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Licensee: Virginia Electric and Power Company (VEPCO)

Facility: Surry Power Station, Units 1 & 2

Location: 5850 Hog Island Road
Surry, VA 23883

Dates: September 6 - October 24, 1998

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ENCLOSURE

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EXECUTIVE SUMMARY

Surry Power Station, Units 1 & 2
NRC Integrated Inspection Report Nos. 50-280/98-08, 50-281/98-08

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a seven-week period of resident inspection; in addition, it includes the results of announced inspections by a regional reactor inspector and a senior health physics specialist.

Operations

- The shutdown of Unit 1 for a scheduled refueling outage was well executed. During a problem with an electrical breaker, plant conditions were well managed by the control room operations staff (Section O1.2).
- The inspectors performed a detailed walkdown of the Unit 1 containment following plant shutdown. Overall condition of the Unit 1 containment was observed to be very good with minimal leaks noted (Section O1.3).
- Reactor coolant system draindown activities to flange level were well controlled and accomplished in accordance with the procedural requirements (Section O1.4).
- Two tagouts were technically adequate and were in accordance with the licensee's administrative procedures (Section O2.1).
- Portions of the Unit 1 Component Cooling Water system which support spent fuel pit cooling and residual heat removal and the Unit 2 Low Head Safety Injection system were properly aligned and material condition of the equipment was good (Sections O2.2 and O2.3).
- The inspectors determined that the Component Cooling Water system valve alignment procedure did not address all the valves in the system. The licensee issued a deviation report after the inspectors informed management that some of these problems had been identified in June 1997 and no permanent procedure change had been initiated (Section O2.2).
- The reactor operator restoration brief for uninterruptible power supply 2B2 was thorough. Operators exhibited a good questioning attitude by asking questions to ensure that requirements were understood and by discussing previous restoration problems. The operators correctly used simultaneous verification, verified expected system response and adhered to procedures during the restoration (Section O4.1).
- Management Safety Review Committee members exhibited a questioning attitude and utilized open discussion to effectively identify, assess and recommend solutions to technical issues. The inspectors also verified that a quorum was present (Section O8.1).

Maintenance

- Maintenance personnel completed the reactor coolant filter replacement using approved procedures. Appropriate coordination, pre-job preparation, and supervisory oversight enabled the maintenance crew to successfully replace the filter while giving appropriate consideration to as-low-as-is-reasonably achievable principles (Section M1.1).
- Work activities associated with a 480 volt breaker preventive maintenance work order were accomplished in accordance with the procedure requirements (Section M1.2).
- Service water strainer maintenance activities were completed in a thorough and professional manner. Maintenance personnel were knowledgeable of the assigned task, procedures were detailed and actively used on the job, and cooperation and coordination between the various plant groups were good (Section M1.3).
- Control room leakage testing using the Unit 1 cable tunnel air bottles was performed in accordance with procedural requirements and demonstrated the ability to maintain the control room envelope at positive pressure for one hour. Additionally, senior reactor operator oversight was detailed (Section M1.4).
- A violation was identified for failing to follow procedure requirements by running the control room air filtration system with painting occurring in the vicinity of the intake of the system. Pending the licensee's development of corrective actions, this matter will be tracked as an EEI (Section M1.5).
- The post maintenance testing (PMT) program was effective for its intended function and was implemented properly. The PMT program self-assessment identified valuable recommendations, which were being implemented, for improving the program. Deviation reports related to PMT were adequately dispositioned. Post maintenance tests were performed as stated in work orders (Section M1.6).

Engineering

- An informal process was used to ensure an adequate water thermal barrier was being maintained on the containment side of the safety injection containment suction gate valves to prevent pressure locking of these valves during an accident. Once the inspectors identified this to the licensee, a procedure change was issued to give specific formal guidance to plant operators. A 10 CFR 50.59 safety evaluation was performed which supported the revision (Section E1.1).

Plant Support

- Health physics practices were observed to be proper (Section R1).
- The licensee was properly monitoring and controlling personnel radiation exposure during the Unit 1 Refueling Outage and posting area radiological conditions in accordance with 10 CFR Part 20. The licensee had implemented an effective shutdown

chemistry control plan and closely monitored primary coolant chemistry during the shutdown for the Unit 1 Refueling Outage (Section R1.1).

- The overall performance of the emergency response organization during an emergency drill demonstrated the licensee's ability to adequately execute the emergency plan (Section P1.1).
- Improper pre-staging of some personnel during an emergency drill resulted in a failure to demonstrate, by one position, that minimal staffing in the Technical Support Center could be accomplished within the required time frame (Section P1.1).
- Security and material condition of the protected area perimeter barrier were acceptable (Section S1).

Report Details

Summary of Plant Status

Unit 1 operated at power until October 19, 1998, when the unit was shutdown for a scheduled 32-day refueling outage. The unit remained shutdown for the remainder of the inspection period.

Unit 2 operated at power for the entire reporting period.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707, 40500)

The inspectors conducted frequent control room tours to verify proper staffing, operator attentiveness, and adherence to approved procedures. The inspectors attended daily plant status meetings to maintain awareness of overall facility operations and reviewed operator logs to verify operational safety and compliance with Technical Specifications (TSs). Instrumentation and safety system lineups were periodically reviewed from control room indications to assess operability. Frequent plant tours were conducted to observe equipment status and housekeeping. Deviation reports (DRs) were reviewed to assure that potential safety concerns were properly reported and resolved. The inspectors found that daily operations were generally conducted in accordance with regulatory requirements and plant procedures.

O1.2 Unit 1 Shutdown for Refueling Outage

a. Inspection Scope (71707)

The inspectors observed and assessed the performance of the operating crew during the shutdown of Unit 1 for a planned refueling outage.

b. Observations and Findings

On October 19, the inspectors observed the shutdown of Unit 1 for a planned 32-day refueling outage. At 1:51 a.m., the unit was removed from the grid, and the reactor was manually tripped at 1:59 a.m. Prior to removing the unit from the grid, the operators experienced a problem in shifting house electrical loads from the unit station service transformers to the reserve station service transformers due to a breaker malfunction. This problem was well managed by the control room staff. All necessary operations personnel were kept well informed of the status of the troubleshooting activities. While personnel were evaluating the matter, the power reduction was halted, and all key plant parameters were closely monitored by the operators until the breaker malfunction was resolved. Overall, the shutdown was well executed and performed in accordance with plant procedures.

c. Conclusions

The shutdown of Unit 1 for a scheduled refueling outage was well executed. During a problem with an electrical breaker, plant conditions were well managed by the control room operations staff.

O1.3 Unit 1 Containment Walkdown

a. Inspection Scope (71707)

The inspectors performed a detailed walkdown of the Unit 1 containment following entry into the cold shutdown condition.

b. Observations and Findings

On October 20, the inspectors performed a detailed walkdown of all major areas of the Unit 1 containment once containment vacuum was broken and cold shutdown was achieved. The walkdown included all elevations, reactor coolant pump cubicles, reactor coolant system (RCS) loop rooms, the pressurizer cubicle, the containment sump, and seal table room. The overall condition of the containment for a unit that had been operating for an extended period was very good in that; 1) Leakage from piping systems was noted to be minimal, 2) The sump was free of any debris, 3) Material condition of components was good, and 4) No excess material was located within the containment.

c. Conclusions

The inspectors performed a detailed walkdown of the Unit 1 containment following plant shutdown. Overall condition of the Unit 1 containment was observed to be very good with minimal leaks noted.

O1.4 Unit 1 Draindown to Flange Level

a. Inspection Scope (71707)

The inspectors observed portions of the activities associated with lowering RCS water level to allow removal of the Unit 1 reactor vessel head.

b. Observations and Findings

The inspectors observed control room activities associated with lowering RCS level from 22 percent pressurizer level to flange level to allow removal of the reactor vessel head. The activity was controlled by procedure 1-OP-RC-004, "Draining the RCS to Reactor Flange Level," Revision 9. The inspectors reviewed the procedure prior to initiation of the draindown and verified that the required initial conditions were met. The inspectors also independently verified that the RCS standpipe was properly aligned and capable of providing accurate RCS indication prior to initiation of the evolution. The activity was well controlled and accomplished in accordance with the procedural requirements.

c. Conclusions

Reactor coolant system draindown activities to flange level were well controlled and accomplished in accordance with the procedural requirements.

O2 Operational Status of Facilities and Equipment

O2.1 Equipment Tagging Observations (71707)

The inspectors reviewed equipment isolation tagouts, 2-98-EP-0022, "Uninterruptible Power Supply (UPS) Panel 2B2," and 1-98-VS-0115, "Self Cleaning Strainer Continuous B #3 MER." The tagouts, while in effect, were reviewed for technical and administrative adequacy. Tagout, 2-98-EP-0022, was also reviewed after it had been cleared. The inspectors verified that the equipment was restored, returned to service appropriately, and that tags were removed. The inspectors found that the two tagouts were technically adequate and were in accordance with the licensee's administrative procedures.

O2.2 Unit 1 Component Cooling System

a. Inspection Scope (71707)

The inspectors walked down portions of the Unit 1 Component Cooling (CC) system and reviewed the system valve alignment procedure against the system drawing. The inspectors performed the walkdown on the portion of the CC system associated with the spent fuel pit coolers and the Unit 1 residual heat removal system outside containment.

b. Observations and Findings

The CC system is not required to mitigate an accident; however, the system supplies cooling water to the spent fuel pit heat exchanger and makeup to the charging pump cooling water system. The CC system was properly aligned and material condition was good on the portion of the system reviewed. During review of the system alignment procedure 1-OP-51.1A, "Component Cooling System Alignment," Revision 5, the inspectors identified a large number of valves that were not addressed in the procedure. The vast majority of the valves identified as not being in the valve alignment procedure were vent and drain valves, however, some flow path valves were identified that were not verified by the valve alignment procedure. The inspectors identified that in procedure 1-OP-51.1A valves 1-CC-710 and 1-CC-781 were incorrectly identified and were specified to be in an incorrect position. These two valves were actually part of the charging pump cooling water system and were in the correct position as specified by that system's operating procedure. The inspectors also identified several pieces of equipment that had been isolated and abandoned in place. The procedure specified valve alignments that would place some of the abandoned equipment in service.

The inspectors discussed these items with operations personnel and independently verified that the flow path valves were in their correct position, including the valves that

were incorrectly identified on the valve alignment procedure. Subsequent discussions with operations personnel determined that the incorrectly identified valves and the valve position discrepancies associated with abandoned in place equipment had been previously identified by operations personnel in June 1997 and that a one time use only procedure change had been issued at that time. The licensee had not initiated a permanent procedure change. The licensee issued a deviation report to document and correct the procedure problems identified by the inspectors. The inspectors expressed a concern to licensee management that a procedure problem involving configuration management had been allowed to remain uncorrected for over a year.

c. Conclusions

The portions of the Unit 1 Component Cooling Water system supporting spent fuel pit cooling and residual heat removal were properly aligned and material condition of the equipment was good.

The inspectors determined that the Component Cooling Water system valve alignment procedure did not address all the valves in the system and required two valves to be in incorrect positions. The licensee issued a deviation report after the inspectors informed management that some of these problems had been identified in June 1997 and no permanent procedure change had been initiated.

O2.3 Unit 2 Low Head Safety Injection System

a. Inspection Scope (71707)

The inspectors performed a walkdown of the Unit 2 Low Head Safety Injection (LHSI) system.

b. Observations and findings

During the inspection period, the inspectors performed a walkdown of the Unit 2 LHSI system. The inspectors reviewed the associated system drawings, valve alignment procedure, and inspected accessible portions of the system to verify proper valve alignment and material condition. The system was found to be in good material condition and properly aligned for standby operation.

c. Conclusions

The Unit 2 Low Head Safety Injection system was found to be in good material condition and properly aligned for standby operation.

O4 Operator Knowledge and Performance

O4.1 Uninterruptible Power Supply (UPS) 2B2 Restoration

a. Inspection Scope (71707, 62707)

The inspectors observed the control and performance of the UPS 2B2 restoration following preventive maintenance.

b. Observations and Findings

The inspectors attended the brief held for the operators participating in the restoration of UPS 2B2. The brief was conducted by the reactor operator supervising the evolution. The brief was very thorough, using a briefing checklist to ensure that all important information was addressed and understood. The operators exhibited a good questioning attitude, drawing upon lessons learned from past UPS restorations to avoid potential problems.

The UPS 2B2 restoration was observed by the inspectors, and was found to be well coordinated and systematically controlled. The operators correctly used simultaneous verification for equipment tag removal and component operation to ensure that the sensitive evolution of restoring UPS 2B2 was completed in accordance with procedural requirements. The inspectors observed the operators display the good practice of verifying proper system response after the performance of each action. Operators performing the UPS 2B2 restoration were observed to use proper three part communications with one another throughout the evolution.

c. Conclusions

The reactor operator restoration brief for the uninterruptible power supply 2B2 was thorough. Operators exhibited a good questioning attitude by asking questions to ensure that requirements were understood and by discussing previous restoration problems. The operators correctly used simultaneous verification, verified expected system response and adhered to procedures during the restoration.

O4.2 Tour with the Service Building Inside Operator (71707, 71750)

On October 8, the inspectors accompanied the service building inside operator during his routine rounds. This tour included the Unit 1 and Unit 2 switchgear rooms, number 1, 2, and 3 emergency diesel generator rooms, number 1, 2, 3, and 4 mechanical equipment rooms, the station battery rooms, Unit 1 and Unit 2 emergency switchgear rooms and Unit 1 and Unit 2 cable vaults. The inspectors evaluated the operator's attention to detail, familiarity with plant systems, and thoroughness of rounds. The inspectors also checked the rooms for general housekeeping conditions. The inspectors discussed with the operator the operation of several components including the rod control motor generators, the starting air compressors for the emergency diesel generators, and the main feedwater regulating valves. The operator conducted his

rounds in a thorough and professional manner and was knowledgeable of plant systems.

O4.3 Tour with the Service Building Outside Operator (71707, 71750)

On October 14, the inspectors accompanied the service building outside operator during his routine rounds. This tour included the auxiliary building, the fuel building, Unit 1 and Unit 2 safeguards buildings, and Unit 1 and Unit 2 main steam valve houses. The inspectors evaluated the operator's attention to detail, familiarity with plant systems, thoroughness of rounds, and radiological work practices. The inspectors also checked the buildings for general housekeeping conditions. The inspectors discussed with the operator the operation of several systems including containment spray, low head safety injection and the fuel oil transfer systems. The operator conducted his rounds in a thorough and professional manner and was knowledgeable of plant systems.

O8 Miscellaneous Operations Issues (92700, 40500)

O8.1 Management Safety Review Committee (MSRC) (40500)

On September 9, 1998, the inspectors attended the quarterly meeting of the MSRC. The committee reviewed and recommended two changes to the Surry Technical Specifications. The committee also reviewed the scope and schedule for the October 1998 Unit 1 outage. The inspectors observed that the MSRC members exhibited a questioning attitude and utilized open discussion to effectively identify, assess and recommend solutions to technical issues. The inspectors also verified that a quorum was present.

O8.2 (Closed) Licensee Event Report (LER) 50-281/96006-00: Auto reactor trip due to steam/feed flow mismatch coincident with a low SG level. This LER describes a reactor trip from 11 percent power during a reactor shutdown. The event was discussed in NRC Inspection Report Nos. 50-280, 281/96-12. The inspectors reviewed the LER and found the licensee corrective actions acceptable.

O8.3 (Closed) LER 50-281/97001-00: Manual reactor trip and ESF actuation due to loss of EHC control power. This LER describes a manual reactor trip due to a loss of electro-hydraulic control power. The event was discussed in NRC Inspection Report Nos. 50-280, 281/97-02. The inspectors reviewed the LER and found the licensee corrective actions acceptable.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Reactor Coolant Filter Replacement

a. Inspection Scope (62707)

The inspectors witnessed maintenance personnel perform the replacement of a reactor coolant filter. The inspectors reviewed procedures associated with the activity.

b. Observations and Findings

On September 29, the inspectors witnessed maintenance personnel perform the replacement of the 1-CH-FL-2 reactor coolant filter. The activity was performed in accordance with Procedure 0-MCM-0605-04, "Reactor Coolant Filter Replacement," Revision 5-P4. During the procedure review, the inspectors found minor errors associated with several procedural steps, and referred these procedural discrepancies to the licensee for correction.

The inspectors observed that the filter replacement evolution was well coordinated with adequate supervision present. Supervision provided direction and past lessons learned to the individuals performing the maintenance to assist in minimizing the radiation exposure received. Maintenance personnel involved were successful in completing the filter replacement while implementing methods to maintain the associated dose as-low-as-is-reasonably achievable (ALARA).

c. Conclusions

Maintenance personnel completed the reactor coolant filter replacement using approved procedures. The inspectors identified to the licensee several minor procedural deficiencies. Appropriate coordination, pre-job preparation, and supervisory oversight enabled the maintenance crew to successfully replace the filter while giving appropriate consideration to as-low-as-is-reasonably achievable principles.

M1.2 Breaker Maintenance

a. Inspection Scope (62707)

The inspectors observed motor operated valve breaker maintenance activities.

b. Observations and Findings

The inspectors observed maintenance activities associated with Work Order (WO) 00382734, "PM 480 Volt MCC Breaker 1-98-SI-0012." The work activity was accomplished in accordance with procedure 0-ECM-0306-02, "Motor Control Center Maintenance," Revision 19. The work activity was accomplished in accordance with the work order.

c. Conclusions

Work activities associated with a 480 volt breaker preventive maintenance work order were accomplished in accordance with the procedure requirements.

M1.3 Control Room Chiller 4A Service Water Strainer

a. Inspection Scope (62707)

The inspectors observed the activities associated with the cleaning of the Y-strainer for the Control Room Chiller 4A Service Water system.

b. Observations and Findings

The inspectors observed maintenance personnel cleaning the Y-strainer in the service water supply for the control room chiller in accordance with WO 00397694-01. The chiller had been declared inoperable because of indications that the service water strainer had clogged. Upon opening the strainer, maintenance personnel found mud and biological matter, mainly consisting of worms and hydroids. The strainer was cleaned and the chiller was returned to service. The inspectors determined that the work instructions were adequate and followed, and that technicians were knowledgeable of the assigned task.

c. Conclusions

Maintenance activities involving the service water strainer were completed in a thorough and professional manner. Maintenance personnel were knowledgeable of the assigned task, procedures were detailed and actively used on the job, and cooperation and coordination between the various plant groups were good.

M1.4 Control Room Leakage Test Using the Unit 1 Cable Tunnel Air Bottles

a. Inspection Scope (61726)

The inspectors observed the performance of procedure 1-OSP-VS-002, "Control Room Leakage Test Using the Unit 1 Cable Tunnel Air Bottles," Revision 3, to ensure that the control room could be maintained at positive pressure for one hour using the volume of air from the Unit 1 cable tunnel air bottles.

b. Observations and Findings

On October 18, the inspectors observed the performance of procedure 1-OSP-VS-002. A thorough pre-job brief was conducted by the operator in charge of the test. The test was conducted in accordance with procedural requirements. The control room pressure was maintained at least 0.05 inches of water higher than the adjoining turbine building for one hour as required by TS. In addition, detailed oversight of the test was performed by the Unit 1 senior reactor operator.

c. Conclusions

Control room leakage testing using the Unit 1 cable tunnel air bottles was performed in accordance with procedural requirements and demonstrated the ability to maintain the control room envelope at positive pressure for one hour. Additionally, senior reactor operator oversight was detailed.

M1.5 Painting During Control Room Air Filtration System Flow Test

a. Inspection Scope (62707)

The inspectors reviewed the circumstances involving the running of the control room emergency ventilation system with painting in the vicinity of the ventilation system suction.

b. Observations and Findings

On October 5, during a routine tour of the power station, the inspectors detected the odor of fresh paint near the entrance to the main control room annex. The control room annex entry door provides passage to and from the turbine building breezeway. Upon entering the control room, the inspectors noted that plant operators were performing test 0-OPT-VS-004, "Control Room Air Filtration System Flow Test," Revision 1, which involved the running of the control room emergency ventilation system (fan/filter train 2-VS-F-41). This system contains charcoal filters, which if exposed to paint fumes, degrades the filter's radioiodine retention capability. The inspectors informed the operations staff that a strong odor of paint was evident at the entrance to the control room annex, and expressed a concern of the possible exposure of the charcoal to the paint fumes due to the close proximity of the suction of the 2-VS-F-41 fan to the area in which the fumes were noted.

The operations staff quickly located and secured the painting activity in the cable spreading room. This area is located above the control room and is in the vicinity of the control room air filtration system air intakes. Paint fumes were being drawn into the turbine building from the cable spreading room. The charcoal in the filters was replaced as recommended by the ventilation system engineer, and a deviation report was issued. These actions represented prompt and effective initial followup to this matter.

Following this event, the inspector reviewed procedure 0-OPT-VS-004, and noted that "Precautions and Limitations" Section 4.2 states that to prevent damage to the filter internals, this test shall not be conducted if painting is occurring near the intakes of the Control Room Air Filtration System. This matter is a violation of NRC requirements in that the licensee failed to follow the requirements specified in procedure 0-OPT-VS-004. At the end of the inspection period, the licensee was developing corrective actions to address this event. Pending review of the licensee's proposed corrective actions this matter is identified as EEI 50-280, 281/98008-01.

c. Conclusions

A violation was identified for failing to follow procedure by running the control room air filtration system with painting occurring in the vicinity of the system intake. Pending the licensee's development of corrective actions, this matter will be tracked as an EEI.

M1.6 Post Maintenance Testing (PMT) Program

a. Inspection Scope (62702)

The inspectors reviewed the PMT program, deviation reports (DRs), and work orders (WOs) and observed PMT performance to determine if the PMT program was implemented in accordance with proper procedures and was effective.

b. Observations and Findings

The inspectors discussed the PMT program with the program coordinator and engineers. The procedure for this program is VPAP-2003, "Post Maintenance Testing Program," Revision 7. This program includes the testing of modifications and new installations after the work is completed and before the components or systems are released to service. The PMT program provides the vehicle for electronically tracking the testing requirements or technical reviews following maintenance, modifications, or new installations. Testing for modifications and new installations were normally specified in design change packages.

The licensee oversight group performed self-assessment SLA 98-09, "Effectiveness of the PMT Program," in June 1998 in response to Violation 50-281/97012-03 which was issued for missed PMT after maintenance was completed on the Unit 2 turbine driven auxiliary feedwater pump governor. The purpose of the self-assessment was to ensure the PMT program was effective and implemented properly. The self-assessment reviewed the adequacy of the program, reviewed PMT related DRs, evaluated process and implementation of the PMT, and discussed the program with the personnel of various departments using the program. The self-assessment concluded that the program was effective to identify the required PMT. The licensee was in the process of implementing the self-assessment's five recommendations for improving the program. The inspectors reviewed the self-assessment and its recommendations and considered that the assessment was a good vehicle for making valuable recommendations.

The inspectors reviewed 25 DR summaries generated in the last one and one half years related to PMT. The inspectors discussed 10 DRs with the program coordinator and reviewed the details contained in the DRs. The inspectors found that only three cases were related to PMT problems. The inspectors found that the DR related to the problems stated in Violation 50-281/97012-03 for failure to follow work procedures was the only example where PMT was missed. The second case was one where the required PMT was not performed for the component and was detected through the PMT data review. The licensee then performed the PMT for the component. The third case involved required PMT that was added through the PMT data review after the maintenance was completed. These cases were considered isolated cases.

The inspectors reviewed 30 work orders which were completed in the last five years on valves and valve operators for the residual heat removal and safety injection systems. The purpose of the review was to determine if PMT was performed in accordance with the requirements stated in the PMT data sheets. Based on the documentation reviewed the inspectors determined that the PMT were performed as required.

The inspectors observed two post maintenance test in the field. One was related to returning UPS 2B-2 to service after maintenance and cleaning. The licensee used procedure 2-MOP-EP-004, "Removal from Service and Return to Service of UPS 2B-2 Components," Revision 2, for the testing. The tests included functionality checks for the breaker, switch, and light indicators. The UPS 2B-2 was successfully returned to service. The other observed post maintenance test was associated with emergency service water pump 1-SW-P-1A. The maintenance performed on the pump included repacking the annubar (WO 00395683-01) and replacing shims and aligning the engine (WO 00389989-01). The tests performed were associated with maintenance and operation of the pump. The procedure used for the maintenance test was 0-MCM-0703-01, "Emergency Service Water Pump Diesel Engine Service and Inspection," Revision 3. Maintenance personnel performed an overspeed trip test to adjust the governor trip setpoints within 1920 and 1960 RPMs. Maintenance personnel made several adjustments before obtaining trip setpoints within the allowable range. Operation personnel performed a functional test by using procedure 0-OP-SW-002, "Emergency Service Water Pump Operation," Revision 7. Pump vibration data taken during the test was within the acceptable range. All the tests were performed in accordance with the correct procedures and were adequate.

The inspectors concluded that the PMT program was effective as stated in the self-assessment.

c. Conclusions

The post maintenance testing (PMT) program was effective for its intended function and was implemented properly. The PMT program self-assessment identified valuable recommendations, which were being implemented, for improving the program. Deviation reports related to PMT were adequately dispositioned. Post maintenance tests were performed as stated in work orders.

M8 Miscellaneous Maintenance Issues (92700, 92902)

- M8.1 (Closed) LER 50-280, 281/97007-00: Outside Appendix R design basis due to vital Bus isolation issue. This LER was submitted when it was noted that there was no means to isolate the UPSs from the 120 VAC vital busses in the event of a control room fire. This condition could lead to a loss of power to the Appendix R Remote Monitoring Panels. This event was discussed in NRC Inspection Report Nos. 50-280, 281/97-09 and resulted in the issuance of a Notice of Violation (EA 97-474, 01013). The inspectors reviewed the LER and the proposed corrective actions to prevent recurrence and found them adequate.

M8.2 (Closed) Violation (VIO) 50-281/97012-03: Failure to follow work instructions related to the Unit 2 TDAFW governor replacement. The licensee revised the response to this violation in correspondence dated April 14, 1998. The revised response listed five commitments for corrective actions to resolve the violation. The five commitments were case study training, additional training for mechanical maintenance supervisors, procedural clarifications, PMT matrix revisions, and an assessment of the PMT program. The inspectors reviewed the five commitments stated in the response. Only the procedural clarifications remain to be completed. The licensee sent seven people to Woodward Governor Company for governor maintenance and adjustment training. The licensee conducted several meetings to discuss the problems among management, supervisors, engineers, and maintenance personnel for the root cause and resolution of this violation. The PMT matrix was revised. A self-assessment was performed, SLA 98-09, "Effectiveness of the PMT Program," which was evaluated in Section M1.6 of this report.

III. Engineering

E1 Conduct of Engineering

E1.1 Operation of Containment Sump Pumps to Ensure Adequate Coverage of Safety Injection (Recirculation Spray) Sump Suction Valves

a. Inspection Scope (37551)

The inspectors reviewed the licensee's practice of periodically placing the containment sump pumps in the off position during normal at power operation.

b. Observations and Findings

The licensee periodically places the containment sump pumps in the off position during normal at power operation. These sump pumps are used to remove routine sump leakage during normal operation and are not used for accident mitigation. When questioned about this practice, the licensee stated that this was done to ensure that a thermal barrier of water was kept on the containment side (in the recirculation spray sump) of the safety injection containment suction gate valves to prevent pressure locking of these valves during an accident (as described in NRC Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves"). Specifically, when recirculation spray sump level indication drops below the minimal detectable reading (due to evaporative losses), the containment sump pumps are placed in the off position so that the containment sump will fill and overflow into the adjoining recirculation spray sump (a weir divides the two sumps). Once the recirculation spray sump level indication is returned to a detectable level, the containment sump pumps are returned to a normal status with one pump in automatic and one in standby. While the pumps are in the off position, the containment sump high level alarm is locked in until the sump pumps are returned to the normal status. Thus, neither the alarm function nor indications of the sump pumps cycling on and off are available to the operators to provide indication of abnormal leakage inside the containment.

Review of the matter by the inspector revealed that this practice was not recognized by the Updated Final Safety Analysis Report (UFSAR), nor was it procedurally controlled. UFSAR paragraph 4.2.7.1.4 states that the containment sump level instrumentation is one of the backup methods of detecting primary system leakage. These facts were brought to the attention of licensee management. The licensee took the following actions; 1) Initiated and completed a procedure change to 1-PT-36 and 2-PT-36, "Instrumentation Surveillance," to give the operators specific instructions to add water to the recirculation spray sump by placing the sump pumps in the off position, and 2) Performed a 10 CFR 50.59 safety evaluation which supports this practice. The inspectors reviewed these actions and found them to be satisfactory. In no case, did the inspectors observe or determine that an adequate amount of water was not being maintained on the containment side of the safety injection containment suction gate valves. The lack of a procedure for maintaining an adequate thermal barrier constituted an informal control of an important action necessary to ensure the valves could be operated under accident conditions. The licensee's actions to correct this matter were appropriate.

c. Conclusions

An informal process was used to ensure an adequate water thermal barrier was being maintained on the containment side of the safety injection containment suction gate valves to prevent pressure locking of these valves during an accident. Once the inspectors identified this to the licensee, a procedure change was issued to give specific formal guidance to plant operators. A 10 CFR 50.59 safety evaluation was performed which supported the revision.

E8 Miscellaneous Engineering Issues (92903)

- E8.1 (Closed) VIO 50-280, 281/96010-01: Failure to promptly identify and correct deficient Unit 2 FLOWCALC condition. This item was previously addressed in NRC Inspection Report Nos. 50-280, 281/98-04. That inspection determined that all but low priority corrective actions had been completed. The inspectors reviewed the licensee actions to address the open items. The inspectors determined that progress had been made in closing the items and that documented due dates had been established and are being tracked in the commitment tracking system for items not closed.
- E8.2 (Closed) VIO 50-281/96013-01: Weld undersize problems for supports in letdown line piping. This violation was issued for several undersized welds found in various supports in the weld shop after the licensee weld inspector accepted the welds. The licensee immediately issued DR S-96-2702 for the root cause analysis and corrective actions to prevent recurrence. The undersized welds were immediately upgraded to meet drawing requirements and the supports were installed on the letdown line piping. The violation response stated that the root cause was that the individual weld inspector misunderstood the weld acceptance requirements. The corrective actions committed in the response included a retest of this individual to regain his certificate, reinforcements of the weld acceptance requirements for other weld inspectors, and reexamination of the welds performed by this individual after he received the certificate as a weld inspector.

The inspectors reviewed the root cause analysis and corrective actions completed which were consistent with the response.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls (71750)

On numerous occasions during the inspection period, the inspectors reviewed Radiation Protection (RP) practices including radiation control area entry and exit, survey results, and radiological area material conditions. No discrepancies were noted, and the inspectors determined that RP practices were proper.

R1.1 Occupational Radiation Exposure Control Program

a. Inspection Scope (83750)

The inspectors reviewed implementation of selected elements of the licensee's radiation protection program during the current Unit 1 Refueling Outage (RFO). The review entailed observation of radiological protection activities including personnel exposure monitoring, radiological postings, verification of posted radiation dose rates and contamination levels within the radiologically controlled area (RCA), and primary coolant shutdown chemistry controls for dose rate reduction. Those activities were evaluated for consistency with the programmatic requirements, personnel monitoring requirements, occupational dose limits, radiological posting requirements, and survey requirements specified in Subparts B, C, F, G, and J of 10 CFR 20.

b. Observations and Findings

The inspectors conducted frequent tours of the RCA to observe radiation protection activities and practices. Personnel preparing for routine entries into the RCA were observed being briefed on the radiological conditions in the areas to be entered. The briefings were given by radiation control personnel before access was granted and covered the dosimetry and the protective clothing and equipment required by the Radiation Work Permit (RWP) for the entry. The administrative limits for the allowed dose and dose rate for the entry were emphasized during the briefings. The briefings provided thorough descriptions of the existing dose rates which could be encountered during the entry. The inspectors determined that personnel entering the RCA were adequately briefed on the radiological hazards which could be encountered while in the RCA and the radiological protective measures required to be taken during the entry. Individuals at selected job sites were interviewed and it was determined that the workers were aware of their administrative dose and dose rate limits, the work area dose rates, the proximate low-dose waiting areas, areas of high contamination, and protective clothing required by the RWP. The inspectors concluded that the licensee had adequately informed workers of the radiological conditions existing in work areas and the protective measures required to be taken while in the work areas.

The inspectors observed the use of personal radiation exposure monitoring devices by personnel entering and exiting the RCA. Thermoluminescent dosimeters (TLDs) were

used as the primary device for monitoring personnel radiation exposure. In addition, digital alarming dosimeters (DADs) were used for monitoring the accumulated dose and the encountered dose rates during each RCA entry. The DADs were set to alarm at administrative limits established for the specific RWP under which the RCA entry was being made. As the individuals exited the RCA the accumulated dose and encountered dose rate information was transferred from the DADs to the Personnel Radiation Exposure Management System (PREMS) data base in order to track individual exposures. During tours of the RCA the inspectors noted that the required dosimetry was being properly worn by personnel when entering and while in the RCA. The inspectors also noted that personnel exiting the RCA routinely surveyed themselves for contamination using personal contamination monitors (PCMs). The inspectors concluded that the licensee was closely monitoring personnel radiation exposure in a manner consistent with 10 CFR 20.1502.

During tours of the RCA the inspectors noted that general areas and individual rooms were properly posted for radiological conditions. Survey maps indicating dose rates and contamination levels at specific locations within the RCA were posted at the entrance to the RCA. Radiological postings were also conspicuously displayed at individual contaminated and high radiation areas. Color coded signs were also used throughout the RCA to indicate the general area dose rates. At the inspector's request, a licensee Health Physics Technician performed dose rate and contamination surveys in several rooms and locations. The inspectors verified that the survey instrument readings were consistent with the posted area dose rates. Contact dose rates from several radioactive material bearing containers were also verified to be consistent with the dose rates recorded on container labels. Independent contamination surveys performed around several posted contaminated areas indicated that contamination was not being tracked out of the contaminated areas. The inspectors concluded that the licensee's practices for radiological posting and labeling were consistent with the requirements of Subpart J of 10 CFR 20.

The inspectors reviewed the ALARA program details, implementation, and goals for the Unit 1 RFO. Based on the scheduled activities, daily and cumulative exposure projections were established. Individual exposures, based on data from DADs and PREMS, were summarized by RWPs on a daily basis and allocated to the various organizational departments. Daily reports of the collective and departmental exposures, along with their respective projected goals were issued for monitoring purposes. Plots of daily and cumulative exposure versus their respective projections were also distributed daily. The inspectors noted that the cumulative projection was being met as of day three of the scheduled 32 day outage. Based on the scope of work, the licensee's ALARA Committee established an official ALARA goal of 113 man-rem for the 1998 Unit 1 outage and an aggressive challenge goal of 98 man-rem. The inspectors concluded that the Committee's practice of establishing challenging goals reflected licensee management's support and commitment to overall dose reduction.

The inspectors reviewed the licensee's procedures for follow-up actions to Personnel Contamination Events (PCEs) and reviewed selected records for those events which occurred during 1998. Procedure HP-1061.020, "Personnel Contamination Monitoring and Decontamination," indicated that the threshold for initiating follow-up actions was skin or clothing contamination in excess of 100 net counts per minute (ncpm) as

measured by a hand held frisker. The licensee's records indicated that 52 PCEs occurred prior to the start of Unit 1 outage on October 19 and that 20 occurred during the first three days of the outage. The inspectors discussed with the licensee the increased frequency of PCEs during the early stages of the outage. The licensee indicated that the issue was being reviewed. The predominant contaminant was identified as ^{60}Co in several of the events. The licensee indicated that one possible source of the ^{60}Co , which has a relatively long half-life, was residual contamination on protective clothing. The licensee launders reusable protective clothing onsite and surveys the laundered clothing before releasing it for reuse. The licensee indicated that the alarm threshold for the monitor used to survey the clothing had been reduced by approximately 40 percent in order to reduce the potential for similar events. The inspectors concluded that the licensee had effectively implemented a process for identifying and correcting trends related to personnel contaminations.

Bioassays were performed on four individuals involved in PCEs which occurred before the outage but there were no uptakes of radioactive material greater than the threshold for assigning internal dose, i.e., three tenths of one percent of the Annual Limit on Intake (ALI). No uptakes occurred during the first three days of the outage. One of the PCEs which occurred before the outage resulted in the assignment of 1.4 rem to an individual as a skin dose from a hot particle. Skin dose assessments from hot particles had been initiated for three other individuals as a result of PCEs which occurred during the first three days of the outage. Preliminary estimates indicated that all were less than 5 rem. The inspectors reviewed selected dose calculations and determined that they were consistent with licensee dose calculation procedures. No regulatory dose limits were exceeded. The inspectors concluded that the licensee had implemented an effective process for identification and assessment of potential personnel exposure from internal, skin, and hot particle contamination.

The inspectors reviewed the licensee's records for contaminated floor space within the RCA. Radiation protection personnel maintained records of the areas within the RCA, excluding the Containment Buildings, which had contamination levels in excess of 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm²). Contaminated areas were categorized as either temporarily contaminated recoverable areas or non-recoverable areas. Generally the recoverable areas were temporarily established work areas in which planned activities had the potential for causing the proximate area to become contaminated and after which would be decontaminated, i.e., recovered. The non-recoverable areas were infrequently accessed high radiation areas and the exposures which would be incurred to decontaminate the area would not be consistent with ALARA principles. The recoverable square footage was tracked on a daily basis and monthly averages were calculated. The inspectors noted that during non-outage periods the monthly averages for recoverable contaminated floor space during 1998 were less than one percent of the RCA floor space and the non-recoverable area was approximately 2.5 percent. The inspectors concluded that the licensee had aggressively minimized the contaminated floor space within the RCA.

The inspectors also reviewed the licensee's plans for primary chemistry controls during the reactor shutdown for the Unit 1 RFO. The general plan for the shutdown chemistry controls included early injection of boric acid into the RCS during cooldown followed by injection of hydrogen peroxide after cooldown. The objective of the plan was to cause a

controlled release of radioactive materials from the internal surfaces of the RCS and to remove those materials from the coolant by use of the reactor water clean-up system. Specific plans consisted of injecting boron at a controlled rate to achieve an acid reducing environment, controlling the pH such that the coolant remained acidic until the coolant changed to an oxidizing environment by the injection of hydrogen peroxide, and maintaining the coolant's lithium, hydrogen and oxygen concentrations within specified ranges during cooldown in order to keep the released material in soluble chemical compounds. One specific goal of the chemistry control plan was to reduce the combined total activity concentration of the gamma emitters ^{58}Co , ^{60}Co , ^{134}Cs , ^{137}Cs , ^{54}Mn , and ^{51}Mn to less than 0.5 micro-Curies per milliliter ($\mu\text{Ci/ml}$) in order to assure adequate clean-up of the coolant. The inspectors reviewed trend plots for several chemistry parameters monitored by the licensee during the shutdown, including the ^{58}Co concentration, which was one of the major contributors to the total activity concentration. The ^{58}Co concentration peaked at approximately 0.26 $\mu\text{Ci/ml}$ during the oxidizing phase of the process and was then reduced to 0.05 $\mu\text{Ci/ml}$ after 32 hours of clean-up operations. The inspectors reviewed analytical results for selected chemistry parameters and concluded that the licensee had closely monitored and controlled primary coolant chemistry during the shutdown for the Unit 1 RFO.

c. Conclusions

The licensee was properly monitoring and controlling personnel radiation exposure during the Unit 1 Refueling Outage and posting area radiological conditions in accordance with 10 CFR Part 20. The licensee had implemented an effective shutdown chemistry control plan and closely monitored primary coolant chemistry during the shutdown for the Unit 1 Refueling Outage.

P1 Conduct of Emergency Preparedness (EP) Activities

P1.1 Annual Emergency Drill Conducted During Off Hours

a. Inspection Scope (82301)

The inspectors observed the licensee's annual emergency drill. The off hours drill was conducted on Saturday, September 19, 1998.

b. Observations and Findings

On September 19, 1998, the licensee conducted an off hours emergency drill to exercise the emergency response plan. The inspectors observed activities in the simulator control room, Technical Support Center (TSC) and Operations Support Center (OSC). The inspectors determined that the licensee emergency response call out system provided notification to designated individuals in a timely manner and that overall manning of the TSC and OSC was accomplished in a reasonable time frame. The licensee and the inspectors did identify areas for improvement in the area of personnel response to the site in that one position in the TSC was not manned in the required time frame. Seven individuals were determined to have pre-staged themselves in areas close to or at the plant such that they responded in a time frame much quicker than had

they been at home. These individuals were excluded from being considered as acceptable responders, thereby resulting in one position in the TSC not being manned in the required time frame. The inspectors discussed the identified deficiency with regional emergency preparedness inspectors, who concluded that being one person short of minimal manning within the required time frame, while not optimum, was acceptable.

The inspectors observed and evaluated the licensee's implementation of the emergency plan during the drill. Management and control of the facility was performed in a manner that ensured the missions of the facility would be properly carried out. Accident assessment and classification was performed in accordance with the emergency plan. The overall performance of the emergency response organization demonstrated the licensee's ability to adequately execute the emergency plan.

c. Conclusions

The overall performance of the emergency response organization during an emergency drill demonstrated the licensee's ability to adequately execute the emergency plan. Improper pre-staging of some personnel during an emergency drill resulted in a failure to demonstrate, by one position, that minimal staffing in the Technical Support Center could be accomplished within the required time frame.

S1 Conduct of Security and Safeguards Activities (71750)

On numerous occasions during the inspection period, the inspectors performed walkdowns of the protected area perimeter to assess security and general barrier conditions. No deficiencies were noted and the inspectors concluded that security posts were properly manned and that the perimeter barrier's material condition was properly maintained.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on November 6, 1998. The licensee acknowledged the findings presented.

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

M. Adams, Superintendent, Engineering
 R. Allen, Superintendent, Maintenance
 R. Blount, Manager, Nuclear Safety & Licensing
 E. Collins, Director, Nuclear Oversight
 M. Crist, Superintendent, Operations
 E. Grecheck, Site Vice President
 B. Shriver, Manager, Operations & Maintenance
 T. Sowers, Superintendent, Training
 B. Stanley, Supervisor, Licensing
 W. Thornton, Superintendent, Radiological Protection

INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering
 IP 40500: Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
 IP 61726: Surveillance Observation
 IP 62702: Maintenance Program
 IP 62707: Maintenance Observation
 IP 71707: Plant Operations
 IP 71750: Plant Support Activities
 IP 82301: Evaluation of Exercises for Power Reactors
 IP 83750: Occupational Radiation Exposure
 IP 92700: Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
 IP 92902: Followup - Maintenance
 IP 92903: Followup - Engineering

ITEMS OPENED AND CLOSED**Opened**

50-280, 281/98008-01	EEL	Failure to follow the requirements specified in procedure 0-OPT-VS-004 (Section M1.5)
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Closed

50-281/96006-00	LER	Auto reactor trip due to steam/feed flow mismatch coincident with a low SG level (Section O8.2)
50-281/97001-00	LER	Manual reactor trip and ESF actuation due to loss of EHC control power (Section O8.3)

50-280, 281/97007-00	LER	Outside Appendix R design basis due to vital bus isolation issue (Section M8.1)
50-281/97012-03	VIO	Failure to follow work instructions related to the Unit 2 TDAFW governor replacement (Section M8.2)
50-280, 281/96-01001	VIO	Failure to promptly identify and correct deficient Unit 2 FLOWCALC condition (Section E8.1)
50-281/96013-01	VIO	Weld undersize problems for supports in letdown line piping replacement (Section E8.2)