U. S. NUCLEAR REGULATORY COMMISSION

REGION II

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Licensee:	Florida Power and Light Company
Facility:	Turkey Point Units 3 and 4
Location:	9760 S. W. 344 Street Florida City, FL 33035
Dates:	July 12 - August 22, 1998
Inspectors:	J. Reyes, Resident Inspector B. Crowley, Regional Inspector (Sections M1.1, M2.1, E2.2, E2.5) R. Gibbs, Resident Inspector, North Anna (Section P1.1) S. Rudisail, Regional Inspector (Sections O2.3, M5.1, E2.3,E2.4) W. Poertner, Resident Inspector, Surry (Sections O1.2, O2.1) M. Sykes, Resident Inspector, McGuire (Section O1.2) G. Warnick, Resident Inspector, St. Lucie (Section O2.2) F. Wright, Regional Inspector (Sections R1.1, R2.1, R2.2, R3.1, R8.1)
Approved by:	L. Wert, Chief, Reactor Projects Branch 3 Division of Reactor Projects

EXECUTIVE SUMMARY
Turkey Point Units 3 and 4
NRC Inspection Report 50-250/98-08, 50-251/98-08

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six week period (July 12 to August 22, 1998) of resident inspection. In addition, the report includes regional maintenance and health physics/chemistry inspections.

Operations

- Strong teamwork and planning by Operations, Maintenance, and Work Controls during the Unit 3 power changes was noted. Engineering provided good technical support in assessing a high vibration condition of the 3B turbine plant cooling water pump. (Section O1.1)

- Operator actions to restore Intake Cooling Water (ICW) flow to the Unit 4 CCW heat exchangers following the failure of a strainer inlet isolation valve were prompt and only a slight increase in CCW temperatures occurred. The licensee subsequently identified that numerous manual ICW valves had incorrect pins installed in the valve operator thrust collars and initiated corrective actions to return the valves to their normal configuration. An non-cited violation was identified for failure to effectively implement corrective actions for a similar valve pin problem identified in 1992. (Section O1.2)

Maintenance

- Preventive Maintenance and surveillance activities were performed in a quality manner and documentation was good. Procedures were in place and were conscientiously followed by qualified maintenance personnel. Interface between maintenance and operations personnel was good. Applicable FME controls, M&TE controls, PMT requirements, and QC hold points were properly accomplished. (Section M1.1)

- The licensee identified a deficiency involving the qualifications of General Maintenance Leaders (GML). The licensee promptly discontinued the use of the GML. A non-cited violation was identified addressing the failure to meet ANSI qualification criteria for the GML position. (Section M5.1)

Engineering

- The licensee appropriately addressed a steam leak caused by outer diameter pipe corrosion on the Unit 3 priming ejector system and plant management took proper personnel safety precautions. (Section E2.1)

- The exact cause of the 4A control rod drive motor generator set bearing failure could not be determined. The most probable cause was lubrication starvation resulting from the design of the Fafnir bearing. Root cause determination efforts were thorough. (Section E2.4)

- Two examples were noted in which corrective actions for identified deficient conditions were not aggressively completed. Delays occurred in the resolution of corroded diesel generator fuel oil transfer piping (Section E2.2). A backlog of completed but not reviewed surveillance tests was not promptly corrected. (Section R2.2)

- The licensee was adequately addressing the specific and generic problems with external corrosion of piping. (Section E2.5)

Plant Support

- Radioactive waste and radioactive material transportation documentation met licensee, NRC, and DOT regulatory requirements. Reviewed shipping documentation and records were properly completed. (Section R1.1)

- The radiological effluent monitors and site meteorological station and instrumentation were adequately maintained. (Section R2.1)

- The inspectors verified that the licensee was performing required TS surveillances for engineered safety feature filtration systems. However, the licensee's review of some completed ESF surveillances was not timely or sufficient to identify procedure errors. (Section R2.2)

- The 1996 and 1997 annual radiological effluent report met applicable requirements and no adverse trends in radiological effluents were identified. All radiological effluents were well within release limits. The licensee continued to reduce the quantities of radiological effluents released. (Section R3.1)

- The licensee properly followed their established internal procedures and regulatory requirements to assess radiation doses as a result of internally deposited radioactivity for workers terminating employment. (Section R8.1)

Report Details

Summary of Plant Status

Unit 3 began the period operating at 100 percent reactor power and had been on-line since February 19, 1998. On July 22, power was reduced to 30 percent to perform corrective maintenance on the 3B turbine plant cooling water pump. The unit was returned to 100 percent power on July 24 and operated at that level for the remainder of the period.

Unit 4 operated at or near full power for the entire inspection period and had been on-line since October 14, 1997.

I. Operations

01 Conduct of Operations

01.1 Unit 3 Reactor Power Decrease to 30 Percent

a. Inspection Scope (71707, 62707, and 37551)

The inspectors observed Operations activities during the Unit 3 power decrease to 30 percent and reviewed/observed engineering support and maintenance for the 3B turbine plant cooling water (TPCW) pump.

b. Observation and Findings

During a plant walkdown, an operator noted that the 3B TPCW pump was making an unusual noise. Engineering subsequently performed a vibration spectrometry and determined that the outboard bearing velocity at the 1200 Hertz range was abnormally high. Vibration readings were then taken twice per shift. The data indicated that the bearing appeared to be degrading. The licensee made a decision to decrease power to 30 percent to perform corrective maintenance.

After the power reduction, the 3B TPCW pump was isolated and repair activities were initiated. The licensee also performed additional maintenance on secondary systems including hydro-blast cleaning of the 3A TPCW heat exchanger and repair of the 3B TPCW pump discharge check valve. The inspectors noted good work planning in Operations, Work Controls, and Maintenance for these activities.

The inspectors reviewed and observed portions of the Operations planning, execution of the power changes, and the above maintenance activities. Good control room supervision and reactor engineering support was noted throughout the evolution. Initial vibration data and post maintenance data was reviewed and discussed with engineering. The inspectors noted that engineering provided good technical support and sound recommendations to plant management.

c. Conclusions

Strong teamwork and planning by Operations, Maintenance, and Work Controls during the Unit 3 power changes was noted. Engineering provided good technical support in assessing a high vibration condition of the 3B turbine plant cooling water pump.

01.2 Unit 4 Loss of Intake Cooling Water (ICW) Flow To The Component Cooling Water (CCW) Heat Exchangers

a. Inspection Scope (71707 and 37551)

The inspectors reviewed the licensee's actions for a loss of ICW flow to the component cooling water heat exchangers.

b. Observations and Findings

On August 2, immediately following the removal of the 4A ICW/CCW basket strainer from service for mechanical cleaning, the 4B ICW/CCW basket strainer inlet valve failed closed resulting in a total loss of ICW flow to the Unit 4 CCW heat exchangers. The operator performing the valve manipulations heard a loud noise after removing the 4A strainer from service and determined that differential pressure (DP) across the 4B strainer was zero. The operator immediately returned the 4A basket strainer to service to reestablish ICW flow. ICW flow was reestablished within five minutes and CCW temperatures remained well below the high temperature alarm set point. The inspectors determined that the controlling procedure provided adequate guidance to verify proper CCW flows for removing an ICW header from service. The procedure specifically required that the isolated header be returned to service if ICW flows were not adequate.

The licensee declared the 4B ICW header inoperable and initiated corrective maintenance on the 4B strainer inlet isolation valve (valve 4-50-344). The valve was returned to service on August 3. Condition Report (CR) 98-1132 was initiated to determine the cause of the valve failure.

Valve 4-50-344 is a manual butterfly valve. The licensee determined that the thrust collar locking pin associated with the valve operator had failed. The pin failure resulted in the operator screw shaft being ejected from the actuator causing the valve to go closed. The thrust collar locking pin was analyzed to determine the cause of the failure. The analysis determined that the failure resulted from fatigue. In conjunction with the failure analysis, the licensee reviewed the vendor manual and determined that the incorrect pin had been installed in the actuator thrust collar. The pin that failed was a spring pin whereas the vendor drawing required a groove pin. A spring pin is hollow and normally used to attached the handwheel to the actuator. The licensee also determined that CR 92-0159, initiated in 1992, had identified that a spring pin had been installed in the 4A CCW basket strainer inlet valve 4-50-324. The incorrect pin was identified during corrective

maintenance activities resulting from the failure of the valve to open using the actuator handwheel. Corrective actions for CR 92-0159 included identification of all valves with similar actuators, revision to the associated work order for procedure 0-PMM-019.10 to verify that the correct pin was installed, and corrective actions to prevent future installation of incorrect parts. The pin verification was supposed to occur during grease checks of the valve actuators.

As part of corrective actions for CR 98-1132, the licensee initiated work requests to inspect three valve operators on similar valves that had been identified as fluttering during walkdowns of the Unit 3 and 4 ICW systems. The valves were inspected due to the potential for fatigue failure of the pins resulting from the valve flutter. Inspections determined that all three valve operators had the incorrect pins installed. The inspectors witnessed the inspection of valve 4-50-324 and verified that the wrong pin was installed. The inspectors also verified that the correct pin was present at the job site for installation into the valve operator. The inspectors noted that valve 4-50-324 was the same valve that prompted the 1992 CR. The licensee placed the procedure 0-PMM-019.10 on administrative hold until necessary revisions could be made to specify the proper pin for the thrust collar.

The inspectors considered that the corrective actions for the 1992 failure, if effectively implemented, should have prevented installation of the incorrect pins which were subsequently discovered in 1998. The fact that incorrect pins existed in several valves is significant because it introduced a potential common mode failure for the ICW system. Ineffective corrective actions for the 1992 failure is a violation of 10CFR50 Appendix B, Criterion XVI. However, the failure was licensee identified. Initial and planned corrective actions were reasonable for correcting the problem to prevent recurrence. This non repetitive, licensee-identified and corrected violation is being treated as a Non-Cited violation, consistent with section VII.B.1 of the NRC Enforcement Policy and is identified as NCV 50-250, 251/98-08-01, Failure to Implement Effective Corrective Actions for ICW Valve Failure.

c. Conclusions

Operator actions to restore ICW flow to the Unit 4 CCW heat exchangers following the failure of a strainer inlet isolation valve were prompt and only a slight increase in CCW temperatures occurred. The licensee subsequently identified that numerous manual ICW valves had incorrect pins installed in the valve operator thrust collars and initiated corrective actions to return the valves to their normal configuration. An non-cited violation was identified for failure to effectively implement corrective actions for a similar valve pin problem identified in 1992.

02 Operational Status of Facilities and Equipment

02.1 Unit 4 Intake Cooling Water (ICW) System Walkdown (71707)

During the inspection period, the inspectors performed a walkdown of accessible portions of the Unit 4 ICW system. The inspectors reviewed the associated plant drawing and valve lineup procedure for accuracy. Equipment operability, material condition, and housekeeping were acceptable. The inspectors identified no substantial concerns. The Unit 4 ICW system was properly aligned for normal operation.

02.2 Engineered Safety Feature System Walkdown (71707)

The inspectors walked down accessible portions of both units' Containment Spray systems. Equipment operability, material condition, and housekeeping were acceptable. The inspector also reviewed the procedures used to operate and ensure operability of the system. The procedures were adequate to meet technical specification requirements. The inspectors identified no significant concerns.

02.3 Anticipated Transient Without Scram Mitigation Actuation System (AMSAC) Walkdown (71707)

The inspectors reviewed accessible portions of the AMSAC system. Equipment operability, material condition, and housekeeping were adequate. The inspectors did not identify any concerns during this inspection.

08 Miscellaneous Operations Issues

08.1 World Association of Nuclear Operators (WANO) Peer Review Report (71707)

During the inspection period the inspectors reviewed the WANO Peer Review report dated July 28, 1998. The review had been conducted in June 1998. The inspectors discussed the major strengths and areas for improvement with the Region II branch chief. Based on this review no further NRC follow-up was planned.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

a. Inspection Scope (62707) (61726)

The inspectors observed maintenance and surveillance activities for selected components to evaluate the effectiveness of the licensee's maintenance program.

b. Observations and Findings

The inspectors observed maintenance/surveillance activities for selected portions of the following work orders (WOs) and preventive maintenance (PM) procedures. Associated documentation was reviewed to verify that maintenance was planned, controlled, and performed in accordance with requirements:

- WO 98011943 01, Calibration of the L-163 CVCS Holdup Tank C Level Loop
- WO 98012063 01, PM on Unit 3 Steam Generator Feedwater Pumps A and B
- PM on Unit 4 Charging Pump 4C Suction Stabilizer
- Calibration of Unit 4 Power Range Nuclear Instruments (NIs)
- Calibration of Unit 3 Power Range NIs
- WO 98011968 01, Calibration of Unit 4 Main Steam Header to Turbine Pressure Indicator PI-4-1415
- WO 98011880 01, Quarterly PM on Unit 4 Turbine Air Side Seal Oil Filter 4F1410
- WO 98013410 01, Re-installation of Unit 4 Screen Wash Pump 4P14 Motor
- WO 98014092 01, Preventive Maintenance on Unit 3 Charging Pump 3P201B
- PM (Thermography Inspection) of Load Center 3C

During observation of the above maintenance work, the inspectors evaluated procedure use, assignment and performance of QC hold points, foreign material exclusion (FME) controls, measuring and test equipment (M&TE) controls, post-maintenance testing (PMT) and qualification of maintenance personnel. The applicable revisions of procedures were in place and were conscientiously followed by qualified maintenance personnel. Personnel had a questioning attitude and had procedure or WO requirements clarified before proceeding with an activity. Maintenance supervision was closely involved with monitoring in-process maintenance work. Good interface between maintenance and operations personnel was observed. Applicable FME controls, M&TE controls, PMT requirements, and QC hold points were properly accomplished. The inspectors also observed that work activities were properly documented and problems encountered during the performance of the work activities were appropriately resolved.

In addition to the above observations, the inspectors examined the PM requirements and records for the standby steam generator feed pumps (SSGFPs). There are two SSGFPs; motor driven Pump A and diesel driven Pump B. The licensee's program prescribed periodic inspection, cleaning, overhaul, and oil sampling activities for the pumps. In addition to the PMs, the pumps are operated periodically under surveillance procedures. The inspectors reviewed a sample of completed records for the PMs. The PMs were performed using detailed procedures and were well documented.

c. Conclusions

PM and surveillance activities were performed in a quality manner and documentation was good. Procedures were in place and were conscientiously followed by qualified maintenance personnel. Interface between maintenance and operations personnel was good. Applicable FME controls, M&TE controls, PMT requirements, and QC hold points were properly accomplished.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Material Condition and Housekeeping Observations (62707)

During inspection of in-process maintenance activities, the inspectors observed plant material condition and housekeeping in the turbine and auxiliary buildings. In general, housekeeping and material condition were good.

M5 Maintenance Staff Training and Qualification

M5.1 Review of General Maintenance Leader (GML) Position Qualification Criteria

a. Inspection Scope (62707)

The inspectors reviewed the licensee's corrective actions associated with a deficiency involving the GML position qualification requirements.

b. Observations and Findings

In March 1998, the licensee initiated a change to the maintenance supervisor process. The inspectors reviewed corrective actions associated with Condition Report (CR) 98-611. The CR was initiated on April 13, 1998, when the GML qualification criteria was determined to potentially conflict with Technical Specification (TS) 6.3, Facility Staff Qualifications. TS 6.3 states in part that each member of the facility staff shall meet or exceed the minimum qualification of ANSI N18.1-1971 for comparable positions. ANSI N18.1, section 4.3.2, requires that a supervisor who is not required to be NRC licensed, shall have a high school diploma or equivalent and a minimum of four years experience in the craft or discipline they supervise. The GML position was established to supervise composite crews of various discipline. The

issue prompting the CR was that the GML would not have the experience to supervise both electrical and mechanical craft crews.

On April 13, 1998, in response to the CR, the maintenance crews were returned to a non-composite crew. The inspectors verified that the composite crew format was no longer being used by the licensee. Additional corrective actions were identified in the CR disposition and were determined by the inspectors to be sufficient to address the GML concern. The inspectors determined that a violation of TS 6.3 had occurred for failure to meet the ANSI qualification criteria for the GML position. This non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with section VII.B.1 of the NRC Enforcement policy. This is identified as NCV 50-250,251/98-08-02, Failure to Meet Qualification Criteria for GML Position.

c. Conclusions

The licensee identified a deficiency involving the qualifications of General Maintenance Leaders (GML). The licensee promptly discontinued the use of the GML. A non-cited violation was identified addressing the failure to meet ANSI qualification criteria for the GML position.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Pipe Steam Leak Due to Outer Diameter Pipe Corrosion (Unit 3)

a. Inspection Scope (71707, 37551)

The inspectors observed and reviewed the licensee's actions for a steam leak caused by outer diameter (OD) pipe corrosion.

b. Observations and Findings

During an operator plant walkdown, a small steam leak was identified on a 2-inch schedule 40 pipe of the water box primary ejector system. The primary ejector system uses high pressure (nominal 1000 psi) main steam. The purpose of the system is to provide a partial vacuum during initial startup to prime the water boxes and ensure the condenser tubes are full of water before the circulating water pumps are started. Insulation from the piping near the steam leak was removed and revealed a significant amount of pipe OD corrosion. A few difficulties were encountered when the licensee initially attempted to isolate the piping due to the high internal pipe pressure.

The inspectors reviewed the pipe corrosion, performed a system walkdown with the responsible system engineer, and reviewed the corrosion issue with engineering and management. Upon reviewing the licensee's planned corrective actions from a previous corrosion issue that occurred on the

auxiliary feedwater system, the inspectors found that the primary ejector system had been identified as a system that warranted inspection for OD pipe corrosion. Initially, some delays were encountered because the piping was covered with asbestos insulation. Additionally, this system was not safety-related and was initially not given high priority.

The licensee's initial technical assessment indicated that since the pipe is not pressurized with steam during normal operation, it was believed that the steam would condense in the line and that the pipe would not usually be hot. It was further believed by the licensee that corrosion mechanism was due to water being entrapped in between the insulation and the cold piping thus providing the conditions for the OD pipe corrosion. The licensee indicated that a laboratory analysis was going to be performed on the corroded pipe.

c. Conclusions

The licensee appropriately addressed a steam leak caused by outer diameter pipe corrosion on the Unit 3 priming ejector system and plant management took proper personnel safety precautions.

E2.2 (Closed) Unresolved Item 50-250,251/98-04-01 (37551 and 92902): Emergency Diesel Fuel Oil Pipe Corrosion.

In November 1997, the licensee identified external corrosion on the 3A and 3B EDG fuel oil transfer piping at the ground level where the piping entered the ground in a "french drain." Between November 1997 and April 1998, corrective actions for this problem were slow to be developed. In February 1998, excavation of the "french drain" began around the piping which allowed the licensee to evaluate the extent of the corrosion. However, plant management had ordered that the job be stopped and postponed until a contingency plan was developed in case a fuel oil leak developed during excavation. In mid-April 1998, after questioning by NRC inspectors, the work continued. While removing the corrosion for pipe wall thickness measurements, the EDG 3A fuel oil transfer pump discharge piping developed a small leak. The inspectors raised a number of questions relative to: (1) the original engineering evaluation of the problem, (2) the operability of the EDG with the degraded piping, and (3) the delay of corrective actions. The unresolved item was opened to review these issues further after completion of the metallurgical analysis of the degraded pipe.

During the current inspection, the inspectors reviewed the corrective actions for the fuel oil piping corrosion and concluded that corrective actions as documented in CR 97-1953 were appropriate (See Section E2.5). However, the inspectors noted that the licensee was slow to develop and implement corrective actions between November 1997 and April 1998. Section R2.2 of this report describes another example in which corrective action for an identified problem was not aggressive.

E2.3 Review of Interim Evaluation of Information Notice (IN) 96-48, Supplement 1

a. Inspection Scope (37551)

The inspectors reviewed the licensee's interim evaluation of Motor Operated Valves (MOVs) affected by the information provided by IN 96-48, Supplement 1.

b. Observations and Findings

The licensee developed an interim evaluation documented in Condition Report (CR) 98-1107. The initial screening of the valves included a review of the MOVs with the new 0.9 Application Factor (AF). The previous AF was 1.0. Calculation PTN-BFJM-90-079, "NRC Generic Letter 89-10 MOV Actuator Evaluation," Revision 17, was reviewed to determine if any MOV torque capability at reduced voltage was greater than the actuators required torque to overcome differential pressure. For those MOVs whose torque capability was greater than the required torque no further screening was required.

Further evaluations were performed for MOVs whose torque capability was not greater than the required torque at the revised AF. These MOVs were screened at the specified reduced voltage taken from Calculation PTN-BFJE-91-015, "MOV Voltage Drop Calculation Generic letter 89-10," Revision 5. Those valves which did not pass this evaluation were screened with a detailed evaluation using as-left available torque and specific valve design detail.

Subsequent to this evaluation, additional review by the licensee was performed using reduced voltage values determined in Calculation JPN-PTN-BFJE-90-006, "MOV Voltage Drop Calculation," Revision 15. From this review, no operability concerns were identified.

c. Conclusions

The licensee's interim evaluation of the supplemental information and its potential effect on operability of MOVs was adequate to demonstrate valve operability.

E2.4 (Closed) Inspection Follow-up Item 50-250,251/98-07-01): Root Cause Of Motor Generator Set Fire

a. Inspection Scope (37551)

The inspector reviewed the licensee's root cause analysis for the 4A Motor Generator (MG) set bearing failure.

b. Observations and Findings

On June 10, 1998, the 4A Control Rod Drive Mechanism (CRDM) MG set failed, resulting in a fire that caused actuation of the halon fire protection system and declaration of an unusual event. An Event Response Team (ERT) was formed to review the root cause of the failure. The inspectors reviewed Condition Report (CR) 98-0919 which documented the ERT actions.

The root cause determination effort focused on three probable failure modes; lubrication starvation, vibration induced overload, and insufficient interference fit between the shaft and bearing.. Numerous other potential causes were evaluated but were determined to not be causes of the failure.

The most probable cause of the bearing failure was determined to be lubrication starvation that resulted from the design of the Fafnir bearing. The licensee found that they had used bearings from two vendors, Fafnir and MRC. The bearings were considered to be equivalent by the supplier. The Fafnir bearing was determined to have a 1/8" annulus opening between the inner race and the bearing shields. This opening allows the grease to enter the bearing. The MRC bearing design allows an approximate 5/8" opening for grease to enter the bearing.

A previous MG set failure on March 4, 1997, was determined by the licensee to be the result of inadequate lubrication which most probably resulted from premature bearing failure. During this root cause determination effort, the design of the Fafnir bearing versus the MRC bearing was not considered as the bearings were represented as equivalents. The inspectors reviewed the corrective actions and root cause analysis with the engineering supervisor. The inspectors noted that the root cause effort for the 1997 failure, as documented in CR 97-0286, did not fully pursue potential differences in vendor designs as a possible cause of the failure. However, the inspectors concluded that the differences in the bearings were difficult to identify.

The MRC bearings are installed on the other MG sets with the possible exception being the 3B MG set. Plant Managers Action Item (PMAI) PM98-07-161 was established to verify the type of bearing in the 3B set and replace the bearing if it is a Fafnir bearing. Based on the above review, IFI 98-07-01, Root Cause of Motor Generator Set Fire, is closed.

c. Conclusions

The exact cause of the 4A control rod drive motor generator set bearing failure could not be determined. The most probable cause was lubrication starvation resulting from the design of the Fafnir bearing. Root cause determination efforts were thorough.

E2.5 External Corrosion of Piping

a. Inspection Scope (92902)

In November 1997, the licensee identified external corrosion on the 3A and 3B emergency diesel generator (EDG) fuel oil transfer piping where the piping entered the ground in a "french drain." In April 1998, while removing the corrosion for pipe wall thickness measurements, the EDG 3A fuel oil transfer pump discharge piping developed a small leak. See NRC Inspection Report (IR)50-250,251/98-04, for details of this problem.

On February 16, 1998, subsequent to Unit 3 manual trip and automatic auxiliary feedwater (AFW) initiation on low steam generator level, a steam leak was noted in the turbine structure. The steam leak was determined to be from a two-inch steam trap drain line off the common train 2 AFW steam supply line. The leak was caused by severe external corrosion of the pipe. See IR 50-250,251/98-02 for details.

During the current inspection, the inspectors examined the licensee's corrective actions for the two instances of external piping corrosion.

b. Observations and Findings

For the EDG fuel oil piping, the licensee issued Condition Report (CR) 97-1953 to document the problem and corrective actions. Supplement 1 to the CR documented the final disposition of the problem. The inspectors examined the corrective actions, which are summarized as follows:

- The affected 3A EDG fuel oil transfer pump discharge piping was cut out and replaced. Similar corrosion was identified on the 3A and 3B suction piping. Discharge piping for 3B EDG was not affected since it entered the ground through concrete and did not enter the "french drain." The corrective actions included initiation of a modification (Plant Change Modification PCM 98-028) to replace the transfer pump piping with above ground piping during the upcoming unit 3 refueling outage.

- During an attempt to clean the corrosion from the surface of the 3A EDG fuel oil transfer pump pipe to obtain thickness measurements, the pipe developed a leak. As noted above, the section of this line containing the area of severe corrosion and the leak was cut out and replaced. A metallurgical analysis of the degraded discharge piping was performed and documented in Metallurgical Report MET-98-119. The metallurgical analysis of the pipe showed the corrosion to be a pitting corrosion, with the most severe degradation extending approximately 45 degrees around the circumference of the pipe. The thickness around the circumference of the pipe ranged from 0.216" (essentially original thickness) to zero at the point of the leak. The pipe was not leaking prior to preparation for thickness measurements.

Therefore, the leak could have been caused by damaging the pipe during the corrosion removal process or removing corrosion products from a small hole in the pipe. The cause of the corrosion was determined to be the location of the piping in the "french drain," which allowed water to accumulate and repeatedly wet the piping during rainy periods. Also, the piping was not wrapped and coated in accordance with the site piping specification. Based on inspection of other similar piping, the licensee considered that the lack of wrapping and coating was isolated and most likely a result of previous modifications in the area where the pipe entered the ground. The other end of the pipe was wrapped and coated as required by the piping specification.

- The engineering analysis showed that hoop stresses were controlling for all design conditions and that a minimum wall thickness of only 0.010" was needed to maintain functionality (degraded but operable). The analysis also showed that structural integrity of the piping would be maintained with a hole in the pipe of ≤ 1/16". The system is designed for 125 psi with a working pressure of only 17 psi.

- Operability assessment - Based on the engineering analysis, the assessment concluded that the 3A discharge piping with the as-found corrosion was operable. For 3A and 3B suction piping, the operability assessment concluded that the piping was operable and will continue to be operable until replacement during the upcoming refueling outage. The conclusions were based on: (1) the engineering analysis showing that only 0.010" wall thickness was needed for functionality, (2) adding allowances (0.070") for corrosion (until replacement) and thickness measurement uncertainties, and (3) thickness measurements showing minimum wall thickness in excess of 0.080" (0.134 for 3A suction and 0.097" for 3B suction) for the 2 pipes.

- System engineers performed walkdown inspections of similar Unit 4 EDG fuel oil piping and other safety-related and risk-significant plant piping systems that could be susceptible to similar corrosion problems. No other problems were identified. The Unit 4 EDG fuel oil piping is configured differently and does not enter a "french drain". Also, the required wrapping and coating is evident at ground level where the Unit 4 piping enters the ground.

- Other corrective actions included revision of Procedure EDI-SE-005 (Component and System Walkdowns) and formal system engineer walkdown training to specifically address inspection of underground piping at ground level to detect similar degraded piping conditions. At the time of the current inspection, the training had been completed, and the procedure revision was scheduled, but not yet complete.

Based on review and evaluation of the above corrective actions, the inspectors concluded that appropriate corrective actions had been taken, or were planned, for external corrosion on the EDG fuel oil transfer piping and any similar piping in other systems. Section E2.2 of this report contains additional discussion of this issue.

For the AFW piping, the licensee issued CR 98-0276 to document the problem and corrective actions. Supplement 1 to the CR summarizes the corrective actions for this problem. The inspectors examined the corrective actions, which included the following:

- Based on analysis of the severely corroded AFW pipe, the licensee determined that the following conditions were present and contributed to the corrosion: (1) piping normally isolated or at low pressure/temperature and insulated, (2) piping un-coated and susceptible to corrosion (carbon steel), (3) disruption points in the insulations which have vertical (upward) or horizontal openings that create the potential for water intrusion, and (4) sections of the system exposed to typical weather conditions such that normal rain, etc. would provide a repetitive source of wetting. AFW piping was reviewed using this criteria and susceptible areas inspected and repaired as required.

- In addition to the specific actions for the AFW piping, generic corrective actions for all plant piping that might be susceptible to this type external corrosion were initiated. System engineers were trained and all piping (Safety-related, risk significant, and balance of plant) was walked down and evaluated for susceptibility for external corrosion based on the above 4 criteria. Also the issue was reviewed with senior reactor operators (SROs) for input as to what systems or portions of systems would meet the above criteria from an operational aspect. In addition to the AFW piping, specific areas in 6 other systems were determined to be susceptible as follows: (1)standby feedwater system, (2) main steam dump to atmosphere valves, (3) auxiliary steam to the condenser water box priming ejectors, (4) feedwater warm-up line from Units 1 and 2, (5) feedwater heaters, and (6) load center/switchgear HVAC chilled water piping and computer/cable spreading room HVAC. Inspection of the areas to determine if corrosion is present will require removal of insulation. All inspections are planned for completion by the end of the next refueling outage for each unit (Fall of 1998 for Unit 3 and Spring of 1999 for Unit 4).

- The corrective action also included development of an augmented inspection program for periodic inspections of susceptible piping. This is scheduled for completion by August 31, 1998.

Based on review and evaluation of the above corrective actions, the inspectors concluded that appropriate corrective actions had been taken, or were planned, to address external corrosion on the AFW piping and any similar piping in other systems.

c. Conclusions

The licensee was adequately addressing the specific and generic problems with external corrosion of piping.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Transportation of Radioactive Materials

a. Inspection Scope (86750)

Radioactive waste and radioactive material transportation documentation were reviewed for compliance with NRC and Department of Transportation (DOT) requirements.

b. Observations and Findings

The inspectors randomly selected shipments of radioactive waste and radioactive materials and reviewed the licensee's documentation for those shipments. The inspectors found the licensee's classifications were appropriate. Shipping papers, radiation surveys, vehicle inspections, package handling and loading, and notification forms were properly documented and maintained.

c. Conclusions

Radioactive waste and radioactive material transportation documentation met licensee, NRC, and DOT regulatory requirements. Reviewed shipping documentation and records were properly completed.

R2 Status of RP&C Facilities and Equipment

R2.1 Radiological Effluent Monitoring Equipment

a. Inspection Scope (84750)

Ensure licensee radiological monitoring and site meteorological monitoring equipment were adequately maintained and capable of performing intended functions.

b. Observations and Findings

The inspectors visually inspected radiation monitors and verified the monitors were operable and in satisfactory condition. Calibration and surveillance records were sampled and reviewed. The licensee's calibration and surveillance records were adequate and completed in accordance with approved procedures.

The inspectors also reviewed the status of the meteorological monitoring program. The inspectors found that the meteorological station monitoring equipment was generally reliable and provided good information as needed. The meteorological equipment was maintained by the Land Utilization Group which had previously reported to the licensee's corporate offices. However, the group had recently been assigned to the site staff. The inspector noted that the procedures format and controls did not meet plant procedure standards. Licensee personnel reported the procedures were being revised to meet applicable requirements.

c. Conclusions

The radiological effluent monitors and site meteorological station and instrumentation were adequately maintained.

R2.2 Engineered Safety Features (ESF) Filtration Testing

a. Inspection Scope (84750)

The latest test results of ESF filtration systems were reviewed to verify the Technical Specifications (TS) surveillance requirements for the systems were met.

b. Observations and Findings

The inspectors reviewed surveillance records for the Emergency Containment Filter, Post Accident Containment Vent, and Control Room Emergency Ventilation systems. Records included system performance test, high efficiency particulate air filter and absorber filter leak test, and laboratory analysis of charcoal absorber samples.

While reviewing 0-O.P.-051.7, Post-Accident Containment Vent System Filter Performance Test, dated August 23, 1995, inspectors found the equation for determining penetration was incorrect. Using the documented data with the formula did not result in the test results recorded in October 8, 1996 and June 5, 1997 surveillances. The equation was incorrect in steps 7.5.21.1, 7.8.23.1, 7.6.23.1 and 7.9.23.1. The procedure had been utilized at least twice since the latest procedure revision. However, the equation error had not been identified in either of those tests. The findings were made following the inspection exit meeting and when the staff was unavailable to evaluate the apparent procedure inadequacies. The inspectors reported the findings to the licensee's staff in a telephone call August 10, 1998. Licensee personnel reported they had begun a review of the 0-O.P.-051.7 procedure approximately two weeks earlier and had already identified the formula error identified by the inspectors.

Licensee staff reported the personnel performing the surveillances were experienced and knew the correct equation for calculating the filter penetrations. Testing personnel had relied on memory and not the procedure when the penetration calculations were performed. The

recorded surveillance measurements, when utilized with the correct equation, resulted in acceptable test data. The inspectors concluded the licensee's surveillances performed on October 8, 1996 and June 5, 1997 demonstrated the filter was capable of performing intended functions. The licensee subsequently reported that a temporary change to the 0-O.P.-051.7 procedure had been made to correct the penetration equation.

During the same telephone call the inspectors also inquired about the timeliness of the licensee's review of completed TS surveillances. The inspectors noted the Post Accident Containment Vent System Filter Performance Test completed June 5, 1997 had not been reviewed or approved until August 6, 1998. The licensee's review date was the same date the inspector had received copies of the surveillances. Licensee representatives reported the timeliness of the TS surveillances reviews would be evaluated and the findings would be reported to the inspectors. Seven of the 13 surveillances reviewed by the inspectors were completed in 1997 but had not received a review until August 6, 1998.

In an August 12, 1997, telephone conference call, the inspector determined that a backlog of completed surveillances had been previously identified in a licensee Condition Report (CR) issued in January 1998. The CR was closed in March 1998. Licensee representatives reported the engineering department still had a file cabinet containing surveillances backlogged for final review. The resident inspectors conducted additional review of this issue. Subsequently, the licensee determined that despite the January, 1998 CR addressing the problem, the corrective actions to complete review and transmittal to quality assurance records were not completed as of August. The licensee initiated review of the backlog of completed surveillances. Additionally, CR 98-1175 was initiated to address the incomplete corrective actions. The inspectors concluded that the immediate corrective actions were adequate to address the problem. This was the second example identified this inspection period in which corrective actions were not aggressively pursued for an identified problem.

c. Conclusions

The inspectors verified that the licensee was performing required TS surveillances for engineered safety feature filtration systems. However, the licensee's review of some completed ESF surveillances was not timely or sufficient to identify procedure errors.

R3 RP&C Procedures and Documentation

R3.1 Radiological Effluents and Annual Radiological Effluent Release Report

a. Inspection Scope (84750)

The report was reviewed to verify reporting requirements were met and to review the licensee's efforts to minimize radiological effluents.

b. Observations and Findings

The inspectors compared the quantities of liquid and gaseous releases in 1996 and 1997 to those released in recent years. The quantities of radioactive material released in liquid and gaseous effluents in 1995 were the sites lowest at that time. The gases released in 1996 and the liquids released in 1997 were slightly higher than those low values while the 1996 liquids and the 1997 gases were the lowest annual quantities released. Overall the quantities released in recent years have continued to decline. The 1996 and 1997 radiological effluents were well within effluent release limits.

In 1998 the licensee had not made any gaseous batch releases. The licensee was holding gases in Waste Gas Decay Tanks (WGDT) for maximum decay.

There was an unplanned gas release of the "F" WGDT in May 1996. The release path was through planned release of WGDT "A." A valve failure was identified as the cause. The remaining contents of the "F" tank were sampled and the quantity of gas released determined. The licensee investigated and documented the event in a CR and took corrective actions to prevent recurrence. No radiological effluent release limits were exceeded.

There was one unplanned gas release in March 1997, when the "F" WGDT was released through the Unit 3 Reactor Coolant Drain Tank into the Unit 3 Containment Building. The licensee sampled the "F" WGDT and prepared a permit for the release. The inspector reviewed the licensee's investigation and corrective action concerning the release. Inadequate control of system clearances was identified as root cause. Corrective actions included procedure changes and operator training. No radiological effluent release limits were exceeded.

c. Conclusions

The 1996 and 1997 annual radiological effluent report met applicable requirements and no adverse trends in radiological effluents were identified. All radiological effluents were well within release limits. The licensee continued to reduce the quantities of radiological effluents released.

R8 Miscellaneous RP&C Issues

R8.1 Bioassay Records

a. Inspection Scope (83750)

The inspectors reviewed selected records of worker whole body count results to assess whether the licensee was following their procedures for personnel leaving the site. Regulatory requirements for performing radiological surveys are in 10 CFR 20.1501.

b. Observations and Findings

Whole body count and security records for selected individuals were reviewed. As part of the initial process for obtaining an initial whole body count and a Thermoluminescent Dosimeter (TLD) required for work in a radiologically controlled area, the licensee required personnel to sign Form HP-11B, Turkey Point Nuclear Plant Health Physics Policy Summary, Rev. 1, 01-22-91. This form described eight responsibilities for radiation workers. It specifically instructed the individual to obtain a terminating whole body count/bioassay.

Selected records were reviewed which showed individuals had received entrance whole body counts and, upon termination, exit whole body counts. Also, records were reviewed for one case where an individual left the site with a low level of internal contamination. The licensee performed a detailed dose assessment to quantify the individual's dose due to that internal deposition. The individual's exposure record was properly up dated to include the radiation exposure from that internal deposition of radioactivity.

c. Conclusions

No violations of regulatory requirements were identified. The licensee properly followed their established internal procedures and regulatory requirements to assess radiation doses as a result of internally deposited radioactivity for workers terminating employment.

P1 Conduct of EP Activities

P1.1 Response to Unannounced Emergency Preparedness (EP) Drill (71750)

On August 18, the licensee conducted an unannounced off-hours augmentation EP drill to evaluate the effectiveness of EP facility activation. The primary drill objectives addressed timeliness of facility activation and adequacy of staffing for those facilities. The inspectors discussed the drill results with the EP coordinator and attended a meeting on the identified drill deficiencies. During the drill, the licensee experienced some difficulty manning the Operations Support Center. There was also a deficiency in the timeliness of manning the Emergency Operations Facility. As a result, the licensee initiated CR 98-1202 to evaluate the cause and determine the appropriate corrective actions. The inspectors reviewed the drill deficiencies with the emergency preparedness coordinator and reviewed the planned corrective actions. The licensee's initial actions in response to self-identified deficiencies for an unannounced off-hours drill were reasonable.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results for the Health Physics inspection to members of the licensee management at the conclusion of the inspection on August 6, 1998. The license acknowledged the findings presented. Additional discussions were conducted by telephone on August 10 and 12 regarding the health physics inspection.

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on August 28, 1998. The licensee acknowledged the findings present.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. V. Abbatiello, Quality Assurance Manager
G. E. Hollinger, Licensing Manager
R. J. Hovey, Site Vice-President
D. E. Jernigan, Plant General Manager
T. O. Jones, Acting Operations Manager
J. E. Kirkpatrick, Protection Services Manager
R. J. Kundalkar, Vice President, Engineering and Licensing
M. L. Lacal, Training Manager
C. L. Mowrey, Licensing Specialist
M. O. Pearce, Maintenance Manager
R. E. Rose, Work Control Manager
W. A. Skelley, Plant Engineering Manager
E. A. Thompson, Site Engineering Manager
D. J. Tomaszewski, Systems Engineering Manager
J. C. Trejo, Health Physics/Chemistry Supervisor
G. A. Warriner, Quality Surveillance Supervisor

Other licensee employees contacted included construction craftsmen, engineers, technicians, operators, mechanics, and electricians.

INSPECTION PROCEDURES USED

IP 37550:	Engineering
IP 37551:	Onsite Engineering
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Prevent Problems
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observations

IP 71707:	Plant Operation
IP 71750:	Plant Support Activities
IP 83750:	Occupational Exposure
IP 84750:	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 86750:	Solid Radwaste Management and Transportation of Radioactive Materials
IP 92902:	Followup - Maintenance

ITEMS OPENED AND CLOSED

Opened

50-250,251/98-08-01	NCV	Failure to Implement Effective Corrective Actions for ICW Valve Failure (section O1.2).
50-250,251/98-08-02	NCV	Failure to meet ANSI qualification criteria for GML position (section M5.1).

Closed

50-250,251/98-08-01	NCV	Failure to Implement Effective Corrective Actions for ICW Valve Failure (Section O1.2).
50-250,251/98-08-02	NCV	Failure to meet ANSI qualification criteria for GML position (section M5.1).
50-250,251/98-04-01	URI	Emergency diesel fuel oil pipe corrosion (section E2.2).
50-250,251/98-07-01	IFI	Root cause of motor generator set fire (section E2.4)