no cement linings were installed at these locations during original pipe installation.

The inspections prior to the dual unit outage in 1991 were 100% inspections. Subsequent inspections have covered 50% of the piping and components including valves and basket strainers. The determination of the percentage of piping/components to be inspected is based on the nature of recommended corrective actions identified during the previous inspection. To date, none of the piping downstream of the CCW heat exchanger has been internally inspected. The piping has, however, been subjected to ultrasonic testing to verify adequate sound metal wall thickness except for the buried cast iron piping which consists of a few pipe fittings. The similar section of piping on the TPCW heat exchanger has been internally inspected and found to be in good shape. Due to the overall condition of the cast iron piping, it was concluded that an internal inspection of the inaccessible piping downstream of the CCW heat exchangers is not warranted.

4.3.5 Component Maintenance

Objective

Determine if the SWS components are being adequately maintained to ensure their operability under all accident conditions. Review information regarding unavailability due to planned maintenance as an indicator of maintenance adequacy.

Results

Review of equipment history revealed several possible recurring equipment problems. The ICW header valves, 3/4-50-308 and 310, as well as the cross-tie valves, 3/4-50-307 and 309 exhibit flow induced flutter. This requires that the valve operators be repaired to reduce the amount of movement. This was addressed on UAQ #10 and on UAQ #11. This condition caused 4-50-308 to fail almost totally shut in 1989. There were unique design and fabrication features of that particular valve which contributed to its failure. In January of 1995, a

corrective maintenance activity to address such a repair resulted in the closure of one of the valves and the loss of a header for 15 minutes without the knowledge of the operators. The closure of the valve was due to the stem locking device, used to secure the valve while the operator is removed, slipping and allowing the valve to go closed. The importance of this event was recognized by the Maintenance Department and changes to the procedure to improve the use of the stem locking device were implemented. A subsequent use of the stem locking device while the SWOPI Team was on site was unsuccessful due to the proper torque values not being included in the procedure. This was corrected and the stem locking device was then used to secure a valve for maintenance of the operator. While the work was being performed on the valve operator on one train, the opposite train was removed from service for strainer cleaning. Although this was permitted by Technical Specifications, it was recognized as not ideal. Procedure changes were subsequently implemented to provide more detailed guidance on the use of stem locking devices. UAQ #10 and UAQ #11 are both considered closed.

Maintenance records indicate that the check valves have been found degraded in the past and in many cases have needed to be replaced with new valves. The valve that was removed during the recent change out of the 4C ICW pump shows signs of degradation at the hinge pin areas. One closure spring was found broken and the other was heavily corroded. The ICW pump discharge check valves are identified in the plant PSA as potentially risk significant. UAQ #23 was issued to address this issue. The response to the UAQ provided Condition Report 94-297 containing Operability Assessment 021-94 which concludes that the valve does not require its springs to perform its safety related functions. PC/M 86-210 which installed the valves, does evaluate the function of the closure springs as necessary only to minimize pressure spiking, and are not required for valve closure. Efforts to improve the service life of the springs are underway as well as improvements to the inspection requirements. UAQ # 23 was considered closed based upon the above discussion.

The ICW pump column sections and the motor support stands are subjected to long term corrosion and erosion. The maintenance procedures provide for the inspection and identification of degradation but did not provide criteria or guidelines for what is acceptable. This has resulted in degraded parts returned to service having been sandblasted and coated but not evaluated or repaired. In the case of the motor support stand, acceptance criteria were not captured in any procedure for evaluation and in fact several of the motor stands have significant metal loss. As discussed in Section 4.3.2, plant procedures have since been updated to provide the necessary criteria.

4.3.6 Maintenance History, Trending and Post-Maintenance Testing

Objective

Review the maintenance history for the selected components of the SWS for the past two operating cycles (minimum of 2 years) or longer if necessary. Look for recurring equipment problems and determine if any trends exist. Evaluate the adequacy of the root cause analysis and corrective actions implemented in response to adverse trends. Review several completed maintenance activities for technical adequacy performance of appropriate post-maintenance testing and satisfactory demonstration of equipment operability.

Results

A review of the equipment history and other observations made during the course of the inspection indicated some examples of delays in dispositioning degraded components and incomplete corrective actions. The following is an example:

- An inspection of the 4B ICW pump in May of 1994 noted some level of shaft corrosion just above the packing gland. A CR was issued to evaluate the noted condition and to perform a more thorough inspection during disassembly. The pump was then removed from service. Although the original condition report required the inspection of a degraded pump shaft in July of 1994, this inspection did not take place until March of 1995, although a similar shaft was inspected.

  Although additional degradation of the pump shaft was observed on 3/1/95, the operability assessment of this condition was not approved until 3/9/95.

  A section of the degraded shaft was saved for further analysis. The shaft section was "bead blasted" to remove corrosion products in order to determine the full extent of material loss. Unfortunately, removing the corrosion products hindered the root cause analysis. Subsequent discussions between Maintenance and Engineering stressed the need to retain samples in the "as found" condition because undisturbed samples are often important in supporting a clear conclusion of failure mechanism.

  These issues were addressed on UAQ's #1 & #15 both of which are considered closed. As discussed in Section 4.5.4, changes to procedures 0-ADM-054, "PMAI Corrective Action Tracking Program", and 0-ADM-518 "Condition Reports", were implemented to address improvements to the corrective action process which address these issues.

A review of several completed work packages indicated that the post maintenance testing satisfactorily demonstrates the operability of the equipment prior to return to service.

4.3.7 Maintenance Personnel Knowledge

Objective

Conduct detailed interviews with the maintenance personnel to determine their technical knowledge of how components are maintained such as the setting of limit switches, the alignment of pump couplings, cleaning and replacing filters, and the maintenance of circuit breakers.

Results

Discussions and interviews with maintenance personnel revealed that they are generally very knowledgeable. There were no observations in this section. Some examples include:

> Discussions with plant electricians on the oil level for the ICW pump motors indicated that they were very familiar with the proper way to read and record the oil level on the motors. With no prompting, they readily detailed the proper steps and explained why the oil level appeared to be wrong.
>
> Discussion with the foreman that was present when valve 3-50-308 failed closed indicated that he was very clear on how important it was to reopen the valve. In fact, he stayed at the valve with the only mechanic that was at the job site and assisted operations personnel in getting the valve back open. The foreman also initiated the procedure changes that clarify the use of the stem locking device.
>
> The plant electricians were knowledgeable of the procedure for the meggering of the insulated joints on the ICW pump expansion joints. When asked how this was done, they were readily capable of describing the process and how they obtained the correct results.

4.3.8 Maintenance Training and Qualification

Objective

Determine if maintenance personnel receive adequate training pertaining to the SWS and if the degree of training provided is consistent with the amount of technical detail in the procedures. (Generic Letter 89-13, Action V).

Results

Several of the training modules were reviewed and interviews were held with training personnel. The training process appears to be very good with the following exception:

- Training module M-45 for manual butterfly valves only mentions the operator incidently and does not discuss the adjustment of operator internals that is in fact done in the field. There is also no mention of the use and importance of the valve stem lock which contributed to the loss of a ICW header during maintenance. This issue is handled in a procedure that is used for the maintenance of the manual operators. This procedure was modified to clarify the use of the stem locking device.

4.3.9 Periodic Inspection Program

Objective

Review the periodic inspection program used to detect corrosion, erosion protective coating failure, silting and biofouling. (Generic Letter 8913 Action III).

Results

The periodic inspection program of the ICW piping system is discussed in section 4.3.4.

4.4 Surveillance Testing

4.4.1 Adequacy of Surveillance and In-Service Test Procedures

Objective

Review and evaluate the technical adequacy and accuracy of the technical specification surveillance procedures and in-service test procedures performed in the past two operating cycles (minimum of 2 years) for the SWS. Coordinate the review with the mechanical systems design inspector to ensure design assumptions on system performance are satisfactorily demonstrated by the test methodology.

Results

A review of the operating and test procedures indicated that this system is an open ended flow system which has minimal surveillance requirements found in T.S. 3/4.7.3. Monthly valve position verification and automatic sequencer testing every refueling make up the system surveillance. The intake cooling water (ultimate heat sink) temperature is verified every day to be at or below 100°F. Testing is performed in accordance with procedures 3/4-OSP-019.1, "Intake Cooling Water Inservice Test", 3/4-OSP-019.3, "ICW Manual Valve Operability Test", 3/4-OSP-019.4, "Component Cooling Water Heat Exchanger Performance Monitoring", 3/4-OSP-030.1, "Component Cooling Water Pump Inservice Test", 3/4-OSP-030.4, "Component Cooling Water Heat Exchanger Performance Test" and 3/4-OSP-206.2, "Quarterly Inservice Valve Testing". There were no concerns identified with the procedures which are used to determine the Technical Specification Operability.

The CCW heat exchangers are tested in accordance with 3/4-OSP-30.4, "Component Cooling Water Heat Exchanger Performance Test". Six (6) heat exchanger tests were observed to determine how temperatures were taken as input into the heat exchanger performance computer model. Data gathering was performed by Technical Department personnel and transmitted by radio to the system engineer for input to the computer program which solves the heat exchanger heat balance. One personnel safety issue, included in UAQ #17, was noted by the SWOPI Team which involved personnel standing on the CCW heat exchangers to collect data. After concern was expressed by the SWOPI Team, the test procedure was revised. The issue was then considered closed. The procedure revision, however, resulted in invalid temperatures the first time the 4C readings were taken. The system engineer noted the temperature difference in the ICW inlet temperatures during data input and asked for a retest by radio communications. The retest was performed while the personnel were still in position. This illustrates how the speed with which data is gathered and evaluated allows for timely correction or verification of input which may be suspect. This

prevents inaccurate performance determinations and is considered a strength of the program.

The computer program which determines overall heat exchanger performance was reviewed. Computer programs for Units 3 & 4, HX3 & HX4, were developed by FPL and Bechtel Power Corporation and copyrighted in 1988. The computer program solves a set of equations which calculates the heat balance across the CCW heat exchanger using conservation of energy. Seven equations and seven unknowns are obtained; five of the unknowns are measured in the field and the computer solves for the last two by iteration and convergence. The measured values are ICW T_{in}, ICW T_{out}, CCW T_{in}, CCW T_{out} and ICW flow. Since CCW flow is not readily obtainable, the program was developed to calculate this value and then solve for the internal fouling factor by iteration until the heat balance converges. The output from the computer program is the maximum allowable ICW temperature which will allow a heat removal capacity of $60 \times E^6$ BTU/Hr, which is the design capacity of the heat exchanger.

Data input to the program was determined to be accurate. The correct number of tubes plugged for each heat exchanger was verified with either the correct number or a more conservative number entered. ICW and CCW temperatures were input to 1/100 of a degree from field measurement using a hand held Omega Mini-temp with an repeatability accuracy of 0.3°F. The input temperature was the mathematical average of ten measures taken at one interval. The method of determining that the system remained stable during data gathering is accomplished by starting at the CCW inlet (the fluid most likely to change) and gathering data from the other points and returning to the CCW inlet for a fifth point. The first and fifth temperature averages are compared and verified to be within 0.1°F. If the difference is beyond this limit, a retest is performed when the system is stable. This method of data taking also reduces the instrument uncertainty by relying on instrument repeatability instead of absolute temperature measurement.

Following the first inspection period, the plant installed permanent RTDs to monitor the temperatures during the heat exchanger test. This action had two positive effects, 1) reduced the instrument error associated with the Omega Mini-temp, and 2) eliminated the personnel safety issue associated with climbing on equipment.

The delta T between inlet and outlet temperatures is very small during normal operation which challenges calculational uncertainty. The STA trends the performance test and plots the ICW_{max} temperature against a linear fouling factor line of 1.0°F/day for Unit 3 and 0.9°F/day for Unit 4. Deviation from this trend line alerts the plant staff to evaluate the anomaly. This process of trending and review was implemented to offset the lower temperature differentials encountered during plant operation.

The system engineer was asked to perform a hand calculation in accordance with 3/4-OSP-30.4; step 7.19. The data provided was from the startup test report for the new 4A heat exchanger. A comparison of the hand calculated results to that from the April 26, 1989 data indicated that there was excellent agreement (within 0.3°F) between the methods.

There were no concerns identified with the program or procedures which are used to determine the CCW heat exchangers heat removal capability.

4.4.2 Test Acceptance Criteria

Objective

Review the SWS design and licensing basis. Verify that test acceptance criteria are consistent with the design basis to ensure the SWS testing adequately demonstrates that the SWS will operate as designed. Review indicators of SWS system performance (such as overall system unavailability or recurring problems) to identify if any testing inadequacies exist or if testing frequency is appropriate. Determine if surveillance test procedures comprehensively address required SWS responses.

Results

Letter JPE-PTPM-85-1426, "CCW Heat Exchangers Evaluation Calculational Methodology" dated 12/20/85, was reviewed. No concerns were noted.

Calculation PTN-BFJI-95-003 Rev. 0, "Effect of Instrumentation Uncertainty on Allowable ICW Temperature Calculation" was generated to address the concern with the uncertainties associated with the instruments used to measure ICW and CCW temperatures and ICW flows used as input to computer programs HX3 and HX4. The computer program does not include an uncertainty factor and therefore the plant includes a 3°F ICW_{max} temperature uncertainty. A review of this calculation shows that the instrument uncertainty associated with the performance monitoring programs (surveillances) is 1.8°F. The calculation states that the instrument inaccuracy associated with the ICW canal temperature reading taken by the ANPO every four hours does not exceed 1.2°F. The calculation further states that these values must be added together (1.8 + 1.2 = 3.0°F). This total uncertainty accounts for the "Administrative Margin" currently built into the ICW Performance Monitoring Program of 3°F.

The plant procedure for controlling the number of tubes plugged in the CCW heat exchangers was reviewed. The procedure adequately ensures that the correct number of plugged tubes is reflected in the computer programs (HX3 and HX4) used to determine CCW heat exchanger performance.

The unavailability data for the basket strainers indicates that fouling is an increasing problem due to grasses (1992 - 12.7 hrs/mo; 1993 - 16.7 hrs/mo & 1994 - 20.1 hrs/mo). Additionally, the unavailability of the basket strainers is 1.7 hours per month for the PSA. Current out-of-service (OOS) times for the basket strainers is as high as 155 hours per month (Unit 4 - July 1994). This issue was addressed on UAQ #9 and is further discussed in Section 4.1.3. The PSA for Turkey Point was rerun with the higher out-of-service hours and the resultant core damage frequency varied by less than 0.01% which is insignificant. As previously mentioned, UAQ #9 is considered closed.

The screen wash system does not have a surveillance/performance test to determine effectiveness (ensuring clean nozzles, spray coverage). However, there are surveillances to verify the automatic start feature of the screen wash system, and is performed monthly. Operator rounds for the intake area has the operator monitor system performance, checks the ΔP cells for the intake wells and monitor the screen wash strainer. As discussed in previous Sections, the response to UAQ #7 and UAQ #9 included the Plant task team's conclusion that screen wash spray nozzle deflector plate performance was the single greatest identifiable contributor to the increase in basket strainer cleanings. In response to this report, all screen wash spray nozzle deflector plates have been replaced and procedures have been revised to periodically inspect these plates and replace as necessary. This corrective action seems to have improved the performance of the traveling screen/screen wash system.

4.4.3 Preoperational Testing

Objective

To determine that test acceptance criteria are consistent with the design and licensing bases and to ensure the SWS will operate as designed.

Results

The original pump performance tests conducted in the early 1970's indicated that the pumps did not meet their rated performance criteria. Corrective actions were taken and the pumps satisfied the design requirements. The pump impellers and bells have since been replaced with new base lines for pump performance developed. Current pump performance is not an issue. There were limited tests performed on the ICW system due to its simple design, use of manual valves and only two control valves.

A review of the start-up test for the CCW portions of the RHR and ECC systems was performed. There was verification of system flows automatic and alarm functions. Deviations to the test were documented for components which were

not operable at the time of the test for later verification. ECC fan test data was not available for review, however, preoperational tests for containment penetration coolers, normal containment coolers and other fans indicate that valid test methods were followed and valid test conclusions were reached.

Following the replacement of the Unit 4 CCW heat exchangers, start-up performance tests were performed to verify adequacy of the installation. These tests were reviewed and contained new baseline data for the Performance Monitoring Program. The computer program HX4 was used to verify heat removal capability using parameters from the fabricators. There were no concerns identified in the pre-operational testing area.

4.4.4 Support Systems and Plant Modifications Testing

Objective

To determine that surveillance and testing has been properly performed on support systems and plant modifications.

Results

The traveling screen and screen wash systems have been discussed in previous Sections.

Five PC/Ms were reviewed to verify that startup tests are performed where applicable. The Unit 4 CCW heat exchanger replacement modification included adequate performance tests which verified heat exchanger heat removal capability. The remaining PC/Ms included adequate post-modification and startup tests.

Post maintenance testing was observed for the replacement of the 4C ICW pump. This testing was performed in accordance with 4-OSP-019.1, Intake Cooling Water Inservice Test. There were no concerns identified with this test.

4.4.5 Inservice Test Program for Pumps and Valves

Objective

To determine the technical adequacy, completeness and trending of activities associated with the ICW and selected CCW pumps and valves.

Results

A review of the IST program for pumps and valves revealed that two ICW pumps were in the alert range. A review of the test data indicates that one pump could

be removed from the alert range. This was discussed with plant test personnel.

The 3C ICW pump was in alert for two conditions, low discharge head and motor vibration. This pump is being monitored by the IST group however, its current condition does not represent an operational concern.

There is a common set of data which appears to be incorrect (off by 1/2 psi). This put one pump into the alert range. A possible cause of the error was identified by the test group which involves the use of a quick disconnect coupler. When disconnected, a small amount of pressure can be maintained in the test line which would create an error when "zeroing" the pressure gauge. The quick disconnect has been modified to allow venting, eliminating this possible root cause.

CCW pump testing is performed in accordance with 3/4-OSP-030.1, Component Cooling Water Pump Inservice Test. The IST program determines valve operability in accordance with 3/4-OSP-206.2, "Quarterly Inservice Valve Testing".

ASME Section XI 1989, subsections of IWD, are applied to the CCW and the interfacing RHR system for support examinations, periodic pressure testing and snubber inspections. These examinations consist of random support inspections periodic pressure testing (twice during the ten year interval) at normal operating pressure and temperature, snubber inspection and testing in accordance with Plant Technical Specifications and ASME, and a hydrostatic test at the end of the ten year interval. The rules of the ASME Section XI (IWD-4000 & IWD-7000) are also applied to the CCW system for repair and/or replacement activities.

CCW trend data was available and no pumps were in alert.

ASME Section XI 1989, subsections of IWD, are applied to the ICW system for support examinations and periodic pressure testing. These examinations consist of random support inspections, periodic pressure testing (twice during the ten year interval) at normal operating pressure and temperature, and a hydrostatic test at the end of the ten year interval. The rules of the ASME Section XI (IWA-4000 & IWD-7000) are also applied to the ICW system for repair and/or replacement activities.

There were no concerns identified with the ISI/IST program.

4.4.6 Instruments Calibration/Testing

Objective

To determine how ICW and selected CCW instruments are calibrated and tested, how valve stroke time testing is performed, and how and where temporary test equipment is installed to verify compliance with Technical Specification operability requirements. Also determine if tolerance used for instrument accuracy is acceptable.

Results

Flow data is obtained by portable equipment maintained under the M&TE program.

Water level is obtained from a steel tape and metal weight.

Pressure and differential pressure data is obtained by portable equipment maintained under the M&TE program.

Vibration measurements are obtained by portable hand held equipment maintained under the M&TE program.

There were no concerns observed with the use and/or calibration of this test equipment.

M&TE equipment records were reviewed to verify that instrument tolerance spans were appropriate for the parameter being measured.

The expected indication for the field instruments range from 50% to 80% of their full scale reading, except for delta P gauges which have full range indications as seen from recent strainer fouling (0 to 3.0 psi ΔP). This is considered acceptable.

4.5 QUALITY ASSURANCE and CORRECTIVE ACTIONS

4.5.1 Review Committees

Objective

Review the meeting minutes of the plant onsite safety review committee and the offsite safety review committee for the past six months for items pertaining to the SWS.

Results

Review of the Plant Nuclear Safety Committee (PNSC) Meeting minutes for the period September 1, 1994 (#94-162) through April 27, 1995 (#95-067) revealed a number of items that addressed the service water (ICW and CCW) systems. In that period, there were only two operability determinations made by the committee that were applicable to the ICW system. The conclusions drawn for the identified Condition Reports (CRs) were reasonable.

Four 10 CFR 50.59 evaluations were reviewed and found to be acceptable. One Safety Evaluation, JPN-PTN-SENP-95-011, takes credit for two ICW pumps to meet ICW flow requirements during basket strainer cleaning. Calculation PTN-BFJM-95-003, which is referenced in the Evaluation, demonstrates the hydraulic capability of two pumps to meet the flow requirements with one header isolated, during MHA conditions. The provisions of Generic Letter 80-30 were applied to establish the acceptability of this approach. Procedural controls have been put in place to address the plant configuration allowed by the safety evaluation. This sufficiently answered the SWOPI Team's questions in this area.

A review of the Company Nuclear Review Board (CNRB) Meeting minutes for the period July 19, 1994 (#407) through January 17, 1995 (#413) revealed no unusual operability determinations. Nine LER's, three violations, three non-cited violations, and two Quality Assurance audit findings were reviewed for applicability. There were no items applicable to the service water (ICW or CCW) systems identified.

4.5.2 Operational History

Objective

Review the operational history of the SWS, including licensee event reports, nuclear plant reliability data system reports (NPRDS), 10 CFR 50.72 reports, enforcement actions, non-conformance reports, technical specifications operability determinations, maintenance work requests, and adverse test results or recurrent test failures. Emphasize the adequacy of root-cause evaluations.

Results

•**LER's-** A review of thirty-two Licensee Event Reports generated from 1980 through 1991 reveal a number of varying malfunctions and incidents in the systems. Of note, there were several incidents involving automatic pump restarts due to personnel errors, several incidents of low ICW flow conditions, multiple pump failures, and multiple pumps Out-of-Service due to personnel errors. Corrective actions taken to address the identified causes were verified to be in place as committed and evaluated for adequacy. Although there were several repeat events in the past, the lack of recent events is indicative of effectiveness of those actions.

•**NPRDS-** This system has identified several cases of repetitive maintenance opportunities, which were properly translated into the corrective action system through CRs or PC/Ms. (Items were: CR 93-155, repetitive failure of Bettis operators on POV-3/4-4882 and POV-3/4-4883; CR 94-752, repetitive failure of ICW pump motor bearing Fenwal temperature indicators; PC/Ms 94-005 and 94-008, which revised solenoid valve control circuits to eliminate repetitive failures). It appears that this system is functioning effectively.

•**10 CFR 50.72 Reports-** None were available for evaluation by the Team.

•**Enforcement Actions-** Reviewed five available "enforcement actions" dealing with the ICW and CCW systems. All were adequately addressed with the exception of the commitment to install and operate the Amertap Continuous Tube Cleaning (CTC) System in the CCW heat exchangers. Due to the system's ineffectiveness, it has not been utilized and is considered "abandoned in place". As previously discussed in Section 4.2.1, UAQ #21 addresses its abandoned status and is considered resolved.

•**NCR's-** Non-conformances are now a part of the CR system. The administrative procedure provides guidance on the determination of adverse conditions that should be declared non-conformances.

•**Technical Specification (TS) Operability Determinations-** TS operability determinations are made under the CR process. This is done either as an initial assessment by the Nuclear Plant Supervisor (NPS), or by Engineering or Technical Department as directed by the Plant General Manager based on the severity determination made by the NPS. No unusual operability determinations were identified.

•**Nuclear Plant Work Order (PWO)-** Review of PWO's revealed a few recurrent maintenance items, such as the failure of the Fenwal temperature indicators. Recurrent failures usually are identified in the CR system for further evaluation (see NPRDS).

•**Test Results/Failures-** None identified, except for pump "alert" conditions noted in Section 4.4.5.

Formal root cause evaluations are required for items that are: Designated by the Plant General Manager; Identified as a "Significant Condition Adverse to Quality"; Quality Assurance Audit Findings, or ASME Section XI/EQ equipment failures. However, each and every CR receives a review and analysis for causal factor determination and trending. These factors are then evaluated for significant trends on an at-least-quarterly basis. If a trend is identified, a formal root-cause analysis will be initiated through the CR process (e.g., CRs 95-0141, -0142 & -0143).

Individual causal factor investigations and analyses are conducted as assigned by the Plant General Manager, in order to determine appropriate corrective actions. The assignee retains overall responsibility for timely and appropriate resolution. Administrative controls are in place to provide for any additional evaluations concerning reportability or operability that may be required due to changing conditions.

In general, causal factor evaluations appear to be reasonable and consistent with good judgement. However, the Human Performance Enhancement System (HPES) may not have been fully utilized on valve mispositionings. In the sixteen (16) mispositionings reviewed, including eight (8) involving communications and personnel error, HPES evaluations were requested only three times. For five (5) of these events, all or part of the resolution was discipline of the personnel. In 1995, three (3) of the personnel error events were required to have a HPES evaluation performed. A HPES evaluation was performed on only one of these events. Investigations by the Plant concluded that insufficient information was available to conduct an evaluation on the other two events.

Valve mispositioning events were identified as an adverse trend in April of 1995 and a CR was generated. Operations management, in response to the CR, has

since completed a detailed investigation of valve mispositioning events and corrective actions have been taken.

4.5.3 Quality Verification

Objective

Determine if Turkey Point's quality verification activities identified the significant issues raised by the Self-Assessment Team.

Results

Previous Quality Assurance audits and Performance Monitoring reviews (PMON) have identified some issues similar to SWOPI identified issues. In 1988, the Quality Assurance Department conducted a comprehensive (Vertical Slice) audit of the ICW System, Audit Number QAO-PTN-88-925, from which 15 Findings were identified. These Findings included drawing and design control errors, inadequate off-normal operating procedures dealing with grass in the intake structure, problems with vendor manuals, inadequate root-cause evaluations for repetitive instrument failures, and configuration control problems. QA Performance Monitoring report, QAO-PTN-95-001, PMON #5, specifically evaluated ICW. This and other recent audits identified several items that the SWOPI Team also considered. These included the following:

a. Two CR corrective actions had been cancelled with no work completed.

b. Ineffective Event Analysis, limited use of HPES evaluation of events caused by human performance, infrequent self-evaluation by supervision/management involved in a given event, and event analysis by untrained personnel.

c. Potential for closure of CR's without completed corrective action.

d. Inadequate corrective action taken after a CR was closed with a PMAI to track a Request for Engineering Assistance (REA). The REA was subsequently cancelled.

e. ICW pump interlock for autostart of the C pump on SIAS or Loss of Offsite Power (LOOP) is not addressed in operating procedure, strainer backwash concerns including temperature limits and potential pressure gauge damage, valve position inconsistencies (field vs drawings), difficulties in positive valve position verification, and valve testing discrepancies.

None of these issues were formally identified as Quality Assurance Findings, but were included in the body of the reports as recommendations for improvements to the plant programs. Some of these recommendations did result in significant changes to the CR procedure. Other recommendations, however, were not implemented. QA management has clarified its expectations to ensure that all QA identified issues or recommendations are entered by the auditor into a documented tracking system (PMAI, PWO, etc.) for followup and closure.

All other previous QA issues that were formally identified as Findings were resolved with responses and corrective actions that were considered acceptable for the conditions.

Quality Assurance conducted an evaluation of the plant's response to SOER 94-1. This response and evaluation addressed the specifics of the Salem event, Reactor Trip-Safety Injection-Pressurizer Solid, and did not deal with the loss of ICW system flow due to plugging of the screens and basket strainers.

Quality Assurance conducts a quarterly surveillance of CRs, in accordance with Surveillance Checklist 'QCS-20. This includes an assessment of closeout documentation and tracking of followup actions, ensures that non-conformances are properly identified and dispositioned, and verifies that root-cause analysis and causal factor trending is being accomplished. This quarterly evaluation includes all Quality Department initiated CRs and a ten percent sample of all others. PMAI items were not normally included in the quarterly evaluation until recently. QCS-20 has now been revised to include evaluations of corrective actions through all tracking mechanisms.

4.5.4 Self-Assessment and Commitment Tracking

Objective

Review the timeliness and technical adequacy of Turkey Point's resolution of findings from its self-assessments. Review the open item tracking system items pertaining to the SWS for adequate tracking and closure of identified deficiencies.

Results

There are two open item tracking systems in place which may apply to the corrective action mechanism at the plant. With few exceptions, conditions adverse to quality are identified on a CR. Once a CR is initiated and reviewed by the Nuclear Plant Supervisor, a determination of severity level is made which governs the timeliness of approval and disposition. There is no evidence that this initial review is not being completed in a timely manner. Once approved by the Plant General Manager, the CR is entered into the Technical Department's CR

Tracking System. Following the investigation, analysis, and disposition of the identified condition, actual implementation of the necessary corrective actions may be completed (some are mandatory) or deferred and transferred to another mechanism, such as the Plant Manager Action Item (PMAI) system, for implementation tracking. The CR is annotated with the PMAI number(s) and can then be closed.

A weakness was observed in the PMAI Tracking System that can adversely affect the timely and adequate completion of corrective actions associated with CRs. PMAI due dates could be extended without Plant General Manager approval. This is not permitted within the CR System. Furthermore, the adequacy of completed corrective actions is not evaluated by a member of the Technical Department when tracked as a PMAI. This weakness was clearly demonstrated when CR 94-554 was closed and incomplete corrective actions (pump disassembly) were entered into the PMAI tracking system. Two extensions to corrective action due dates were granted (7/27/94 to 11/29/94 and then 11/29/94 to 4/1/95) without Plant General Manager approval. The second extension was approved by the section supervisor and department manager after the item was overdue. One PMAI was closed out without adequate correction action taken (pump packing). Additionally, procedures did not require CR related PMAI documents to be maintained as QA records, although in practice they were. These issues were identified on UAQ #15.

In response, changes to Administrative Procedure 0-ADM-054, "PMAI Corrective Action Tracking Program", were implemented in April of 1995 requiring originator and appropriate plant management approval of PMAI corrective action close-out and due date extensions of CR related PMAI corrective actions. These changes also require documents related to CR related PMAI corrective actions to be transmitted to QA Records for retention. Administrative Procedure 0-ADM-518, "Condition Reports", clarifies the requirements for operability assessments to be completed within three working days regardless of whether a new CR or a CR supplement is issued. This directly addresses delays in the operability assessment of the 4B ICW pump discussed in Section 4.3.6.

The corrective actions taken in response to this issue were considered acceptable by the SWOPI Self Assessment Team, and UAQ #15 is considered closed.

4.5.5 Interface Between Engineering and Operations

Objective

Evaluate the interface between engineering and technical support (E&TS) and plant operations regarding corrective actions to resolve operational problems.

Results

During the course of the Self Assessment, the interaction between the technical and operations groups was observed on a number of issues. Although a generally healthy relationship exists, some operational issues identified by the SWOPI Team may not be getting the attention deserved.

The ICW basket strainer fouling issue, previously discussed, may be an example of an opportunity for improved interface. Although a process exists for identifying and addressing "Operator Workarounds", this condition had not been identified as one requiring attention through this process.

After UAQ #5 was issued concerning ICW pump runout concerns, a Night Order and a Procedure Change were issued to provide instructions to operators to protect the pumps. More than one revision to these instructions were required before the concern was adequately addressed by procedures. This also may indicate a need for improved interface.

Appendix A
Unresolved Assessment Question Cross Reference

UAQ#	Description	Status	Section	Finding
1	ICW Pump Shaft Degradation	Resolved	4.3.1	
2	POV Stress Problem	Resolved	4.1.17	
3	ICW Piping Inspection	Resolved	4.1.7a	
4	Temperature Probe Tags	Resolved	4.2.1	
5	ICW Pump Runout	Resolved	4.1.13	Finding #2
6	Inspection Acceptance Criteria	Resolved	4.1.9	
7	Grass/Algae Intake	Resolved	4.1.9	Finding #1
8	Spoolpiece/Valve Configuration	Resolved	4.1.5	
9	ICW Basket Strainer Impacts	Resolved	4.1.3	
10	ICW Header Valve Failure Mechanism	Resolved	4.3.5	
11	ICW Header Single Failure Vulnerability	Resolved	4.3.5	
12	Flow Instrument Uncertainty	Resolved	4.1.19	
13	Valve Position Verification	Resolved	4.2.6	Finding #3
14	ICW Flow Monitoring	Resolved	4.2.3	
15	Corrective Action Weaknesses	Resolved	4.5.4	Finding #4
16	ICW Pump Column & Motor Stand Corrosion	Resolved	4.3.2	
17	Personnel Safety	Resolved	4.4.1	
18	Training Simulator Issues	Resolved	4.2.5	
19	Intake-Related Simulator Scenarios	Resolved	4.2.5	
20	3A CCW Heat Exchanger Tube Degradation	Resolved	4.3.1	
21	Miscellaneous Configuration	Resolved	4.1.5	
22	Unavailability Logging	Resolved	4.1.21	
23	ICW Pump Discharge Check Valve Reliability	Resolved	4.3.5	
24	Throttled Valve Identification	Resolved	4.2.8	Finding#5
25	Simulator Pump Run-out Weaknesses	Resolved	4.2.3	
26	RCP Thermal Barrier Isolation	Resolved	4.1.7	
27	ECC Heat Removal Calculations	Resolved	4.1.3	
28	HELB Protection of NCC Piping	Resolved	4.1.1	
29	Maximum Allowable CCW Heat Exchanger Flow	Resolved	4.1.6	
30	CCW Single Failure Vulnerability	Resolved	4.1.1	

Appendix B
UAQ Summary

UAQ Number: 1
Date Issued: 3/8/95
Question Concerns Operability? Yes
Question Summary:

The ICW pump lower headshaft previously installed in the 4B pump was inspected on 3/1/95 and noted to have considerable degradation just below the packing gland. Although some analysis has taken place, as of 3/8/95, a Condition Report has not been issued, and an initial assessment of operability has not been completed, even though this condition could be applicable to the six pumps currently in operation. What is the current basis of operability of these pumps?

Inspector Close-out Summary:

The initial assessment of operability was reviewed by the Assessment team on 3/9/95 and found acceptable for operating pumps. Information Request (IR) # 82 was issued on 3/17/95 identifying specific questions related to the Operability Assessment and Disposition of Condition Report 94-554 and its supplements. A meeting was held to discuss the response to the IR and although the Assessment Team identified some improvement opportunities in the Condition Report responses, the final conclusions were found acceptable.

UAQ Number: 2
Date Issued: 3/9/95
Question Concerns Operability? Yes
Inspector: Bryan
Question Summary:

Intake Cooling Water stress problem M08-513-03 does not appear to have been revised to account for the installation of POV-4-4882 & 4883 on Unit 4 which took place in 1988 via PCM 88-346. The POV's isolate the TPCW heat exchangers and their failure would represent a serious operability concern. What is the current status of this Stress Problem.

Inspector Close-out Summary:

The response to the UAQ indicated that the valves had been replaced via PC/M 86-024 while the valves were still manual valves. The stress problem M08-413-03, indicates that the piping was properly analyzed, but that the drawings were not updated after PC/M 88-346 installed the valve control circuits and changed the valve identification numbers

to POV-4-4882 and -4883. A CRN (C-10091) to the drawing update MEP was issued to resolve the isometric discrepancy. This UAQ is considered closed.

UAQ Number: 3
Date Issued: 3/10/95; Reopened 5/19/95
Question Concerns Operability? Yes
Inspector: Bryan
Question Summary:

PTN's Intake Cooling Water (ICW) Piping Inspection/Repair Program does not address the underground common discharge pipe downstream of the CCW heat exchangers. An underground pipe failure occurred in the 1984 timeframe in the area beneath where the Standby Steam Generator Feed Pumps are currently placed. Interviews indicate that the failed piping was excavated and repaired with a collar, although documentation of this work hasn't been located. A pipe failure in the common discharge piping which restricts flow through the CCW heat exchangers would compromise the heat removal capability of the ICW system.

Inspector Close-out Summary:

UAQ #3 was initially issued because it was thought that this underground piping was all cement-lined cast iron, which could corrode without detection through inspection. Corrosion could conceivably lead to a collapse of the discharge piping and block flow through the CCW heat exchangers. The initial response to the UAQ indicated that this common piping was not cement-lined cast iron, but reinforced concrete. The UAQ was then closed. Subsequently, the 6-7 foot section immediately downstream of the CCW heat exchangers was discovered to be cement-lined cast iron. UAQ #3 was reopened on 5/19/95 to address the original concern of undetected corrosion.

The subsequent response to UAQ #3 indicated that experience with inspection results of other buried cement-lined cast iron piping have been utilized to characterize the condition of this portion of the piping. Inspections to date have not revealed any significant wall thickness reduction associated with cast iron piping. External corrosion has not been observed. Based on known corrosion rates and the piping inspections to date, future corrosion of this underground piping resulting in flow degradation is not considered a concern. UAQ #3 is considered closed.

UAQ Number: 4
Date Issued: 3/17/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

When conducting a system configuration inspection, it was noticed that all temperature probes in the intake system were tagged with two permanent tags each. One labelled each as a temperature element, and the second labelled each as a temperature indicator. No temperature indicators are placed at those locations. What is the correct configuration?

Inspector Close-out Summary:

PCM 93-084 changed the Temperature Indicators to Temperature Elements as part of P&ID reconstitution effort. The TI's did not exist. This effort did not result in removal of the tags in the field. Operations management has now initiated a Plant Manager's Action Item PM-95-03-144 to follow up on removal of the tags in error, and the corrective action has been completed. This UAQ is closed.

UAQ Number: 5
Date Issued: 3/17/95
Question Concerns Operability? No
Inspector: Khurana
Question Summary:

Two ICW Pumps operate in normal configuration to supply water to CCW Heat Exchangers and TPCW Heat Exchangers. If one of the operating pumps trips, the other pump may run out. Has this configuration been analyzed? Please provide the calculation or analysis.

Inspector Close-out Summary:

In response to this issue, a Night Order was issued immediately, and changes to procedures 3/4-ARP-097.CR, "Control Room Annunciator Response", and 3/4-OP-019, "Intake Cooling Water System", were subsequently initiated to provide operators with guidance to protect the ICW pumps against runout conditions. The corrective actions taken in response to this issue are considered acceptable by the SWOPI Self Assessment Team, and UAQ # 5 is considered closed.

UAQ Number: 6
Date Issued: 3/17/95
Question Concerns Operability? No
Inspector: Bryan
Question Summary:

Document STD-ESI-92-002 Rev. 0, "PTN Intake Cooling Water System Piping Inspection Guidelines" document contains acceptance criteria for pipe and lining condition. However, the basis for this criteria is not provided, nor is the basis referenced. What is the basis for this acceptance criteria?

Inspector Close-out Summary:

The response to Information Request #38 provided the requested basis. The Engineering Standard will be updated to include the appropriate references per PMAI 95-03-156.

UAQ Number: 7
Date Issued: 3/17/95
Question Concerns Operability? No
Inspector: Culpepper
Question Summary:

On 3/9/95 a large grass & algae intake resulted in degraded ICW system performance. This condition was not prevented by following current plant procedures. The response to the referenced Information Request, received on 3/17/95, indicated that a team has been formed to investigate: methods to extract the grass & algae, improvements to the intake extraction equipment, and procedural enhancements to mitigate the loss of ICW capacity. The need to address the prevention of ICW degradation is not mentioned. What is the expected outcome of this team which will prevent the degradation of ICW, regardless of what grass & algae appears at the intake structure.

Inspector Close-out Summary:

A new off-normal operating procedure ONOP-011, "Screen Wash System/Intake Malfunction", was issued in May, 1995 which directs that, if necessary, an ICW pump will operated in the same well as an idle Circulating Water pump to eliminate the mechanism for debris carryover into the ICW system. The SWOPI Team considers operation of an ICW pump in a stagnant well to be a sufficient response which would preclude recurrence of the ICW low flow condition. UAQ # 7 is therefore considered closed.

UAQ Number: 8
Date Issued: 3/17/95
Question Concerns Operability? No
Inspector: Bryan
Question Summary:

Configuration walkdown using DWG 5613-P-633-S Sheet 2 Rev. 4 showed the supports on each side of 3-50-350 were measured in the field to be 7' 10" apart and the drawing specified 12' 4 1/4". Also, the field configuration shows valve 3-50-350 next to the "T" at point 52 and the drawing shows a spool piece between the valve and the "T".

Inspector Close-out Summary:

CRN-M-8262 was initiated to revise DWG 5613-P-633-S Sheet 4 to incorporate the above measurement and configuration discrepancies. The attachment to SWOPI Information Request #55 provide more details. This UAQ is closed.

UAQ Number: 9
Date Issued: 3/29/95
Question Concerns Operability? No
Inspector: Culpepper
Question Summary:

ICW header isolation for basket strainer backwash and cleaning is a daily evolution at Turkey Point. This has become an accepted practice, even though an LCO is entered, valves manipulated, and additional procedural steps taken each time. One interpretation of strainer unavailability data indicates that an adverse trend may be evident. The design of the basket strainer is not ideal for the type of debris encountered, and may be a key factor in the exposure of the plant to low ICW flow conditions.

Why is this condition accepted?

Inspector Close-out Summary:

Subsequent to the event of March 9, 1995 (ICW low flow condition), the plant formed a team to investigate root causes. On June 1, 1995, this team issued their final report which concluded that screen wash spray nozzle deflector plate performance was the single greatest identifiable contributor to the increase in basket strainer cleanings. In response to this report, all screen wash spray nozzle deflector plate have been replaced and procedures have been revised to periodically inspect these plates and replace as necessary. This UAQ is closed.

UAQ Number: 10
Date Issued: 3/30/95
Question Concerns Operability? No
Inspector: Dillard
Question Summary:

Some ICW header isolation valves, particularly the 308 and 310 valves, are subject to flow induced oscillation which causes the valves to work the operator back and forth. In the past three years, eight work orders have been generated on these valves due to excessive disc/stem motion. In addition, two other work orders have been generated on 307 & 309 for similar reasons. In 1989, valve 4-50-308 experienced a stem/disc separation which resulted in header flow restriction and an LER. In February, 1995, during repair of valve 3-50-308 for excessive stem/disc motion, a stem locking device came loose allowing the valve to close, isolating an in-service header for approximately 15 minutes. A similar failure of valve 3-50 406 would isolate all ICW flow. The apparent response to this condition is to repair as necessary.

What efforts are being addressed toward identifying and eliminating the root cause of this condition?

Inspector Close-out Summary:

Procedure changes have been implemented to provide more detailed guidance on the use of stem locking devices. Flow induced valve fluctuations do cause wear of the actuator eccentrics, and these are being sufficiently addressed by the valve PM program. CV-3-2202 is being replaced with a spool piece during the fall, 1995 refueling outage, eliminating the single passive failure concern. UAQ #10 is considered closed.

UAQ Number: 11
Date Issued: 3/30/95
Question Concerns Operability? No
Inspector: Culpepper
Question Summary:

CV-3-2202 is bound closed, requiring full ICW flow through the bypass valve 3-50-406. Excessive disc/stem motion is a recurring condition with ICW butterfly valves of this type and in fact, work order 940001586 was generated on this valve on 2/4/94 due to loose actuator internals. In 1989, a similar model valve experienced a disc/stem separation resulting in inadvertent throttling of flow. Because there is no control room indication or alarm for low ICW flow conditions, a failure of this type would not be immediately apparent. This represents a potential single failure vulnerability based on current plant configuration and equipment history and is within the Current Licensing Basis.

What corrective actions will be taken to eliminate this failure vulnerability.

Inspector Close-out Summary:

Flow induced valve fluctuations do cause wear of the actuator eccentrics, and these are being sufficiently addressed by the valve PM program. CV-3-2202 is being replaced with a spool piece during the fall, 1995 refueling outage, eliminating the single failure concern. UAQ #11 is considered closed.

UAQ Number: 12
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Bryan/Couture
Question Summary:

ICW flow is measured at the outlet of each ICW heat exchanger by reading FI-3/4-1407,8 & 9. The uncertainty of these instruments was calculated by the response team to be 248 gpm. A review of operator logs indicates as little as 250 gpm margin at times between required flow and measured flow. In addition, there is considerable instability of indication of these instruments due to pressure pulsations. Actual practice in reading these fluctuating indicators varied among operators observed. With total flow being read from three instruments with the stated uncertainty, how is sufficient ICW flow verified under these conditions?

Inspector Close-out Summary:

The plant response has indicated that the amount of introduced error due to the flow instrumentation is negligible considering margins in the containment heat removal analyses which is the purpose of this surveillance. Although FPL has not performed an explicit analysis quantifying these margins, low flow and/or high temperature conditions have been evaluated and the results indicate ample margin to account for instrument uncertainty. Examples of analyses which show considerable margin are Westinghouse WCAPs 12262 and 12263 and Westinghouse letter 95-JB-GL-5133, dated 4/3/95. Operators have been issued a training bulletin which solidifies plant policy to read both ends of the fluctuating gage reading, record both values, and compare both ends of a spectrum value range to ensure the value remained within limits. This practice was later verified in use both in the field and in log readings taken later in the inspection. This UAQ is closed.

UAQ Number: 13
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

Position testing is not a station requirement for valve position verification. Rather, visual verification of valve position indication, along with system parameter observation, is the current practice. Although visual valve position indication is heavily relied upon, maintenance procedures focus primarily on reinstalling valve position indication in the same position as removed. Although an option, maintenance procedures do not require that tests verify that position indication is correct. On 3/9/95, root valve 3-50-446 to PI-3-1520, 3B CCW heat exchanger inlet pressure, was found in the closed position. The CCW heat exchanger area is not on the SNPO operator rounds checklist, nor on the operator readings sheet.

In light of the above, how is positive valve position verification assured.

Inspector Close-out Summary:

A change to procedure 0-ADM-031, "Independent Verification", was issued to require a "hands on" method of verification if at all possible and provides alternative methods to be used when "hands on" is not possible. A change to procedure 0-ADM-200, "Conduct of Operations", was also issued to provide management expectations for both valve manipulation and verification. In addition, Operations Department Instruction ODI-CO-018, "Valve Manipulation Expectations" was written to provide a program for Operations Supervision to monitor and train on valve manipulations. This UAQ is closed.

UAQ Number: 14
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

Control room indication of ICW flow does not exist nor are any alarms provided for low flow conditions. Flow monitoring can only be conducted at local flow indicators on the outlet of each CCW heat exchanger. Operator reading sheets only require checking and recording of ICW flow through the CCW heat exchangers once per shift. Basket strainer differential pressure, although critical to ICW fluid supply to the heat exchangers, is monitored only every four hours. Station events demonstrate that flow degradation can occur rapidly from a number of causes without timely detection.

How is sufficient ICW flow adequately verified?

Inspector Close-out Summary:

Changes have been made to the intake off-normal operating procedure to require increased monitoring of the ICW flows and basket strainer ΔP gages during events where ICW flow could be degraded and UAQ #14 is considered closed.

UAQ Number: 15
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Coste, Couture
Question Summary:

The following items related to corrective action were observed:

1. Delays in dispositioning degraded shaft conditions on 4B ICW pump;
2. Close-out of CR-related PMAI's without adequate evaluation of action items;
3. CR-related PMAI due dates extended without same level of approval as CR action items;
4. CR supplements issued on issues which may affect operability yet without procedural requirements for three day operability assessments;
5. CR-related PMAI's are not required by procedure to be maintained as QA records;
6. Incomplete root-cause evaluations of valve mispositioning events.

What actions will be taken to address the items observed?

Inspector Close-out Summary:

Changes to Administrative Procedure 0-ADM-054, "PMAI Corrective Action Tracking Program", were implemented in April of 1995 requires management approval of PMAI corrective action close-out and due date extensions of CR related PMAI corrective actions, and requires documents related to CR related PMAI corrective actions to be transmitted to QA Records for retention. Administrative Procedure 0-ADM-518, "Condition Reports", clarifies the requirements for operability assessments to be completed with three working days regardless of whether a new CR or a CR supplement is issued. Operations management completed a detailed investigation of valve mispositioning events and corrective actions have been taken. UAQ #15 is considered closed.

UAQ Number: 16
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Dillard
Question Summary:

Although considerable corrosion-related material loss was evident on the column sections of the ICW pump which was removed from the 4B well in May of 1994, this condition was not identified as needing further technical evaluation. ICW pump motor support stands on all pumps, although well painted, also show signs of noticeable material loss, particularly the 3A. Although Maintenance Procedure 0-PMM-019.3 does make provision for noting unusual or irregular conditions, criteria for making these determinations is not provided.

How do progressive corrosion-related conditions consistently receive the required technical attention and evaluation?

Inspector Close-out Summary:

Procedures 0-PMM-019.1, "Intake Cooling Water Pump General Inspection", 0-PMM-019.2, "Intake Cooling Water Pump Removal and Replacement, "0-PMM-019.3, "Spare Intake Cooling Water Pump Overhaul, and "0-PMM-019.6, "Intake Cooling Water Pump Repacking", have been revised to include the required inspection criteria. UAQ #16 is considered closed.

UAQ Number: 17
Date Issued: 3/31/95
Question Concerns Operability? No
Inspector: Culpepper
Question Summary:

On a number of occasions, personnel safety practices were observed in the plant which were inconsistent with station policy. Examples include workmen not wearing hardhats, working at heights without safety harnesses, and standing on ICW piping.

What actions will be taken by station management to address these issues?

Inspector Close-out Summary:

Safety issues were addressed by plant management in the April, 1995 plant safety meetings. Workorders were implemented to re-wire RTDs in the CCW system to allow technicians to compete performance tests without climbing on piping. Additionally, Administrative Procedure 0-ADM-033, "PTN Industrial Safety Program", was issued on 4/20/95. UAQ #17 is closed.

UAQ Number: 18
Date Issued: 4/20/95
Question Concerns Operability? No
Inspector: Couture / Bryan
Question Summary:

Several issues developed which involve the readiness of the simulator to provide adequate and valid training on scenarios involving grass intake and ICW system response.

(1) Simulator response is unrealistic when pumps are stopped in a clogged intake well. (2) Instructor facility does not provide ICW flows and certain valve position information in a form to support real time flow balancing. (3) ICW flow control valve CV-3-2202 and valve 3-50-406 are not configured or operated on the simulator as in the plant. (4) ICW model response to support pipe break simulations may be inadequate. (5) Provisions for simulation of basket strainer cleaning and flow throttling in response to pump loss casualties are not provided. (6) ICW header pressure developed on the simulator with one pump flow is inconsistent with design information.

What efforts are being taken to address these issues?

Inspector Close-out Summary:

The plant conducted its own thorough review of CCW and ICW simulator preparedness, and generated an even larger list of potential improvements. The training group issued multiple Simulator Work Requests to improve and tune the ICW and CCW system models. Almost all of these improvements had already been tested and incorporated during the SWOPI Self Assessment and the effectiveness of the changes were verified satisfactory. UAQ #18 is considered closed.

UAQ Number: 19
Date Issued: 4/20/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

There are no established simulator training exercises to provide practice on mitigation of grass and algae intake which results in the development of high screen differential levels. The challenges to grass intake events similar to those experienced at Salem as described in SOER 94-01 need to be run with all operators on the simulator.

There are no established simulator training exercises which provide training in managing plant operation with the sustained loss of ICW pumps where conditions leave only one

pump running. One pump only scenarios should be available to practice response to high flow concerns in this condition. Nuclear Plant Supervisors interviewed expressed concern that the loss of ICW pump scenarios they have experienced always result in starting another pump in a short period of time. Operators are not challenged to mitigate the condition of having to throttle and balance ICW flows with one pump or conduct a shutdown with limited ICW flow.

What efforts are being taken to address these issues?

Inspector Close-out Summary:

A new simulator practice exercise was created {14C-L-P} which closely models the plant grass intake event in March. It incorporates critical operating concerns and lessons learned. Simulator training scenario {14DA-L-P} has been modified to practice extended management of one ICW pump run out flow conditions. In addition, a new simulator evaluation scenario has been added. Training for all Licensed Operator crews on these two scenarios was being conducted during the SWOPI Team second evaluation visit. The effectiveness of these scenarios and crew performance was observed during these sessions. UAQ #19 is considered closed.

UAQ Number: 20
Date Issued: 4/20/95
Question Concerns Operability? No
Inspector: Dillard
Question Summary:

The tubes in the 3A CCW heat exchanger are degraded. The stated degradation mechanism is stress corrosion cracking , although all aspects of this mechanism are not fully understood. The analysis that was done when this condition was observed in 1990 does not consider catastrophic failure a credible event and only considers single tube failures. It is not clear that the seismic loads were properly considered in the analysis, given that the failure mechanism is not fully known.

How was acceptability of the condition established in light of the above?

Inspector Close-out Summary:

Safety Evaluation JPN-PTN-SEMJ-90-054, Rev. 0 was provided which sufficiently evaluates the degraded condition of the tubes. This UAQ is closed.

UAQ Number: 21
Date Issued: 5/25/95
Question Concerns Operability? No
Inspector: Culpepper
Question Summary:

A number of discrepancies were identified between the FSAR, Design Basis Documents, plant configuration drawings, and actual plant configuration. In addition, minor equipment materiel condition observations were made. These issues were discussed with Response Team personnel at the time of discovery and dispositioned to collect in one UAQ to document. This UAQ documents these miscellaneous issues which are described below:

During the configuration walkdown, Stress Problem 039/M08-589-01 Drawing 5613-H-606 Sheet 1A through 6C and Stress Problem CIRC-1 Drawing 5613-H-633 Sheet 1A through 17C were reviewed. Numerous dimensional discrepancies were noted on the Stress problem drawings.

The On-line Continuous Tube Cleaning System (CTCS), which is provided for each CCW heat exchanger to assist long term heat removal capability, was valved out and not in service. Discussions with operators and other plant personnel indicate that the system is not used and considered abandoned in place. Design Basis Document (DBD) 5610-019-DB-002, Rev. 3, page 10, states that due to the ineffectiveness of the on-line continuous tube cleaning system, "The system was eventually abandoned in place." However, plant drawings do not reflect an abandoned status.

The TPCW isolation valves, POV-3/4-4882 and 4883 have abandoned solenoid valves attached to them.

There were traces of rusty water leaking from the crevice between the channel head flanges and the channel heads. This was apparently rainwater trapped in the caulking.

ICW Pump Discharge Check Valve Instruction Manual from TRW Mission Duo-Chek (V000329) makes no mention of the check valve insulating studs. There is no mention of the plastic sleeves that are currently used on the studs. The insulated joints were assembled three different ways.

The Unit 4 CCW Heat Exchangers were replaced in the 1989 time frame. The CCW Heat Exchanger Instruction Manual, EFCO (AA409), does not provide a specification sheet or any design information.

-IR# 160 Design Closing DP for CV-3/4-739

The response to IR# 160 identified per TEDB stated that CV-3/4-739 is rated at 150 psig and not 100 psig as indicated in the DBD. The DBD should be revised to reflect the design rating of 150 psig. Currently, there is no commitment to revise the DBD.

-IR# 165 DBD Setpoint Discrepancy RV-3/4-715

The response to IR# 165 included a DBD Comment Form to revise the setpoint for RV-3/4-715 to 150 psig.

-IR# 170 ECC Bypass Lines

The response to IR# 170 included a FSAR Change Package to revise page 6.3-6 of the FSAR to accurately describe the normal ECC return flow and bypass flow operation.

-IR# 208 Maximum Total Heat Load less than Nominal in DBD

The response to IR# 208 included a DBD Comment Form to revise the Heat Load Table 3-4 in the CCW Design Basis Document to accurately represent the maximum and minimum total heat loads.

-IR# 231 DWG 5613-P-596-S Sheet 3 Field Dimension Discrepancy

The response to IR# 231 included a CRN M-8301 to revise drawing 5613-P-596-S sheet 3 to correct dimensional discrepancies noted during the SWOPI walkdown of the CCW system. The response indicates that correct dimensions had been previously evaluated and were found to be acceptable. The drawing, however, had not been updated.

-IR# 232 DWG 5613-P-596-S Sheet 2 One Inch Line Not Shown

The response to IR# 232 commits to write a CRN to the drawing update MEP to revise drawing 5613-P-596-S sheet 2 to include the 1" Chemical Pot Feeder CCW Supply line.

-IR# 249 Engineering Standard IC 3.17, "Instrument Setpoint Methodology for Nuclear Power Plants

Appendix B to Engineering Standard IC 3.17, "Turkey Point Setpoint Program Plan and Specific Guidelines/Assumptions," has not been completed. The response from Engineering was that it is currently scheduled for issue on July 20th 1995, but is subject to change.

-IR# 262 DWG 5613-M-3030 Sheet 5 Flow for MOV-3-716B Incorrect

The response to IR# 262 included a commitment to revise drawing 5613-M-3030 sheet 5 via CRN M-8302 to correct the flow indicated for MOV-3-716B.

-IR# 279 Incorrect MOV reference on DWG 5613-P-613-S Sheet 1

The response to IR# 279 included a commitment to revise drawings 5613-P-613-S sheet 1 and 5613-P-612-S sheet 1 via the drawing update MEP to correctly identify the MOVs on these drawings.

Inspector Close-out Summary:

Corrective actions have been initiated on all the items identified on this UAQ, which is considered closed.

UAQ Number: 22
Date Issued: 5/17/95
Question Concerns Operability? No
Inspector: Gouldy
Question Summary:

ICW components are not logged as unavailable if a Tech Spec action statement are not entered. For example, cleaning of the third CCW heat exchanger does not result in logged unavailability.

How is unavailability accurately accounted for IPE and Maintenance Rule?

Inspector Close-out Summary:

The response to this UAQ indicated that per 0-ADM-213, "Technical Specification Related Equipment Out-of-Service Logbook", all out-of-service time for TS related equipment be logged, regardless of LCO action statements. In addition, the PSA and Maintenance Rule baseline is being established at this time using the TS related equipment out-of-service log. Any required revisions to the unavailability assumptions will be incorporated into the PSA. UAQ #22 is considered closed.

UAQ Number: 23
Date Issued: 5/17/95
Question Concerns Operability? No
Inspector: Dillard
Question Summary:

The 4C ICW pump check valve removed in March of 1995 was found with worn hinge pins and a broken return spring. The failure history of ICW pump discharge check valves records a number of broken return springs. Check valves are currently replaced each time the pump is removed, but this replacement is driven by pump maintenance and not check valve performance. The PRA identifies ICW pump discharge check valves as a significant contributor to core damage risk.

How is acceptable reliability of the check valves assured?

Inspector Close-out Summary:

The response to the UAQ provided Condition Report 94-297 containing Operability Assessment 021-94 which concludes that the valve does not require its springs to perform its safety related functions. That conclusion, however, is based on an engineering evaluation (JPE-LR-87-019 REV.1) that in fact does not evaluate the need for springs. PC/M 86-210 which installed the valves, does evaluated the function of the closure springs as necessary only to minimize pressure spiking, and are not required for valve closure. Efforts to improve the service life of the springs underway as well as improvements to the inspection requirements. UAQ # 23 is considered closed based upon the above discussion.

UAQ Number: 24
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

It is plant policy to consistently identify all valves in the CCW system which must be maintained in a throttled condition. The method of identification is supposed to be (1) yellow painted handwheels, and (2) permanent plastic caution tags.

Contrary to the above, several valves were found not tagged, and/or not with yellow painted handwheels. Some valves had permanent yellow tags with a required percent open position listed which was marked out with grease pencil to another very distinct number listed and initialed by the STA from 1986. What is the correct method for controlling the setting of these throttled valves?

What efforts are being addressed toward correcting this condition?

Inspector Close-out Summary:

In response to UAQ #24, the plant promptly conducted a complete check of all throttled valve tagging and painting in the CCW system. They identified tagging or handwheel painting discrepancies on 22 of the 52 valves requiring throttling. Plant Work Orders were issued, worked and closed which correctly tagged or painted all throttled valves in the system. All other discrepant markings were removed. UAQ #24 is considered closed.

UAQ Number: 25
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Couture
Question Summary:

Operator performance was observed implementing the one pump ICW run out flow guidance contained in 3/4-ARP-097.CR procedure during several scenarios. Recent proposed changes made a draft revision to 3/4-ONOP-019 do not adequately address these concerns;

(1) Clear guidance is not provided on what sequence or priority of actions to be followed to accomplish flow reduction and maintain acceptable ICW flow to the CCW heat exchangers.

(2) Clear instructions or limits are not provided as to how far to reduce flow to the CCW heat exchangers. (What is acceptable? When is it acceptable?)

(3) No clear temperature or flow criteria are associated with the throttling actions on both the primary and secondary sides.

(4) Specific valve numbers are not provided to indicate where the throttling should occur.

(5) It is not clear when a decision to remove the unit from service should be made.

Inspector Close-out Summary:

3/4-ARP-097.CR procedure has been revised through the OTSC process. 3/4-ONOP-019 has also been revised to adequately address these concerns. This UAQ is closed.

UAQ Number: 26
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Bryan/Khurana
Question Summary:

In the event of a RCP thermal barrier tube rupture, the CCW system goes two phase and will be substantially overpressurized if the leak is not isolated. Assuming the single failure of MOV-3/4-626 failing to close, the manual isolation valve 3/4-736 would have to be closed by a Nuclear Operator to isolate the leak.

The response to IR # 206 states that there is no calculation which determines how long it would take for the CCW system to overpressurize and qualitatively estimates that nearly 4 minutes would elapse from the break initiation until primary water reaches the surge tank. Based on the calculated flowrate of 317 GPM (DBD, Pg. 38) and additional 3 minutes (for a total of 7 minutes) would be required to overfill the surge tank.

Interviews with a PTN Nuclear Operator determined that the 3/4-736 valve is very difficult to operate and requires a valve wrench and considerable effort to close. The Nuclear Operator had personally closed the valve numerous times for clearances and takes at least 10 minutes to close at normal system pressure. At primary system pressure, the valve would be expected to be even more difficult to operate.

A review of maintenance records shows that 3/4-736 has not been overhauled in the life of the plant.

What information demonstrates that this valve can be closed within the time allowed?

Inspector Close-out Summary:

The response indicated that the valve assemblies are designed to close against the design pressure which is RCS pressure following the failure of the RCP thermal barrier. Based on the design information, the valve is manually closable within the required time, but a valve wrench may be required. Procedures 3/4-ONOP-041.1 were revised to provide directions to operators to close manual valve 3/4-736 if MOV-3/4-626 cannot be closed. UAQ #26 is considered closed.

UAQ Number: 27
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Bryan/Khurana
Question Summary:

Currently available information does not appear to substantiate that the ECCs are capable of removing design bases heat load (60 X 10^6 BTU/hr) under accident conditions. The only available information is

a) statements in FSAR
b) statements in DBD and
c) a two page calculation (Calc. M08-034-002, Rev. 0)

What documentation clearly demonstrates ECC design basis capability?

Inspector Close-out Summary:

After an exhaustive search by the Response Team members, the response to this UAQ provided the original design calculation #5610-M-39A and the original equipment specification #5610-M-39-1. These documents were reviewed with no concerns and the UAQ is considered closed.

UAQ Number: 28
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Bryan/Khurana
Question Summary:

Per response to IR # 198, it cannot be established that the CCW piping associated with Normal Containment Cooler (NCC) inside containment coolers are protected against HELB. If these lines fail under HELB and supply or return containment isolation valve fails to close (single active failure), CCW system will empty into the containment.

How is the acceptability of the current design established?

Inspector Close-out Summary:

The response to UAQ #28 determined that although no formal HELB analysis exists, the existing design provides whip restraints on main steam and feedwater piping to preclude impact of dynamic loads (due to pipe break) to nearby piping, and the concern was considered resolved.

UAQ Number: 29
Date Issued: 5/19/95
Question Concerns Operability? No
Inspector: Bryan/Khurana
Question Summary:

Special tests were performed to position valves for establishing flow balance to provide assurance that minimum CCW flows to required safety related components are met under most limiting CCW system alignment.

Per IR #191 response, evaluation of test results required plant procedures to provide for an action to shutdown one CCW pump under accident conditions if two pumps and two CCW heat exchangers are found in service and the third had to be taken out of service. This action is to prevent flow exceeding maximum permitted flow to the operating CCW heat exchanger.

What procedures are in place to provide for these actions?

Inspector Close-out Summary:

The response to this UAQ indicated that for most conditions, the proper procedural guidance and actions were in place. However, a procedure change was initiated to add a Precautions and Limitations to 3/4-OP-050, "RHR Normal Operating Procedure" to incorporate these required actions. UAQ #29 is considered closed.

UAQ Number: 30
Date Issued: 5/23/95
Question Concerns Operability? No
Inspector: Bryan/Khurana
Question Summary:

The response to Information Request # 189 indicated that the CCW system has been evaluated for single failure vulnerability as a part of the DBD Verification Program. However the verification document provided clearly indicates: "To verify this basis would require that a comprehensive FMEA be performed. This is beyond the scope of the design basis verification program as defined in the design verification procedure."

How was verification of CCW single failure vulnerability documented?

Document References: Information Request # 189
Inspector Close-out Summary:

The response to the UAQ provided applicable references to the FSAR and DBDs which

document the applicable single-failure General Design Criteria (GDCs) that the CCW system was built to. The DBD clearly states that a formal Failure Modes and Effects Analysis (FMEA) for the CCW system was beyond the DBD scope and was not performed. The Design Basis Document (DBD) addresses select individual single active failure vulnerabilities, while other single failure evaluations are available through the Corporate mainframe database. This documentation was reviewed by the SWOPI Team and due to the vintage of the Turkey Point license, was considered acceptable. UAQ #30 is closed and the issue is considered resolved.