



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

July 28, 2006

Carolina Power and Light Company  
ATTN: Mr. C. J. Gannon, Jr.  
Vice President - Harris Plant  
Shearon Harris Nuclear Power Plant  
P. O. Box 165, Mail Code: Zone 1  
New Hill, North Carolina 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INTEGRATED  
INSPECTION REPORT 05000400/2006003

Dear Mr. Gannon:

On June 30, 2006, the US Nuclear Regulatory Commission (NRC) completed an inspection at your Shearon Harris reactor facility. The enclosed integrated inspection report documents the inspection findings, which were discussed on July 20, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one finding concerning the performance of inadequate maintenance on the train "A" chiller of the essential services chilled water (ESCW) system, resulting in that component being inoperable for a period of time in excess of that permitted by your Technical Specifications. This finding was determined to involve a violation of NRC requirements and has potential safety significance greater than very low safety significance. The finding did not present an immediate safety concern in that a fully redundant train "B" of the ESCW system, with its associated chiller, remained operable or available during the "A" train's period of inoperability. Additionally, the train "A" chiller has been returned to service and the condition of concern no longer exists. The NRC will inform you of its final determination of the significance of the condition and any associated enforcement action.

In addition, the report documents one self-revealing finding of very low safety significance (Green). This finding was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this issue as a non-cited violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this non-cited violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Shearon Harris facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) components of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Paul E. Fredrickson, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Docket No.: 50-400  
License No.: NPF-63

Enclosure: NRC Inspection Report 05000400/2006003  
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Shearon Harris facility.

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Paul E. Fredrickson, Chief  
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CP&L

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Report to C.J. Gannon from Paul E. Fredrickson dated July 28, 2006

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INTEGRATED  
INSPECTION REPORT 05000400/2006003

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No: 50-400

License No: NPF-63

Report No: 05000400/2006003

Licensee: Carolina Power and Light Company

Facility: Shearon Harris Nuclear Power Plant, Unit 1

Location: 5413 Shearon Harris Road  
New Hill, NC 27562

Dates: April 1 through June 30, 2006

Inspectors: R. Musser, Senior Resident Inspector  
P. O'Bryan, Resident Inspector  
S. Vias, Senior Reactor Inspector, (Section 1R08)  
B. Crowley, Senior Reactor Inspector, (Sections 1R08, 4OA5)  
B. Miller, Reactor Inspector, (Section 1R08)  
L. Lake, Reactor Inspector, (Sections 1R08, 4OA5)  
J. Rivera-Ortiz, Reactor Inspector, (Sections 1R08, 1R12, 4OA5)  
M. Scott, Senior Reactor Inspector, (Section 1R12)  
W. Loo, Senior Health Physicist (Sections 2OS1, 2OS2, 2PS2)  
R. Hamilton, Senior Health Physicist (Sections 2PS2, 4OA1)  
J. Kreh, Emergency Preparedness Inspector (Section 2OS1)

Approved by: P. Fredrickson, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

IR 05000400/2006-003; 04/01/2006 - 06/30/2006; Shearon Harris Nuclear Power Plant, Unit 1; Operability Evaluations.

The report covered a three-month period of inspection by resident inspectors, and announced inspections by two regional senior health physics inspectors, one regional health physics inspector, one regional emergency preparedness inspector, three regional senior reactor inspectors, and three regional reactor inspectors. One Green non-cited violation (NCV), and one AV with a potential safety significance greater than Green, were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green. A Green self-revealing NCV of Technical Specification (TS) 6.8.1 was identified for the failure to follow procedures while performing maintenance on a service water valve which supports the train "A" essential services chilled water (ESCW) system chiller. This deficiency led to the valve actuator disconnecting from the valve, and rendered the train "A" ESCW system chiller inoperable. The licensee entered this failure to follow procedure into the Corrective Action Program (CAP).

This finding is more than minor because it affected the reliability objective of the equipment performance attribute under the Mitigating Systems Cornerstone in that it affected the mitigating availability of the train "A" ESCW chiller. This finding was determined to be of very low safety significance (Green) because it did not represent a loss of system safety function, the single train of the ESCW system affected did not lose functionality for greater than the TS allowed outage time, and the finding was not potentially risk-significant due to external events. This finding is associated with the cross-cutting area of human performance because maintenance personnel improperly executed plant procedures. (Section 1R15)

- To Be Determined (TBD). A self-revealing AV was identified for the failure to maintain adequate procedures for the performance of maintenance on the ESCW system chillers. Specifically, procedures lacked sufficient details to perform maintenance on the chiller's pre-rotational vane actuator. This deficiency led to the train "A" ESCW system chiller being incapable of starting and inoperable for a period of time greater than allowed by the TS.

This issue is more than minor because it affected the reliability objective of the equipment performance attribute under the Mitigating Systems Cornerstone in

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that it affected the mitigating availability of the train "A" ESCW chiller. The finding was determined to have potential safety significance greater than very low because of the resultant reduced functional capability of the ESCW system to mitigate events, and the length of time the condition existed. This significance of this AV will remain indeterminate pending completion of the significance determination process. A contributing cause of this issue is associated with the cross-cutting area of human performance, in that the maintenance organization did not generate specific, written procedures to perform ESCW maintenance. (Section 1R15)

B. Licensee Identified Violations

None.

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## REPORT DETAILS

### Summary of Plant Status

The unit began the inspection period at rated thermal power and operated at full power until April 8, when the unit was removed from service for the commencement of Refueling Outage 13 (RFO13). The unit was returned to service on May 16, and commenced power ascension. On May 18, the unit, at 29 percent power, was shutdown to repair a hydrogen leak on the main generator. On May 19, the unit was returned to service, and achieved rated thermal power on May 21. The unit operated at or near rated thermal power for remainder of the inspection period.

#### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

##### 1R01 Adverse Weather Protection

###### a. Inspection Scope

When a tornado warning was issued for the site on June 11, the inspectors reviewed actions taken by the licensee in accordance with Procedure AP-300, "Severe Weather Response," to ensure that the adverse weather conditions would neither initiate a plant event nor prevent any structure, system or component (SSC) from performing its design function.

After the licensee completed preparations for seasonal high temperature, the inspectors walked down the emergency diesel generators and the high head safety injection system. These systems were selected because their safety related functions could be affected by adverse weather. The inspectors reviewed documents listed in the attachment, observed plant conditions, and evaluated those conditions using criteria documented in Procedure AP-301, "Adverse Weather."

The inspectors reviewed the following action requests (ARs) associated with this area, to verify that the licensee had identified and implemented appropriate corrective actions:

- 163469, "Emergency Service Water Pump Start Due to Elevated Temperatures"
- 166213, "AOP-006 Entry Due to Increased Generator Temperatures"

###### b. Findings

No findings of significance were identified.

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#### 1R04 Equipment Alignment

##### a. Inspection Scope

The inspectors performed the following three partial system walkdowns, while the indicated SSC were out-of-service (OOS) for maintenance and testing:

- The A residual heat removal system with the B residual heat removal system OOS on April 14
- The A emergency service water system with the B emergency service water system OOS on April 15
- The condensate storage tank including AFW suction piping and valves on June 19.

To evaluate the operability of the selected trains or systems under these conditions, the inspectors reviewed valve and power alignments by comparing observed positions of valves, switches, and electrical power breakers to the procedures and drawings listed in the Attachment.

##### b. Findings

No findings of significance were identified.

#### 1R05 Fire Protection

##### a. Inspection Scope

For the 20 areas identified below, the inspectors reviewed the licensee's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures, to verify that those items were consistent with FSAR Section 9.5.1, Fire Protection System, and FSAR Appendix 9.5.A, Fire Hazards Analysis. The inspectors walked down accessible portions of each area and reviewed results from related surveillance tests, to verify that conditions in these areas were consistent with descriptions of the applicable FSAR sections. Documents reviewed are listed in the Attachment.

- 236', 261', and 286' levels of the fuel handling building including areas 5-F-FPP, 5-F-CHF, and 5-F-BAL (3 areas)
- All levels of the reactor containment building, fire area 1-C (1 area)
- B emergency diesel generator building including areas 1-D-1-DGB-RM, 1-D-3-DGB-ES, 1-D-DTB, 1-D-1-DGB-ASU, 1-D-1-DGB-ER, and 1-D-3-DGB-HVR (6 areas).
- All levels of the turbine building including areas 1-G-286, 1-G-314, 1-G-240, and 1-G-261 (4 areas).
- The 261' level of the reactor auxiliary building including areas 1-A-4-COMB, 1-A-4-COME, and 1-A-4-COMI (3 areas)

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- The 305' level of the reactor auxiliary building including areas 12-A-6-HV7, 12-A-6-CHF1, and 12-A-6-CHF2 (3 areas)

Also, to evaluate the readiness of the licensee's personnel to prevent and fight fires, the inspectors observed fire brigade performance during an unannounced fire drill in the emergency diesel generator building on June 7.

The inspectors reviewed AR 196748, "Fire Brigade Members Not Meeting Expectations" to verify that the licensee had identified and implemented appropriate corrective actions.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

Internal Flooding

a. Inspection Scope

The inspectors walked down the turbine building 240' and 263' elevations containing risk-significant SSCs which are below flood levels or otherwise susceptible to flooding from postulated pipe breaks, to verify that the area configuration, features, and equipment functions were consistent with the descriptions and assumptions used in FSAR Section 3.6A.6, Flooding Analysis, and in the supporting basis documents listed in the Attachment. The inspectors reviewed the operator actions credited in the analysis to verify that the desired results could be achieved using the plant procedures listed in the Attachment.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance

a. Annual Review

The inspectors visually inspected the A component cooling water heat exchanger, and reviewed the results of Procedure EPT-163, "Generic Letter 89-13 Inspections (Raw Water Systems and Local Area Air Handler Inspection and Documentation)," to verify that any potential heat exchanger deficiencies which could degrade heat exchanger performance were identified and properly addressed by the licensee. The inspectors also verified that the frequency of inspection was sufficient to detect degradation prior to loss of heat removal capability below design basis values. Documents reviewed are listed in the Attachment.

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b. Findings

No findings of significance were identified.

1R08 Inservice Inspection (ISI) Activities

.1 Piping Systems ISI

a. Inspection Scope

On April 17-28, the inspectors reviewed the implementation of the ISI program for monitoring degradation of the reactor coolant system (RCS) boundary and the risk significant piping system boundaries. The inspectors selected a sample of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI required examinations for review.

The inspectors conducted an on-site review of nondestructive examination (NDE) activities to evaluate compliance with the TS and the applicable editions of ASME Section V and XI (1989 Edition/No Addenda for examinations credited to the second 10-year ISI interval), and to verify that indications and defects (if present) were appropriately evaluated and dispositioned in accordance with the requirements of ASME Section XI, IWB-3000 or IWC-3000 acceptance standards.

Specifically, the inspectors directly observed the electronic data collection associated with NDE activities described below and reviewed their corresponding NDE procedures, NDE reports, and equipment certification records, and personnel qualifications records.

- Automated ultrasonic (UT) examination data for reactor pressure vessel (RPV) welds RVN0Z0-Outlet Nozzle to Shell @ 145deg, STHW-RV-04 - lower shell to lower head circumferential weld, and RVNOZCI-N-05SE- inlet nozzle to shell weld (Class 1).
- Automated eddy current (ET) examination of the RPV bottom head penetrations #3, #32, and #34 (Class 1).
- Remote visual examination of RPV internal surfaces including the bottom core support lug and key-way located at 90deg, the surface of the lower head including the bottom mounted instrument connections (BMI's), and the outlet nozzle located at 145deg (Class 1).

The inspectors reviewed a report for the automated UT examination of RPV weld RVN0Z0, outlet nozzle to shell @ 145deg (Class 1). The review was conducted to verify that the evaluation and disposition of recordable indications was in accordance with the applicable version of ASME Section XI, IWB-3000.

The inspectors reviewed a sample of welding activities performed since the beginning of the last refueling outage for ASME Class 2 piping. The inspectors reviewed welding procedures, welder performance qualification records, and NDE records associated with weld AH-3-S2-FW18, 4-inch diameter butt weld, service water to containment fan

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coolers, ASME Class 2. The review was conducted to verify that the Section XI Repair/Replacement requirements were met for the weld and its subsequent repair.

b. Findings

No findings of significance were identified.

.2 Boric Acid Corrosion Control (BACC) Program

a. Inspection Scope

On April 17-28, the inspectors reviewed the licensee's BACC activities to verify that licensee commitments made in response to NRC Generic Letter 88-05 "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary" and to applicable industry guidance documents, had been implemented. Specifically, the inspectors performed an on-site record review of procedures and the results of the licensee's mode 3 containment walkdown inspection after RFO 13 was completed. The inspectors also conducted an independent walkdown of the reactor building to evaluate compliance with licensee BACC program requirements and to verify that degraded or non-conforming conditions, such as boric acid leaks identified during the mode 3 containment walkdown, were properly identified and corrected in accordance with the CAP.

The inspectors reviewed a sample of engineering evaluations completed for evidence of boric acid found on systems containing borated water to verify that the minimum design code required section thickness had been maintained for the affected components. Specifically, the inspectors reviewed the following evaluations:

- AR 190567, Active leak of valve 1RC-103 (RCS Loop 2 to Pressurizer Spray)
- AR 190572, Brown boric acid at valve packing (multiple valves on SI Accumulators)

b. Findings

No findings of significance were identified.

.3 Steam Generator Tube ISI

a. Inspection Scope

From April 24-28, the inspectors reviewed the Unit 1 steam generator (SG) tube eddy current testing (ECT) examination activities to ensure compliance with the TS, applicable industry operating experience and technical guidance documents, and 1989 Edition with no addenda ASME Code Section XI requirements.

The inspectors reviewed licensee SG inspection activities to ensure that ECT inspections conducted during RFO-13 conformed to the Steam Generator Integrity Program. The inspectors reviewed the SG examination scope, ECT acquisition

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procedures, examination technique specification sheets (ETSS), ECT analysis guidelines, the current SG specific assessment of potential degradation mechanisms, SG Operational Assessment and Condition Monitoring documents from the previous Unit 1 outage, and the current SG tube plugging and stabilization procedures. The inspectors reviewed documentation to ensure that the ECT probes and equipment configurations used were qualified to detect the expected types of SG tube degradation in accordance with Appendix H, "Performance Demonstration for Eddy Current Examination" of EPRI "Pressurized Water Reactor Steam Generator Examination Guidelines: Revision 6." Additionally, the inspectors reviewed the qualification and certification records for the ECT standards, SG tube plugs, SG tube stabilizers, and ECT data analysis and resolution analysis personnel.

The secondary side water chemistry and loose parts monitoring programs were reviewed to ensure they were consistent with applicable industry guidance documents. The inspectors independently reviewed the licensee's secondary side visual examination results and associated evaluations for loose parts that are not retrievable and will remain in the SGs during the next operating cycle. The inspectors observed ECT acquisition, resolution analysis, tube stabilization, and tube plugging activities.

b. Findings

No findings of significance were identified.

.4 Identification and Resolution of Problems

The inspectors performed a review of ISI related problems, BACC and SG ISI, that were identified by the licensee and entered into the CAP as nuclear condition reports (NCR) documents. The inspectors reviewed the NCRs to confirm that the licensee had appropriately described the scope of the problem and had initiated corrective actions. The inspectors performed this review to verify compliance with 10CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. The corrective action documents reviewed by the inspectors are listed in the Attachment.

1R11 Licensed Operator Requalification

a. Inspection Scope

On June 13, the inspectors observed licensed-operator performance during requalification simulator training, to verify that operator performance was consistent with expected operator performance, as described in the training exercise guide. This training tested the operators' ability to place the plant in a safe condition after a station blackout. The inspectors focused on clarity and formality of communication, the use of procedures, alarm response, control board manipulations, group dynamics and supervisory oversight. The inspectors observed the post-exercise critique to verify that the licensee had identified deficiencies and discrepancies that occurred during the simulator training.

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b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

.1 Routine Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed two degraded conditions listed below to verify the licensee's handling of these conditions in accordance with 10CFR50, Appendix B, Criterion XVI, Corrective Action, and 10CFR50.65, Maintenance Rule. Documents reviewed are listed in the Attachment.

- Local leak rate test (LLRT) failures during RFO13
- Functional failures of containment isolation valves (Target Rock)

The inspectors focused on the following attributes:

- Appropriate work practices,
- Identifying and addressing common cause failures,
- Scoping in accordance with 10 CFR 50.65(b),
- Characterizing reliability issues (performance),
- Charging unavailability (performance),
- Trending key parameters (condition monitoring),
- 10 CFR 50.65(a)(1) or (a)(2) classification and reclassification, and
- Appropriateness of performance criteria for SSCs/functions classified (a)(2) and/or appropriateness and adequacy of goals and corrective actions for SSCs/functions classified (a)(1).

The inspectors reviewed the following ARs associated with this area to verify that the licensee had identified and implemented appropriate corrective actions:

- 190624, "Maintenance Rule Reclassifications"
- 196750, "Target Rock Position Indication a1 Goal Exceeded"

b. Findings

No findings of significance were identified.

.2 Periodic Evaluation (Triennial)

a. Inspection Scope

On June 26-30, the inspectors reviewed the licensee's Maintenance Rule (MR) periodic assessment, "Maintenance Rule Cycle 12, Periodic a(3) Assessment," to assess the

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effectiveness of the assessment and verify that it was issued in accordance with the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The inspectors' review included an evaluation of: periodic assessment timeliness, balancing of reliability and unavailability, (a)(1) activities, (a)(2) activities, and use of industry operating experience for the 18 month-period covered by the assessment. The inspectors reviewed selected MR activities covered by the assessment period for the following MR a(1) status component and attendant systems: 6.9 KV AC distribution, ESCW system, 250 VDC distribution, containment isolation, and normal service water. Additionally, the inspectors conducted a plant walkdown to assess the condition of risk significant plant structures within the scope of the MR to verify that condition monitoring was adequately performed.

The inspectors reviewed selected plant work order data, self assessments, system health reports, reliability and unavailability monitoring status documents, significant adverse condition investigation reports, MR system scoping documents, and attendant MR expert panel meeting minutes. The inspectors also discussed and reviewed relevant corrective action reports, and discussed issues with system engineers and licensee management. In addition, the inspectors attended a Plant Nuclear Safety Committee meeting to assess the management approval for the transition of 250 VDC distribution and main feedwater systems from MR status a(1) to a(2). Specific documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation

a. Inspection Scope

The inspectors reviewed the licensee's risk assessments and the risk management actions for the plant configurations associated with the four activities listed below. The inspectors verified that the licensee had performed adequate risk assessments, and implemented appropriate risk management actions when required by 10CFR50.65(a)(4). For emergent work, the inspectors also verified that any increase in risk was promptly assessed, and that appropriate risk management actions were promptly implemented.

- Week of May 15 including reactor startup for low power physics testing, reactor shutdown, and various other maintenance activities.
- Severe thunderstorm warning on May 26.
- Emergent repairs to the ESCW chilled water system chiller, WC-2A on June 2.
- Tornado warning on June 11.

b. Findings

No findings of significance were identified.

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## 1R15 Operability Evaluations

### a. Inspection Scope

The inspectors reviewed four operability determinations addressed in the ARs listed below. The inspectors assessed the accuracy of the evaluations, the use and control of any necessary compensatory measures, and compliance with the TS. The inspectors verified that the operability determinations were made as specified by Procedure OPS-NGGC-1305, "Operability Determinations." The inspectors compared the justifications made in the determination to the requirements from the TS, the FSAR, and associated design-basis documents, to verify that operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred:

- 185884, "Turbine Driven AFW Pump Overspeed Tappet Nut Not Properly Engaged"
- 194627, "1SW-1055, A Chiller FCV Operator and Valve Not Connected"
- 196258, "A-SA Chiller Failed to Start"
- 196857, "Heat Load Calculation Does Not Bound Fuel Shipped to HNP"

### b. Findings

#### .1 Failure to perform maintenance on valve 1SW-1055 in accordance with maintenance procedure

Introduction. A Green self-revealing NCV of TS 6.8.1, "Written Procedures" was identified for a failure to follow a procedure used to adjust the linkage between a service water control valve and its actuator, which ultimately resulted in rendering one ESCW train inoperable.

Description. While in mode 6 during RFO13, preventive maintenance was conducted on service water control valve 1SW-1055 in late April, with the work completed on April 30. This valve utilizes an electric-hydraulic actuator to regulate service water flow to the train "A" ESCW chiller condenser. The maintenance included valve and actuator separation and valve disassembly as documented in work order #816771. Following valve and actuator reassembly, while adjusting the valve stroke, using Procedure PIC-I058, "Calibration of a ITT Milliampere Hydramotor Actuator Model NH-92 & 94," Revision 11, adequate thread engagement was not maintained on a fastener that connects the service water discharge valve actuator to the valve body. This procedure compliance error ultimately resulted in the valve becoming separated from its actuator and the train "A" ESCW chiller being inoperable for approximately 4.5 hours (TS allowed outage time is 72 hours).

The train "A" ESCW chiller is required by TS 3.7.13, "Essential Services Chilled Water System," to be operable in modes 1 through 4. On May 10, the plant entered mode 4 and on May 16, the plant entered mode 1. The valve actuator for 1SW-1055 separated from the valve body of 1SW-1055 on May 16 and was repaired later the same day. The train "A" ESCW chiller functioned correctly for approximately 8.5 days of cumulative runtime prior to valve 1SW-1055 becoming separated.

Analysis. On April 30, Procedure PIC-I058 was not followed during adjustment of the linkage between service water control valve 1SW-1055 and its actuator, contributing to adequate thread engagement not being maintained between the valve and its actuator. This procedure adherence problem ultimately resulted in train "A" ESCW chiller being inoperable for approximately 4.5 hours. This issue is a performance deficiency associated with the Mitigating Systems Cornerstone. The finding is greater than minor since it affects the Mitigating Systems Cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage), and is associated with the cornerstone attribute of equipment performance.

The risk significance of this issue was evaluated using NRC Inspection Manual Chapter 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations" because the train "A" ESCW chiller is only required to be operable in modes 1 through 4, after plant heat up has started and residual heat removal has been secured. This finding was determined to be of very low safety significance (Green) because the finding did not represent a loss of system safety function, the ESCW train affected did not lose functionality for greater than the TS allowed outage time, and the finding was not potentially risk-significant due to external events. This finding is associated with the cross-cutting area of human performance because maintenance personnel improperly executed plant procedures.

Enforcement. TS 6.8.1 states, in part, that procedures shall be established, implemented, and maintained covering activities referenced in appendix A of Regulatory Guide 1.33, revision 2. Regulatory Guide 1.33, revision 2, part 9 states that maintenance that can affect the performance of safety-related equipment should be properly planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Procedure PIC-I058, Revision 11 provides instructions for adjusting the valve stroke for valve 1SW-1055 during maintenance. Contrary to above, on April 30, the adjustment to valve 1SW-1055 was not adequately conducted, in that the valve actuator was not properly secured to the valve body, resulting in the valve actuator separating from the valve body on May 16. However, because this violation is of the very low safety significance, the issue was entered into the CAP (AR 194627), and the deficient condition was promptly corrected, this finding is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000400/2006003-01, Failure to Follow Procedure During Service Water Control Valve Preventive Maintenance.

.2 Inadequate maintenance procedure for replacement of train "A" ESCW chiller pre-rotational vane actuator

Introduction. Subsequent to the ESCW chiller maintenance activity (with related NCV) conducted in late April, and discussed in Section 1R15.b.1, additional, but different, maintenance was conducted on the same chiller in early May. For this maintenance work, a self-revealing AV was identified for a failure to maintain adequate procedures that specified the required torque of a threaded fastener which holds the chiller

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compressor pre-rotational vane shaft to the pre-rotational vane actuator linkage arms. Because of this lack of guidance, the chiller maintenance was completed with the chiller compressor threaded fastener under-torqued, which led to the fastener becoming loose during chiller operation, ultimately resulting in the chiller failing to start on June 1.

Description. While in mode 6 during RFO13, maintenance was conducted on the train "A" ESCW system chiller in early May, with the work completed on May 4. This maintenance included replacing the chiller compressor and pre-rotational vane actuator as documented in work order #664677. The pre-rotational vane shaft is integral to the compressor and connected to the pre-rotational vane actuator via linkage arms. The linkage arms are connected to the pre-rotational vane shaft with a threaded fastener. During normal operation when the chiller is shut down, the pre-rotational vanes move to the minimum load position and linkage arm rotation causes a limit switch to make-up. This limit switch must be made-up to satisfy a chiller electrical start interlock.

After the compressor and pre-rotational vane actuator was replaced, the threaded fastener connecting the pre-rotational vane shaft to the linkage arms was not adequately tightened. Since the threaded fastener wasn't properly tightened, it loosened during subsequent chiller operation. Eventually, the fastener became too loose and the linkage arms and pre-rotational vane shaft lost synchronization. The train "A" ESCW chiller was successfully started on May 25 and run for approximately one hour. The train "A" ESCW chiller then failed to start on the next start attempt on June 1. Since the pre-rotational vanes do not move when the chiller is shutdown, inspectors determined that the pre-rotational vane shaft and linkage arms lost synchronization during chiller operation on May 25. At that time, the linkage arms were not correctly positioned to make-up the chiller start interlock, and therefore the chiller was inoperable starting at 9:16 p.m. on May 25.

The original equipment manufacturer of the train "A" ESCW chiller is the York International Division of Borg-Warner Corporation. York maintenance procedures specify that 75 foot-pounds of torque be used to tighten the threaded fastener which connects the pre-rotational vanes to the actuator linkage arms. Despite this guidance, the licensee did not develop adequate maintenance procedures to ensure that the threaded fastener was properly tightened and therefore licensee maintenance personnel did not apply the proper torque to the fastener when performing the maintenance.

Analysis. For the train "A" ESCW chiller compressor replacement in RFO13, maintenance procedures were inadequate in that they did not specifically direct maintenance personnel to tighten the pre-rotational vane shaft to linkage arm fastener to 75 ft-lb, which is a performance deficiency associated with the Mitigating Systems Cornerstone. This issue is more than minor because it affected the reliability objective of the equipment performance attribute under the Mitigating Systems Cornerstone in that it affected the mitigating availability of the train "A" ESCW chiller. The finding was determined to have potential safety significance greater than very low because of the resultant reduced functional capability of the ESCW system to mitigate events, and because the degradation existed for approximately seven days. The finding did not present an immediate safety concern in that the fully redundant train "B" of ESCW

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remained operable or available during the train "A" period of inoperability. A contributing cause of this issue is associated with the cross-cutting area of human performance, in that the maintenance organization did not generate specific, written procedures to perform ESCW maintenance.

Enforcement. TS 6.8.1 states, in part, that procedures shall be established, implemented, and maintained covering activities referenced in appendix A of Regulatory Guide 1.33, revision 2. Regulatory Guide 1.33, revision 2, part 9 states that maintenance that can affect the performance of safety-related equipment should be properly planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Contrary to this, maintenance procedures did not adequately address torque requirements for the train "A" ESCW chiller pre-rotational vane shaft to actuator linkage fastener, leading to the train "A" ESCW chiller being inoperable for a period of time in excess of that permitted by the TS. Pending determination of safety significance, this finding is identified as AV: AV05000400/2006003-02, Failure to Maintain Adequate Procedures Such That a Required Torque Was Not Provided for a Threaded Fastener on an ESCW System Chiller.

#### 1R19 Post Maintenance Testing

##### a. Inspection Scope

For the five post-maintenance tests listed below, the inspectors witnessed the test and/or reviewed the test data, to verify that test results adequately demonstrated restoration of the affected safety function(s) described in the FSAR and the TS. The tests included the following:

- CM-E0020, "Replace Oil Filled Electrolytic Capacitors and/or Ferro-Resonant Transformer Assembly and Tune Westinghouse 7.5 KVA Static Inverters," for testing following maintenance on vital inverter II on April 21.
- OST-1073, "1B-SB Emergency Diesel Generator Monthly Operability Test, Modes 1 - 6," for post-outage testing on April 22.
- OST-1040, "Essential Services Chilled Water Systems Operability Quarterly Interval Modes 1 - 6," after the B train P-4 pump was rebuilt on April 24.
- OST-1108, "RHR Pump Operability Quarterly Interval Modes 4 - 6," after A RHR pump replacement on May 2.
- OST-1214, "Emergency Service Water System Operability Train A Quarterly Interval Modes 1 - 4," after the A emergency service water pump was replaced on May 3.

##### b. Findings

No findings of significance were identified.

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## 1R20 Refueling and Outage Activities

### .1 Review of Outage Plan

#### a. Inspection Scope

Prior to the RFO-13, the inspectors reviewed the licensee's outage risk control plan to verify that the licensee had performed adequate risk assessments, and had implemented appropriate risk management strategies when required by 10CFR50.65(a)(4).

#### b. Findings

No findings of significance were identified.

### .2 Monitoring of Shutdown Activities

#### a. Inspection Scope

The inspectors observed portions of the cooldown process to verify that TS cooldown restrictions were followed.

#### b. Findings

No findings of significance were identified.

### .3 Licensee Control of Outage Activities

#### a. Inspection Scope

The inspectors observed the items or activities described below, to verify that the licensee maintained defense-in-depth commensurate with the outage risk control plan for key safety functions and applicable TS requirements when taking equipment OOS. The inspectors reviewed the licensee's responses to emergent work and unexpected conditions to verify that resulting configuration changes were controlled in accordance with the outage risk control plan, and to verify that control room operators were kept cognizant of plant configuration.

- clearance activities
- RCS instrumentation
- electrical power
- decay heat removal
- spent fuel pool cooling
- inventory control
- reactivity control
- containment closure

b. Findings

No findings of significance were identified.

.4 Reduced Inventory Conditions

a. Inspection Scope

The inspectors reviewed the licensee's commitments from Generic Letter 88-17, and confirmed by sampling that those commitments were still in place and adequate. Periodically during the reduced inventory conditions, the inspectors reviewed system lineups to verify that the configuration of the plant systems were in accordance with those commitments.

b. Findings

No findings of significance were identified.

.5 Refueling Activities

a. Inspection Scope

The inspectors observed fuel handling operations (removal, inspection, and insertion) and other ongoing activities, to verify that those operations and activities were being performed in accordance with the TS and approved procedures. Also, the inspectors observed refueling activities to verify that the location of the fuel assemblies was tracked, including new fuel, from core offload through core reload.

b. Findings

No findings of significance were identified.

.6 Monitoring of Heatup and Startup Activities

a. Inspection Scope

Prior to mode changes and on a sampling basis, the inspectors reviewed system lineups and/or control board indications to verify that TS, license conditions, and other requirements, commitments, and administrative procedure prerequisites for mode changes were met prior to changing modes or plant configurations. Also, the inspectors periodically reviewed RCS boundary leakage data, and observed the setting of containment integrity, to verify that the RCS and containment boundaries were in place and had integrity when necessary. Prior to reactor startup, the inspectors walked down containment to verify that debris has not been left which could affect performance of the containment sumps. The inspectors reviewed reactor physics testing results to verify that core operating limit parameters were consistent with the design.

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b. Findings

No findings of significance were identified.

.7 Identification and Resolution of Problems

a. Inspection Scope

Periodically, the inspectors reviewed the items that had been entered into the CAP, to verify that the licensee had identified problems related to outage activities at an appropriate threshold and had entered them into the CAP. For the significant problems documented in the CAP and listed below, the inspectors reviewed the results of the licensee's investigations, to verify that the licensee had determined the root cause and implemented appropriate corrective actions, as required by 10CFR50, Appendix B, Criterion XVI, Corrective Action.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

For the six surveillance tests identified below, the inspectors witnessed testing and/or reviewed test data, to verify that the SSCs involved in these tests satisfied the requirements described in the TS and the FSAR, and that the tests demonstrated that the SSCs were capable of performing their intended safety functions.

- OST-1824, "1B-SB Emergency Diesel Generator Operability Test 18 Month Interval Modes 1 through 6 and Defueled" on April 8 .
- OST-1813, "Remote Shutdown System Operability 18 Month Interval Modes 5, 6 or Defueled," on April 11.
- MST-E0013, "1E Battery Performance Test" on April 18.
- \* EST-213, "ASME System Pressure Test for Fuel Oil Piping" on May 2.
- OST-1826, "Safety Injection: ESF Response Time, Train B 18 Month Interval on a Staggered Test Basis Mode 5-6," on May 8.
- \*\* EST-212, "Type C Local Leak Rate Tests"

\*This procedure included inservice testing requirements.

\*\* This procedure included testing of a large containment isolation valve.

b. Findings

No findings of significance were identified.

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1R23 Temporary Plant Modificationsa. Inspection Scope

The inspectors reviewed the temporary modification described in Engineering Change 64090R1, to verify that the modification did not affect the safety functions of important safety systems, and to verify that the modification satisfied the requirements of 10CFR50, Appendix B, Criterion III, Design Control.

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluationa. Inspection Scope

The inspectors observed two operations simulator examinations conducted on June 20 and June 27, to verify licensee's self-assessment of classification, notification, and protective action recommendation development in accordance with 10CFR50, Appendix E.

b. Findings

No findings of significance were identified.

## 2. RADIATION SAFETY

Cornerstones: Occupational Radiation Safety and Public Radiation Safety

2OS1 Access Controls To Radiologically Significant Areasa. Inspection Scope

Access Controls The inspectors evaluated licensee activities for monitoring and controlling worker access to radiologically significant areas, focusing on those activities associated with RFO13. The inspection included direct observation of administrative and physical controls, appraisal of the knowledge and proficiency of radiation workers and health physics technicians (HPTs) in implementing radiological controls, and review of the adequacy of procedural guidance and its implementation.

The inspectors reviewed licensee procedures regarding access control to radiologically significant areas. Selected procedural details for posting, surveying, and access control to airborne radioactivity, radiation area, high radiation area (HRA), locked high radiation area (LHRA), and very high radiation area (VHRA) locations were reviewed and

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discussed with cognizant licensee representatives. The inspectors reviewed administrative guidance documents and procedures for control of non-fuel radioactive material stored in the spent fuel pools, and evaluated several radiation work permits (RWPs) used for work in radiologically significant areas associated with RFO-13. The selected RWPs were assessed for adequacy of access controls and specified electronic dosimeter (ED) alarm setpoints against expected work area dose rates and work conditions. Access control procedures for posted LHRA and VHRA locations were reviewed and discussed with selected Radiation Protection (RP) management, supervision, and technicians.

During facility tours, the inspectors evaluated selected radiological postings, barricades, and surveys associated with radioactive material storage areas and radiologically significant areas within the reactor containment building, reactor auxiliary building, waste processing building, and fuel handling building. The inspectors conducted independent dose-rate measurements at various building locations and compared those results to licensee radiation survey map data. The surveyed locations included the lower refuel cavity, the personnel airlock area, the train "B" RHR pump valve chamber, and the seal table room. The inspectors independently assessed implementation of LHRA controls, and evaluated the adequacy of the licensee's LHRA and VHRA key controls through procedural reviews and supervisory interviews.

During the inspection, the proficiency and knowledge of the radiation workers and RP staff in communicating and applying radiological controls for selected tasks were evaluated. The inspectors attended briefings for work activities associated with RWPs 3438 and 3596 (reactor head/core activities and SG sludge lance activities). Radiological worker and HPT training/skill levels, procedural adherence, and implementation of RWP-specified access controls, including those associated with changing radiological conditions, were observed and evaluated by the inspectors during selected job site reviews and tours within the radiological control area. In addition, the inspectors interviewed selected management personnel regarding radiological controls associated with RFO-13 activities.

RP activities were evaluated against Updated Final Safety Analysis Report (UFSAR) Section 12, Radiation Protection; TS 6.12, High Radiation Area; 10 CFR 19.12; 10 CFR Part 20, Subparts B, C, F, G, H, and J; and approved procedures. The procedures and records reviewed are listed in the Attachment.

Problem Identification and Resolution CAP NCR documents associated with access control to radiologically significant areas, radiation worker performance, and HPT proficiency were reviewed and assessed. The NCRs for this program area, listed in the Attachment, were reviewed and evaluated in detail. The inspectors assessed the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with approved CAP procedures.

The inspectors completed 21 of the required 21 samples for Inspection Procedure (IP) 71121.01. All samples have now been completed for this IP.

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b. Findings

No findings of significance were identified.

2OS2 ALARA Planning and Controls

a. Inspection Scope

As Low As Reasonably Achievable (ALARA) Implementation of the licensee's ALARA program during RFO-13 was observed and evaluated by the inspectors. The inspectors reviewed ALARA planning, dose estimates, and prescribed ALARA controls for the five outage work tasks expected to incur the maximum collective exposures. Reviewed activities included installation of temporary/emergent lead shielding for the reactor head stand on the refueling floor in containment, installation and removal of insulation, decontamination activities, reactor headwork activities, incore instrument work and other various work activities associated with RFO-13. Also, incorporation of planning, established work controls, expected dose rates and dose expenditure into the ALARA pre-job briefings and RWPs for those activities were reviewed. The inspectors also independently verified that selected job site dose rates were consistent with the dose rates recorded on pre-job survey maps for containment and auxiliary building work areas and equipment. The inspectors made direct field or closed-circuit-video observations of work activities associated with the reactor head lift and pulling of the thimbles in the seal table room, and evaluated the licensee's use of engineering controls, low dose waiting areas, and on-the-job supervision for selected activities that were conducted in the reactor containment building.

Selected elements of the licensee's source term reduction and control program were examined to evaluate the effectiveness of the program in supporting implementation of the ALARA program goals. Reviewed areas included primary chemistry shutdown controls, radiation field monitoring and trending, and temporary/emergent shielding.

Trends in individual and collective personnel exposures at the facility were reviewed. Records of year-to-date individual radiation exposures sorted by work groups were examined for significant variations of exposures among workers. Exposure tracking during RFO-13, and records of exposures to declared pregnant workers incurred from November 2004 through March 2006 as well as associated guidance for controlling such exposures, were also reviewed. Trends in the plant's three-year rolling average collective exposure history, outage, non-outage and total annual doses were reviewed and discussed with licensee representatives.

The licensee's ALARA program implementation and practices were evaluated for consistency with UFSAR Chapter 12, Sections 1-5, Radiation Protection; 10 CFR Part 20 requirements; Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, February 1996; and licensee procedures. Documents reviewed are listed in the Attachment.

Problem Identification and Resolution The inspectors reviewed NCR documents and audits listed in the Attachment that are related to the ALARA program. The inspectors

assessed the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with CAP-NGGC-0200, Corrective Action Program, Rev. 16.

The inspectors completed 15 of the required 15 samples for IP 71121.02. All samples have now been completed for this IP.

b. Findings

No findings of significance were identified.

2PS2 Radioactive Material Processing and Transportation

a. Inspection Scope

Waste Processing and Characterization The inspectors evaluated licensee methods for processing and characterizing radioactive waste (radwaste). Inspection activities included direct observation of processing equipment for solid and liquid radwaste and evaluation of waste stream characterization data.

Solid and liquid radwaste equipment was inspected for material condition, configuration compliance with the UFSAR, and consistency with Process Control Program (PCP) requirements. Inspected equipment included liquid radwaste hold-up tanks; resin transfer piping; abandoned waste evaporators; remote operating equipment for packaging filters, and elements of the modular fluidized transfer demineralization system. The inspectors discussed system changes, component function, and equipment operability with licensee staff. In addition, procedural guidance for resin transfer was evaluated and compared with current equipment configuration.

Licensee radionuclide characterizations for selected waste streams were reviewed and discussed with radwaste staff. For primary resin, radwaste filters, and dry active waste the inspectors evaluated analyses for hard-to-detect nuclides and appropriate use of scaling factors. Comparison results between licensee waste stream characterization data and outside laboratory data were reviewed for 2005 and 2006. For selected shipment records, waste classification calculations were independently performed and the methodology used for resin waste stream mixing and concentration averaging was evaluated. The inspectors also interviewed radwaste staff and reviewed procedural guidance to evaluate the licensee's program for monitoring changing operational parameters.

Radwaste processing activities were reviewed for consistency with the licensee's PCP, Rev. 8; and UFSAR, Chapter 11, Amendment 52. Waste stream characterization analyses were reviewed against regulations detailed in 10 CFR Part 61.55 and guidance provided in the Branch Technical Position on Waste Classification and Waste Form, 1983. Reviewed documents are listed in the Attachment.

Transportation The inspectors evaluated the licensee's activities related to transportation of radioactive material. The evaluation included direct observation of shipment preparation activities and review of shipping related documents.

The inspectors directly observed transportation activities including the shipment of several containers of vendor tools and equipment associated with split pin inspection, pressurizer safety relief valve, and snubber. The inspectors observed placarding of the shipment vehicles and marking and labeling of the shipment packages. The inspectors observed technicians performing radiation and contamination surveys on packages and vehicles.

As part of the document review, the inspectors evaluated five shipping records for consistency with licensee procedures and compliance with NRC and DOT regulations. In addition, training records for individuals currently qualified to ship radioactive material were checked for completeness and the training curriculum provided to these workers was evaluated. Documents reviewed are listed in the Attachment.

Transportation program implementation was reviewed against regulations detailed in 10 CFR Parts 20 and 71, 49 CFR Parts 170-189; as well as the guidance provided in NUREG-1608. Training activities were assessed against 49 CFR Part 172 Subpart H.

Problem Identification and Resolution Selected NCR documents associated with radwaste processing and transportation were reviewed and discussed with cognizant licensee representatives. The inspectors assessed the licensee's ability to characterize, prioritize, and resolve the identified issues in accordance with Procedure CAP-NGGC-0200, Corrective Action Program, Rev. 16. Reviewed documents are listed in the Attachment.

The inspectors completed 6 of the required 6 samples for IP 71122.02. All samples have now been completed for this IP.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (PI) Verification

a. Inspection Scope

The inspectors sampled licensee data from the period January 2005 through April 2006 for the performance indicators (PIs) listed below. To verify the accuracy of the reported PI data, PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Indicator Guideline," Rev. 4, were used to verify the basis for each data element.

### Cornerstone: Occupational Radiation Safety

- Occupational Exposure Control Effectiveness PI

For the reviewed period, the inspectors assessed CAP records to determine whether HRA, VHRA, or unintended radiation exposures, resulting in TS or 10 CFR 20 non-conformances, had occurred. In addition, the inspectors reviewed selected personnel contamination event data, internal dose assessment results, and ED alarms associated with dose rates exceeding 1 rem/hr and cumulative dose rates exceeding established set-points from January 2005 through April 2006. Reviewed documents relative to this PI are listed in the Attachment.

### Cornerstone: Public Radiation Safety

- Radiological Effluent Technical Specification/Offsite Dose Calculation Manual  
Radiological Effluent Occurrences PI

The inspectors reviewed OOS effluent monitor logs and six effluent release permits. The inspectors reviewed documents listed in the Attachment.

The inspectors completed 2 of the required 2 samples for IP 71151.

#### b. Findings

No findings of significance were identified.

### 4OA2 Identification and Resolution of Problems

#### .1 Routine Review of ARs

To aid in the identification of repetitive equipment failures or specific human performance issues for followup, the inspectors performed frequent screenings of items entered into the CAP. The review was accomplished by reviewing daily AR reports.

#### .2 Annual Sample Review

##### a. Inspection Scope

The inspectors selected AR 141462 for detailed review. This AR was associated with degraded performance of the M-7 containment penetration. The inspectors reviewed this report to verify that the licensee had identified the full extent of the issue, performed an appropriate evaluation, and specified and prioritized appropriate corrective actions. The inspectors evaluated the report against the requirements of the CAP as delineated in corporate Procedure CAP-NGGC-0200, Corrective Action Program, and 10 CFR 50, Appendix B.

b. Findings

No findings of significance were identified.

.3 Semi-Annual Trend Review

c. Inspection Scope

The inspectors performed a review of the CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues, but also considered the results of inspector CAP item screenings, licensee trending efforts, and licensee human performance results. The inspector's review nominally considered the six-month period of January through June, although some examples expanded beyond those dates when the scope of the trend warranted. The review also included issues documented outside the normal CAP in system health reports, self assessment reports, and Maintenance Rule assessments. The specific items reviewed are listed in the Attachment. The inspectors compared and contrasted their results with the results contained in the licensee's latest semi-annual trend reports. The inspectors also evaluated the licensee's trend reports against the requirements of the CAP as specified in CAP-NGGC-0200, Corrective Action Program.

b. Assessment and Observations

There were no findings of significance identified. The inspectors observed that the licensee performed adequate trending reviews. The licensee routinely reviewed cause codes, involved organizations, key words, and system links to identify potential trends in the CAP data. The inspectors compared the licensee's process results with the results of the inspectors' daily screening and did not identify any discrepancies or potential trends in the CAP data that the licensee had failed to identify.

4OA5 Other Activities

.1 (Closed) NRC Temporary Instruction 2515/150, Reactor Pressure Vessel Head and Head Penetration Nozzles (NRC Order EA-03-009) (Unit 1)

a. Inspection Scope

From April 17-21 the inspectors reviewed the licensee's activities relative to the NDE of the reactor pressure vessel head (RPVH) nozzles and the visual examination to identify potential boric acid leaks from pressure-retaining components above the RPVH in response to NRC Bulletins 2001-01, 2002-01, 2002-02, and NRC Order EA-03-009 Modifying Licenses dated February 20, 2004 (NRC Order).

The inspectors' review of the NDE of RPVH nozzles included: a) review of NDE procedures, b) assessment of NDE personnel training and qualification, c) review of NDE equipment certification, and d) observation and assessment of UT and ET examinations. The inspectors also held interviews with contractor representatives (Wesdyne) and other licensee personnel involved in the RPVH examination.

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The activities were reviewed to verify licensee compliance with the regulatory requirements of the NRC Order and gather information to help the NRC staff identify possible further regulatory positions and generic communications.

Specifically, the inspectors reviewed a sample of the results from the volumetric UT and surface ET examinations of RPVH nozzles as follows:

- Observed a portion of in-process UT/ET scanning of RPVH nozzle Nos. 3, 32, and 24
- Reviewed the UT/ET reports and electronic data for RPVH nozzle Nos. 4, 6, 18, 23, 38, 43, and 51
- Reviewed the UT/ET reports for RPVH nozzle Nos. 19 and 20
- Reviewed the results of the UT examination performed to assess for leakage into the annulus between the RPVH penetration nozzle and the RPVH low-alloy steel (interference fit zone) for all penetration numbers listed above
- Reviewed training and qualification records, including qualification and certification procedures, for NDE personnel who performed the above volumetric and surface examinations
- Reviewed certification and calibration records for NDE equipment used to perform the above volumetric and surface examinations.
- Reviewed Wesdyne examinations procedures used to perform the above volumetric and surface examinations

The inspectors also reviewed the procedures and the results for visual examinations performed to identify potential boric acid leaks from pressure-retaining components above the RPVH.

b. Observations and Findings

- 1) Verification that the examinations were performed by qualified and knowledgeable personnel.

The inspectors found that volumetric and surface NDEs were performed in accordance with approved and demonstrated procedures with trained and qualified examination personnel. All examiners were qualified in accordance with the ASME Code and had significant experience, including experience examining RPVHs. In addition to qualification to Code requirements, UT and ET personnel had additional training on RPVH examination.

- 2) Verification that the examinations were performed in accordance with approved and demonstrated procedures.

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The Harris Unit 1 RPVH has 52 control rod drive mechanism (CRDM) nozzles with thermal sleeves, 4 instrument column nozzles, 8 spare penetration nozzles, 1 reactor vessel level indicator system (RVLIS) nozzle, and one vent nozzle, for a total of 66 nozzles.

All penetration nozzles, except the vent nozzle, were examined by remote automated UT and ET examination from the inside diameter (ID) surface in accordance with Wesdyne approved and demonstrated Procedures WDI-SSP-1013, WDI-SSP-1016, WDI-SSP-1014, WDI-SSP-1017, and WDI-SSP-1025. The nozzles were examined using a blade UT/ET probe (for nozzles with thermal sleeve only) and a rotating UT/ET probe (for nozzles without thermal sleeves). Each type of probe was mounted in a single examination module and scanning was performed axially (vertical up and vertical down). For nozzles with thermal sleeves, the examination employed the time of flight diffraction (TOFD) technique using a blade probe containing one set of 44 degree/6 MHz/L-wave transducers (oriented vertically), and a 0 degree/2.5 MHz/L-wave pulse-echo transducer for assessment of leakage into the interference fit zone. For nozzles without thermal sleeves (open housing), except the vent nozzle, the examination employed the TOFD technique using two sets of 55 degree/5 MHz/L-wave transducers (one set oriented vertically for circumferential flaws and the other oriented horizontally for axial flaws), and a 0 degree/2.25 MHz/L-wave pulse-echo transducer for assessment of leakage into the interference fit zone.

The vent nozzle was examined by manual ET examinations in accordance with Wesdyne approved and demonstrated Procedures WDI-STD-101 and WDI-STD-114. The vent nozzle inside surface was ET examined with a multi plus-point coils array probe combined with a bobbin probe. The surface of the vent nozzle's J-groove weld was ET examined using a multi plus-point coils array probe to assess leakage through the J-groove weld.

The inspectors reviewed Wesdyne procedures and observed in-process examinations to verify that activities were performed in accordance with approved and demonstrated procedures. The inspectors found that Wesdyne examination procedures were demonstrated to examine and detect flaws in the RPVH nozzles, as documented in the Electric Power Research Institute (EPRI), Materials Reliability Program (MRP) documents listed in the Attachment. Approved acceptance criteria and critical parameters for RPVH leakage were applied in accordance with these demonstrated procedures.

- 3) Verification that the licensee was able to identify, disposition, and resolve deficiencies.

All indications of cracks or interference fit zone leakage were required to be reported for further examination and disposition. Based on observation of the examination process, the inspectors considered deficiencies would be appropriately identified, dispositioned, and resolved.

UT indications associated to the geometry of the examined volume were identified at several J-groove welds. All indications did not exhibit crack characteristics and were dispositioned as metallurgical/geometrical indications (not service related).

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- 4) Verification that the licensee was capable of identifying the primary water stress corrosion cracking (PWSCC) and/or RPVH corrosion phenomenon described in the NRC Order.

The NDE techniques employed for the examination of RPVH nozzles had been previously demonstrated under the EPRI MRP/Inspection Demonstration Program as capable of detecting PWSCC type manufactured cracks as well as cracks from actual samples from another site. Based on the demonstration, observation of in-process examinations, and review of NDE data, the inspectors determined that the licensee was capable of identifying PWSCC and/or corrosion as required by the NRC Order.

- 5) Evaluation of the RPVH condition (e.g. debris, insulation, dirt, boron from other sources, physical layout, viewing obstructions).

No bare metal visual examinations required by the NRC Order were scheduled for RFO-13. A 100% bare metal visual examination was performed during May 2003 refueling outage and the NRC inspection activities for this visual examination were documented in NRC Integrated Inspection Report 2003-003.

- 6) Evaluation of the licensee's ability to identify and characterize small boron deposits, as described in NRC Bulletin 2001-01.

No bare metal visual examinations required by the NRC Order were scheduled for RFO-13. A 100% bare metal visual examination was performed during May 2003 refueling outage and the NRC inspection activities for this visual examination were documented in NRC Integrated Inspection Report 2003-003.

- 7) Evaluation of the extent of material deficiencies (i.e., cracks, corrosion, etc.) that required repair.

No examples of RPVH leakage, material deficiencies, or flaws requiring repair were identified during the NDEs. As indicated above, UT indications were identified at several J-groove welds and they were dispositioned as metallurgical/geometric indications (not service related).

- 8) Evaluation of any significant impediments to effectively perform each examination method (e.g., centering rings, insulation, thermal sleeves, nozzle distortion, etc.)

The RPVH nozzle examination volume extended from a minimum of 2-in above the highest point of the J-groove weld to the maximum coverage possible below the lowest point of the J-groove weld, which resulted to be more than 1-inch for all nozzles.

Westinghouse Letter LTR-PAFM-06-27, "Shearon Harris Upper Head Penetration Hoop Stress Distribution Below the Weld," dated April 20, documents that the stress levels in all the RPVH nozzle surfaces located at more than 1-inch below the J-groove weld are less than 20 ksi tension.

The inspectors concluded that the examination coverage requirement of the NRC Order was met for all RPVH penetration nozzles. No significant items that could impede the examination processes were noted during observation of the NDEs.

- 9) Evaluation of the basis for the temperatures used in the susceptibility ranking calculation.

During the inspection activities documented in NRC Integrated Inspection Report 50-400/2003-003, the inspectors reviewed the susceptibility ranking calculation and the basis for the RPVH temperatures used in the calculation, as documented in calculation HNP-M/MECH-1091, "Effective Degradation Years for the Reactor Vessel Head." The basis for the RPVH temperature used in the calculation was supported by correspondence from Westinghouse to Progress Energy (Letter PGN-03-40, dated May 28, 2003).

- 10) Verification that the methods used for disposition of NDE identified flaws were consistent with NRC flaw evaluation guidance.

No indications considered to be flaws were found during the RPVH examination. As indicated above, UT indications were identified at several J-groove welds and they were dispositioned as metallurgical/geometric indications (not service related).

- 11) Evaluation of the existing procedures to identify potential boric acid leaks from pressure-retaining components above the RPVH and the licensee's followup actions for indications of boric acid leaks.

The inspectors reviewed Procedure OPT-1519, which was implemented to conduct inspection activities required by the NRC Order to identify potential boric acid leaks from pressure retaining components above the RPVH. The licensee also implemented Procedure EST-227 in conjunction with Procedure OPT-1519. Procedure EST-227 requires visual examinations in areas above the RPVH to meet the Class 1 system pressure test requirements of ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." The licensee generated Condition Report 191710 on April 19, 2006 to implement enhancements for Procedure EST-227, in order to clearly specify that the visual examination requirements established in this procedure are also intended to meet the NRC Order. The inspectors found that the implementation of the procedures mentioned above met the requirements of the NRC Order.

The inspectors reviewed the visual examination results for RFO-13 and held discussions with licensee personnel to confirm followup actions taken for any evidence of boric acid leaks above the RPVH. The inspectors found that no indications of boric acid leaks from pressure retaining components above the RPVH were identified.

#### 4OA6 Meetings

On July 20, the resident inspectors presented the inspection results to Mr. Gannon and other members of his staff. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee personnel**

D. Alexander, Superintendent, Environmental and Chemistry  
A. Barginere, Superintendent, Security  
D. Corlett, Supervisor - Licensing/Regulatory Programs  
R. Downey, MR Coordinator  
R. Duncan, Director - Site Operations  
P. Fulford, Manager, Nuclear Assessment  
C. Gannon, Vice President Harris Plant  
B. Gause, Health Physics Supervisor, Radiation Protection  
W. Gurganious, Training Manager  
K. Henderson, Maintenance Manager  
J. Jankens, Lead Specialist, Radwaste  
C. Kamiliaris, Manager - Support Services  
S. Larson, ISI Coordinator  
E. McCartney, Plant General Manager  
T. Natale, Manager - Outage and Scheduling  
S. O'Connor, Manager - Engineering  
T. Pilo, Supervisor - Emergency Preparedness  
K. Rogers, Lead Specialist, ALARA  
G. Simmons, Superintendent - Radiation Control  
E. Wills, Operations Manager

#### **Contractor Personnel**

C. Holmes, Manager of RPVH examination team, Wesdyne  
F. Bonitz, Level III Examiner, Wesdyne  
W. Holasak, Level III Examiner, Wesdyne

#### **NRC personnel**

P. Fredrickson, Chief, Reactor Projects Branch 4

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

05000400/2006003-02	AV	Failure to Maintain Adequate Procedures Such That a Required Torque Was Not Provided for a Threaded Fastener on an ESCW System Chiller (Section 1R15.b.2)
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Opened and Closed

05000400/2006003-01	NCV	Failure to Follow Procedure During Service Water Control Valve Preventive Maintenance (Section 1R15.b.1)
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Closed

05000400, 2515/150	TI	Reactor Pressure Vessel Head and Head Penetration Nozzles (NRC Order EA-03-009) (Section 4OA5)
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## LIST OF DOCUMENTS REVIEWED

### **Section 1R01: Adverse Weather Protection**

AP-300, "Severe Weather Response"  
AP-301, "Adverse Weather"  
FSAR Section 9.2.1, "Service Water System"  
FSAR Section 8.3.1 "AC Power Systems"  
FSAR Section 6.3, "Emergency Core Cooling Systems"

### **Section 1R04: Equipment Alignment**

#### Partial System Walkdown

#### Residual heat removal system

Procedure OP-111, "Residual Heat Removal System"  
Drawing 2165-S-1324, "Simplified Flow Diagram Residual Heat Removal System"

#### Emergency service water system

Procedure OP-139, "Service Water System"  
Drawing 2165-S-0547 and 2165-S-0548, "Simplified Flow Diagram Circulating and Service Water Systems," sheets 1 and 2

#### Condensate storage tank

Drawing 2165-S-0545, "Simplified Flow Diagram Condensate and Air Evacuation Systems Unit 1"

### **Section 1R05: Fire Protection**

FPP-012-03-FHB, "Fuel Handling Building Fire Pre-Plan"  
FPP-012-01-CNMT, "Containment Building Fire Pre-Plan"  
Harris Nuclear Plant Fire Drill Planning Guide

### **Section 1R06: Flood Protection Measures**

#### FSAR Sections

2.4.10, "Flooding Protection Requirements"  
3.6A.6, "Flooding Analysis"

#### Calculations

Appendix I to the HNP Probabilistic Safety Assessment, "Internal Flooding Analysis"

Procedures

AOP-022, "Loss of Service Water"

**Section 1R07: Heat Sink Performance**

Procedures

PLP-620, "Service Water Program (Generic Letter 89-13)"

EPT-163, "Generic Letter 89-13 Inspections (Raw Water Systems and Local Area Air Handler Inspection and Documentation)"

**Section 1R08: Inservice Inspection Activities**

**Procedures**

SG-SGDA-04-38, Steam Generator Condition Monitoring Assessment of May 2004 Inspection Results and Operational Assessment for Operating Cycle 12 & 13, August 2004

EGR-NGGC-0208, Steam Generator Integrity Program, Rev. 0

STD-100-228, Steam Generator Tube Stabilization Device Installation, Rev. 04

SH-SG-002, Rolled Mechanical Tube Plugging and Stabilizer Installation Using the Advanced Roll Tool (ART) for Steam Generators with 0.6875" OD x 0.040" Wall Tubes, Rev. 00

EST-216, Steam Generator Degradation Assessment for RFO 13, Rev. 15

MNT-NGGC-0007, Foreign Material Exclusion Program, Rev. 6

MRS-SSP-1927-CQL, Westinghouse Model Delta 75 Steam Generator, Secondary Side Tubesheet Inspection, Harris

MRS-TRC-1726, Eddy Current Steam Generator Examination Site Qualified Techniques Validation Report, Rev. 0

EGR-NGGC-0207, Boric Acid Corrosion Control, Rev. 1

OPT-1519, Containment Visual Inspection for Boron and Evaluation of Containment Sump In-Leakage Every Refueling Outage Shutdown, Mode 3, Rev. 8

PDI-ISI-254, Rev.7 Remote Inservice Inspection of Reactor Vessel Welds

PDI-ISI-254-NZ, Rev.0 Remote Inservice Inspection of Reactor Vessel Nozzle to Shell Welds

PDI-ISI-254-SE, Rev.2 Remote Inservice Examination of Reactor Vessel Nozzle to safe End , Nozzle to Pipe, and Safe End to Pipe Welds

WCAL-002, Rev.7 Pulser/Receiver Linearity Procedure

WDI-STD-088, Rev. 3 Underwater Remote Visual Examination of Reactor vessel Internals

EGR-NGGC-0207, Rev. 1 Boric Acid Control

OPT-1519, Rev. 8, Containment Visual Inspection for Boron and Evaluation of Containment Sump In leakage every Refueling Outage Shutdown Mode 3

WDP9.2, Rev. 7 Qualification and Certification of personnel in Non-destructive Examination

SSI-A-005, Rev.22 Qualification and Certification of Nondestructive Examination Personnel

SSI-A-013, Rev3 Qualification and certification of Ultrasonic Examination personnel For Section XI PSI/ISI Inspections

**Self-Assessments**

Harris SG Program Self Assessment, Number: 113074

Boric Acid Corrosion Control Program, Number 113075

**Action Request (AR)**

00125127 Increased Radiation Monitor Readings o REM-3534 (due to SG Loose Parts April 2004)  
00191921 Loose Parts Retrieval in SG-A (Secondary Side)  
00191964 Loose Parts Retrieval in SG-B (Secondary Side)  
00191965 Loose Parts Retrieval in SG-C (Secondary Side)  
00192210 Brown Boric Acid Leakage on FE-985 (Flow element on SI line to RCS Loop 1 Hot Leg)  
00190581 Brown Boric Acid Leakage on FE-973 (Flow element on SI line to RCS Loop 3 Cold Leg)  
00191004 Flange Downstream of 1SI-353 has Brown Boric Acid Buildup

**Section 1R12: Maintenance Effectiveness**

NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"  
ADM-NGGC-0101, "Maintenance Rule Program"  
HPP-780, "Radiation Monitoring System Operating Manual"  
SD-118, "Radiation Monitoring"  
OP-118, "Radiation Monitoring System"  
OWP-RM-15, "Radiation, Effluent, and Explosive Gas Monitoring"  
ISI-801, "Inservice Inspection Program (ISI), Inservice Testing of Valves"  
EST-212, "Type C Local Leak Rate Tests"

**Assessments**

Maintenance Rule Cycle 12, Periodic a(3) Assessment (Assessment Period: June 30, '03 to November 17, '04 - AR 147581)  
Self Assessment Report 111536, Work Management Process Assessment  
Self Assessment Report 146488, HNP Implementation of Corrective Action Program and Operating Experience Program, September 12 to 16, 2005  
Nuclear Assessment Section Report, H-ES-05-01, Harris Engineering Functional Area Assessment, May 13, 2005

**Maintenance Rule Expert Panel Meeting Minutes**

Meeting No. 03-03, 3/26/03  
Meeting No. 03-05, 6/17/03  
Meeting No. 04-03, 2/26/04  
Meeting No. 04-15, 12/9/04  
Meeting No. 05-03, 2/10/05  
Meeting No. 05-07, 4/28/05  
Meeting No. 05-12, 9/1/05  
Meeting No. 06-04, 5/31/06

**Maintenance Rule - System Scoping Documents**

System 4085: Essential Service Chilled Water  
System 5165: 6.9 KV AC Distribution  
System 9001: Containment Isolation Valves  
System 3050: Main Feedwater System  
System 5230: 250 VDC Electrical Distribution  
System 4060: Normal Service Water  
System 5095: Emergency Diesel Generators

**Corrective Action Documents**

**Significant Adverse Condition Investigation Reports for**

Action Request (AR) 38438  
AR 159131  
AR 172596  
AR 190137  
AR 105539  
AR 119086  
AR 79228  
AR 132488  
AR 140449  
AR 160899  
AR 099026-01 [evaluation only]  
AR 198973  
AR 198948  
AR 198754

**Other Documents**

Corrective Maintenance Work Orders completed after June 1, 2005 for:

System 4085: Essential Service Chilled Water  
System 5165: 6.9 KV AC Distribution  
System 5095: Emergency Diesel Generators  
System 5100: Diesel Fuel Oil  
System 5110: Diesel Jacket Water System  
System 5095: Emergency Diesel Generators  
System 5112: Diesel Starting Air

System Health Reports for:

System 5165: 6.9 KV AC Distribution  
System 5230: 250 VDC Electrical Distribution  
System 4060: Normal Service Water  
System 9001: Containment Isolation Valves  
System 4085: Essential Service Chilled Water



Work Orders 00721491-01 6.9 KV Bus UV Circuit Time Delay Pickup Relay (TYPICAL)  
00649357-01 UV Relay for 1A-SA

**Section 1R13: Maintenance Risk Assessments and Emergent Work Evaluation**

OMP-003, "Outage Shutdown Risk Management."  
WCM-001, "On-line Maintenance."

**Section 1R15: Operability Evaluations**

OPS-NGGC-1305, "Operability Determinations"

**Section 1R20: Refueling and Outage Activities**

FHP-020, "Refueling Operations"  
FHP-014, "Fuel and Insert Shuffle Sequence"  
EST-923, "Initial Criticality and Low Power Physics Testing"  
GP-004, "Reactor Startup"

**Section 1R23: Temporary Plant Modifications**

DBD-201, "Emergency Diesel Generator System."  
Drawing 7-G-0509, "Protective Mats For Class 1 Yard Duct Runs Plan & Misc Details."  
FSAR section 3.5, "Missile Protection."

**Section 20S1: Access Controls to Radiologically Significant Areas**

Procedures, Manuals, and Guidance Documents

AP-504, Administrative Controls for Locked and Very High Radiation Areas, Revisions (Rev.) 22  
AP-535, Performing Work in Radiological Control Areas, Rev. 19  
CAP-NGGC-0200, Corrective Action Program, Rev. 16  
HPP-600, Radiation Work Permits, Rev. 20  
HPP-625, Performance of Radiological Surveys, Rev. 21  
HPP-800, Handling Radioactive Material, Rev. 46  
HPS-NGGC-0003, Radiological Posting, Labeling and Surveys, Rev. 8  
HPS-NGGC-0014, Radiation Work Permits, Rev. 3  
HPS-NGGC-0016, Access Control, Rev. 2  
PLP-511, Radiation Control and Protection Program, Rev. 18

Radiation Work Permit (RWP) Documents

RWP 3408, Health Physics Routines  
RWP 3438, Reactor Head/Core Activities  
RWP 3441, Seal Table Activities  
RWP 3455, Nozzle Dam/Nozzle Cover  
RWP 3457, RHR Pump Repairs  
RWP 3596, S/G Sludge Lance Activities

RWP 3601, Reactor Head Volumetric Exam  
RWP 3602, Reactor Vessel 10-Year ISI Activities  
RWP 3696, Radiography

Licensee Records and Data

AP-555, Rev. 3, 04-23-06, Attachment 4 - Radiography Checklist, RAB 261 - Lower Filter House Valve Gallery  
AP-555, Rev. 3, 04-24-06, Attachment 4 - Radiography Checklist, RCB 236 - BD 65  
HRA Briefing, 04/23/06, Decon RHR Motor "A"  
Radiological Survey Record No. 0413-005, Repair UT Tool and Reinstall, RCB 286', Elevated Reactor Head Stand Area, 04-13-06  
Radiological Survey Record No. 0413-010, Post Shielding for work areas, RCB 286', Elevated Reactor Head Stand Area, 04-13-06  
Radiological Survey Record No. 0424-004, Pre-Radiography Survey, RCB 236, 04-24-06

Nuclear Condition Report (NCR) and Quality Assurance (QA) Documents

AR 141414, Personnel error resulting in breach of LHRA boundary, 10/23/2004  
AR 156706, Entry to HRA on wrong RWP, 04/18/2005  
AR 160694, Weakness 1 from Self-Assessment on LHRA controls, 06/07/2005  
AR 160695, Weakness 2 from Self-Assessment on LHRA controls, 06/07/2005  
AR 160697, Weakness 3 from Self-Assessment on LHRA controls, 06/07/2005  
AR 162828, ED dose rate alarm, 07/05/2005  
AR 181822, Unposted HRA, 01/21/2006  
AR 190133, Inadequate HRA boundary, 04/05/2006  
AR 190896, Individual failed to verify correct RWP task, 04/12/2006  
AR 190958, Valid ED dose rate alarm, 04/12/2006  
AR 190981, Reactor containment building 221' LHRA above in-core sump, 04/12/2006  
AR 191123, In-core thimble retraction in excess of 21' 8", 04/14/2006  
NAS Report File No. H-RP-05-01, Harris Radiation Protection Assessment, 11/02/2005  
Self-Assessment Report No. 152347, Locked High Radiation Area Controls, conducted 05/09-18/2005

**Section 20S2: As Low As Reasonably Achievable**

Procedures, Manuals, and Guidance Documents

ADM-NGGC-0105, ALARA Planning, Rev. 7  
AP-110, Pre-Job/Post-Job Briefings, Rev. 18  
AP-530, ALARA, Rev. 8  
AP-535, Performing Work in Radiation Control Areas, Rev. 18  
AP-555, Radiography, Rev. 3  
CAP-NGGC-0200, Corrective Action Program, Rev. 16  
DOS-NGGC-0002, Dosimetry Issuance, Rev. 22  
DOS-NGGC-0004, Administrative Dose Limits, Rev. 8  
HPP-600, Radiation Work Permits, Rev. 20  
HPS-NGGC-0003, Radiological Posting, Labeling And Surveys, Rev. 8

HPS-NGGC-0014, Radiation Work Permits, Rev. 3  
MNT-NGGC-003, Radiation Shielding Use, Rev. 8  
PLP-511, Radiation Control and Protection Program, Rev. 18

Licensee Records and Data

2005 HNP Annual ALARA Report  
2006 ALARA Budget Considerations  
2006 Normal Operations Monthly Dose Goals  
2006-2008 HNP Business Plan Initiative for ALARA Program – Radiation Exposure Reduction  
Active ALARA Reviews, 04/11/06  
ALARA Committee Meeting Minutes, March 2005 - February 2006  
Comparison of Dose (REM) for Repetitive Outage Tasks from RFO-1 to RFO-12  
Dose Budgets for 2005  
Dose Projection Basis for 2005  
Evaluated Risk Assessment, Manual Eddy Current, RWP # 3441, 04/10/06  
Harris Source Term Management Document  
HNP Five Year Dose Reduction Plan 2004 - 2008  
HNP Historical Dose 1992 to 2005  
HNP Refueling Outage 13, Radiological Status Report, 04/26/06 and 04/27/06  
RFO-13 Projections vs. Actuals (04/25/06)  
RFO-13 Refueling and Scaffold ALARA Plans  
Steam Generator Channel Head Radiation Levels for RFO-1 to RFO-11  
TEDE ALARA Evaluation, Seal Table Maintenance Activities, RWP # 3441, 04/07/06

Temporary Shielding Requests (TSR)

TSR 06-024, Revs. 1 and 2, Generic shielding for Rx Head while it is on the head stand  
TSR 06-035, Shield under head to remove LHRA

ALARA Work Packages (AWP)

AWP 06-063, Rev. 1, Seal Table Maintenance Activities  
AWP 06-068, Shielding Activities  
AWP 06-074, Sludge Lance, Foreign Object Search and Retrieval (FOSAR), and Secondary  
Side Steam Generator Inspections  
AWP 06-076, Rev. 2, Install Remove Nozzle Dams/Nozzle Covers  
AWP 06-078, Rev. 1, Replace A RHR Pump and Motor

Radiation Protection Pre-Job Brief Packages

AP-110, Rev. 18, 04-09-06 (2200), Seal Table Room Activities RO-13  
AP-110, Rev. 18, 04-10-06 (1330), Seal Table Eddy Current  
AP-110, Rev. 18, 04-22-06 (0830), Remove/Install Steam Generator Nozzle Dams/Covers,  
RWP 3455, AWP 06-076, Rev. 2  
AP-110, Rev. 18, 04-23-06 (1930), Radiography, RWP 3696  
AP-110, Rev. 18, 04-23-06 (2030), Decon "A" RHR Flange and Bolts, RWP 3457, AWP 06-078,  
Rev. 1

AP-110, Rev. 18, 04-24-06 (0500), Radiography on BD-65 RCB, RWP 3696

#### NCRs

AR 190504, RCS sample activity causes higher than expected dose, 04/08/06  
AR 190754, RCS shutdown crud burst and dose rates, 04/10/06  
AR 190806, Detail not provided to ALARA for planning on incore ECT, 04/11/06  
AR 190978, Reactor head shielding package not per design, 04/12/06  
AR 191168, Contributors to elevated dose rates, 04/14/06  
AR 191290, RFO-13 dose status, 04/17/06  
AR 191927, ALARA plan estimated exceeded, 04/21/06

### **Section 2PS2: Radioactive Material Processing and Transportation**

#### Procedures, Manuals, and Guidance Documents

CAP-NGGC-0200, Corrective Action Program, Rev. 7  
HPP-880, Spent Nuclear Fuel Shipping and Receipt, Rev. 27  
HPS-NGGC-0001, Radioactive Material Receipt and Shipping Procedure, Rev. 22  
HPS-NGGC-0002, Vendor Cask Utilization Procedure, Rev. 13  
PLP-300, Process Control Program, Rev. 9

#### Records and Data

2005 Annual Radioactive Effluent Release Report  
Radman Database Report, Change 47 (10 CFR 61.55 analysis data)  
Radioactive Materials Receipt Log 2005 and 2006 (Year-To-Date)  
Radioactive Materials Shipment Logbook 2005 and 2006 (Year-To-Date)  
Radwaste Shipment: 05-004, 21 filter drums in 21-300 cask to Duratek  
Radwaste Shipment: 05-013, Boron-10 samples (4 gallon overpack)  
Radwaste Shipment: 06-002, Fuel handling tool to Westinghouse  
Radwaste Shipment: 06-010, 20 ft sealand container of used Orex protective clothing to ETI  
Radwaste Shipment: 06-025, Spent resin in 8-120 cask to Studsvik  
Radwaste Shipment: 06-033, Pressurizer relief valve and snubbers

#### NCR and QA Documents

AR 00141185, Inadequate Radioactive Material Labeling  
AR 00159463, Ambiguously Labeled Drum Containing Radwaste Material  
AR 00169189, Rad waste Shipping Documentation Inattention to Detail  
AR 00169354, Transposition Error on Shipment Documentation  
Nuclear Assessment H-RP-05-01, Harris Radiation Protection Assessment

### **Section 4OA1: Performance Indicator Verification**

#### Records

2005 Annual Radioactive Effluent Release Report

AR Searches for High Radiation, HRA, LHRA, and Postings.  
CAP-NGGC-0200, Corrective Action Program, Rev. 16  
REG-NGGC-0009, NRC Performance Indicators And Monthly Operating Report Data, Rev. 5  
Searches for ED alarms >100 mr above setpoint, dose rate alarms >1000mr/hr.  
Shearon Harris Nuclear Power Plant, Off-Site Dose Calculation Manual (ODCM), Rev. 16

#### **Section 4OA2: Identification and Resolution of Problems**

CAP-NGGC-0200, "Corrective Action Program."  
HNP-Site Trend Report - Fourth Quarter, 2005 and First Quarter, 2006.

#### **Section 4OA5: Other Activities**

WDI-STD-101, "RVHI Vent, Eddy Current, Plus-Point Coil," Revision 5  
WDI-STD-114, "RVHI Vent Tube, Eddy Current, Plus-Point Coil, Bobbin Coil," Revision 4  
WDI-SSP-1013, "Procedure for Detection and Sizing of Cracks in PWR Reactor Vessel Closure Head Penetrations using UT Techniques," Revision 2  
WDI-SSP-1014, "Procedure for the Eddy Current Inspection of Reactor Vessel Head Penetration Nozzles with Thermal Sleeves using Blade Probes," Revision 2  
WDI-SSP-1016, "Guidelines for Analyzing Data from PWR Reactor Vessel Head Penetrations using MASERA and MASERA\_TOFD," Revision 1  
WDI-SSP-1017, "Eddy Current Analysis Guidelines for RPV Penetrations," Revision 1  
WDI-SSP-1025, "Procedure for the Eddy Current Inspection of Open Reactor Vessel Head Penetration Nozzles," Revision 3  
EST-227, "ASME Section XI Class 1 System Pressure Test," Revision 7  
OPT-1519, "Containment Visual Inspection for Boron and Evaluation of Containment Sump In-leakage Every Refueling Outage Shutdown Mode 3," Revision 8  
WDP-9.2, "Qualification and Certification of Personnel in Nondestructive Testing," Revision 7  
ANATEC-08, "Certification of NDT Personnel," Revision 17  
ML-QAP-9.1, "Certification of NDE Personnel (ET)," Revision 7  
SSI-A-005, "Qualification and Certification of Nondestructive Examination Personnel," Revision 22  
HC-00, "Qualification and Certification of Non-destructive Testing Personnel," Revision 14

#### **Engineering Documents**

Summary of Demonstration Results: Material Reliability Program (MRP), Demonstration of Tectaton Equipment and Procedures for the Inspection of Alloy 600 Control Rod Drive Mechanism (CRDM) Head Penetrations, Dated March 15, 2005

IR-2006-108, Summary of Demonstration Results: Material Reliability Program (MRP), Demonstration of Tectaton Equipment and Procedures for the Inspection of Alloy 600/690 Control Rod Drive Mechanism (CRDM) Head Penetrations, Dated March 2006

Westinghouse Letter LTR-PAFM-06-27, "Shearon Harris Upper Head Penetration Hoop Stress Distribution Below the Weld," dated April 20, 2006

Corrective Action Documents

Condition Report 00191710\*

Condition Report 00191703\*

Condition Report 00191704\*

\*Condition Reports generated as a result of this inspection

Records

Personnel Certification Records for all Wesdyne Examiners

Framatome Equipment Certification Records for the following NDE Equipment

UT/ET Blade Probes: 2889, 2963, 2919, 3002, and 3003

UT Probe - Circumferential: 3493

UT Rotating Probes: 11239-11240, 11241-11242, and 11894

Calibration Reports: UCR-1/5-2, UCR-2/5-2, UCR-3/5-2, UCR-4/5-2, UCR-5/5-2