



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005**

February 6, 2006

R. T. Ridenoure  
Vice President  
Omaha Public Power District  
Fort Calhoun Station FC-2-4 Adm.  
P.O. Box 550  
Fort Calhoun, NE 68023-0550

**SUBJECT: FORT CALHOUN STATION - NRC INTEGRATED INSPECTION  
REPORT 05000285/2005005**

Dear Mr. Ridenoure:

On December 31, 2005, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Fort Calhoun Station. The enclosed integrated inspection report documents the inspection findings, which were discussed on January 20, 2005, with Mr. David Bannister, Plant Manager, and other members of your staff.

The inspections 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 two self-revealing findings that were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that two violations are associated with these issues. These violations are being treated as noncited violations (NCVs), consistent with Section VI.A of the Enforcement Policy. The NCVs are described in the subject inspection report. If you contest the violations or significance of the NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011-4005; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Fort Calhoun Station facility.

In accordance with 10 CFR Part 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 component 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).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

David N. Graves, Chief  
Project Branch E  
Division of Reactor Projects

Docket: 50-285  
License: DPR-40

Enclosure:  
NRC Inspection Report 05000285/2005005  
w/attachment: Supplemental Information

cc w/enclosure:  
Joe I. McManis, Manager - Licensing  
Omaha Public Power District  
Fort Calhoun Station FC-2-4 Adm.  
P.O. Box 550  
Fort Calhoun, NE 68023-0550

David J. Bannister  
Manager - Fort Calhoun Station  
Omaha Public Power District  
Fort Calhoun Station FC-1-1 Plant  
P.O. Box 550  
Fort Calhoun, NE 68023-0550

James R. Curtiss  
Winston & Strawn  
1400 L. Street, N.W.  
Washington, DC 20005-3502

Chairman  
Washington County Board of Supervisors  
P.O. Box 466  
Blair, NE 68008

Julia Schmitt, Manager  
Radiation Control Program  
Nebraska Health & Human Services  
Dept. of Regulation & Licensing  
Division of Public Health Assurance  
301 Centennial Mall, South  
P.O. Box 95007  
Lincoln, NE 68509-5007

Daniel K. McGhee  
Bureau of Radiological Health  
Iowa Department of Public Health  
Lucas State Office Building, 5th Floor  
321 East 12th Street  
Des Moines, IA 50319

Chief Technological Services Branch  
National Preparedness Division  
Department of Homeland Security  
Emergency Preparedness & Response Directorate  
FEMA Region VII  
2323 Grand Boulevard, Suite 900  
Kansas City, MO 64108-2670

Electronic distribution by RIV:  
 Regional Administrator (**BSM1**)  
 DRP Director (**ATH**)  
 DRS Director (**DDC**)  
 DRS Deputy Director (**RJC1**)  
 Senior Resident Inspector (**JDH1**)  
 Resident Inspector (**LMW1**)  
 Branch Chief, DRP/E (**DNG**)  
 Senior Project Engineer, DRP/E (**VGG**)  
 Team Leader, DRP/TSS (**RLN1**)  
 RITS Coordinator (**KEG**)  
 DRS STA (**DAP**)  
 J. Dixon-Herrity, OEDO RIV Coordinator (**JLD**)  
**ROPreports**  
 FCS Site Secretary (**BMM**)  
 W. A. Maier, RSLO (**WAM**)

SUNSI Review Completed:  **DNG** ADAMS: / Yes  No Initials: **DNG**  
 / Publicly Available  Non-Publicly Available  Sensitive / Non-Sensitive

R:\ REACTORS\ FCS\2005\FC2005-05RP-JDH.wpd

RIV:RI:DRP/E	SRI:DRP/E	C:DRS/EB1	C:DRS/OB	
LMWilloughby	JDHanna	JAClark	ATGody	
<b>T-DNGGraves</b>	<b>T-DNGGraves</b>	<b>/RA/</b>	<b>/RA/</b>	
2/6/06	2/6/06	2/6/06	2/6/06	

E:DRS/EB2	C:DRS/PSB	C:DRP/E	
LJSmith	MPShannon	DNGraves	
<b>DLProulx for</b>	<b>/RA/</b>	<b>/RA/</b>	
2/3/06	2/3/06	2/6/06	

OFFICIAL RECORD COPY

T=Telephone

E=E-mail

F=Fax

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION IV**

Docket: 50-285  
License: DPR-40  
Report: 05000285/2005005  
Licensee: Omaha Public Power District  
Facility: Fort Calhoun Station  
Location: Fort Calhoun Station FC-2-4 Adm.  
P.O. Box 399, Highway 75 - North of Fort Calhoun  
Fort Calhoun, Nebraska  
Dates: October 1 through December 31, 2005  
Inspectors: J. Hanna, Senior Resident Inspector  
L. Willoughby, Resident Inspector  
R. Lantz, Senior Emergency Preparedness Inspector  
T. McKernon, Senior Operations Engineer  
J. Kirkland, Project Engineer, Project Branch E  
Approved By: David N. Graves, Chief, Project Branch E  
Division of Reactor Projects

## SUMMARY OF FINDINGS

IR 05000285/2005005; 10/01/2005 - 12/31/2005; Fort Calhoun Station, Integrated Resident and Regional Report; Operator Performance During Nonroutine Evolutions and Events; Operability Evaluations.

The report covered a 3-month period of inspection by resident inspectors and an announced inspection by an emergency preparedness inspector and a project engineer. Two Green noncited violations of significance were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the significance determination process 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 Findings and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green. A noncited violation (NCV) of Criterion XVI, "Corrective Action," was identified for a failure to identify and correct a condition adverse to quality on a reactor coolant pump seal when another pump was disassembled for maintenance. Specifically, the licensee did not recognize that a material nonconformance (inadequately sized O-rings) was applicable to components installed in the plant. Installation of the incorrect O-ring resulted in subsequent failure of the reactor coolant pump seal.

This finding is more than minor because it affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. This finding was assessed using Appendix G, "Shut-down Operations Significance Determination Process," of Manual Chapter 0609, "Significance Determination Process." Using Checklist 3, "PWR Cold Shut-down and Refueling Operation - RCS Open and Refueling Cavity Level < 23' Or RCS Closed and No Inventory in Pressurizer, Time to Boiling < 2 hours," in Attachment 1, "Phase 1 Operational Checklists for both PWRs and BWRs," of Appendix G of Manual Chapter 0609, this finding did not require quantitative assessment and, therefore, screened as a Green finding. A contributing cause of the finding is related to the crosscutting element of problem identification and resolution in that engineering did not identify that the reactor coolant pump seal was degraded/nonconforming despite several indications. This condition has been entered into the licensee's corrective action program (Section 1R14).

- Green. A noncited violation of Criterion V, "Instructions, Procedures and Drawings," was identified for an inadequate procedure that resulted in several water hammer events on the low pressure safety injection system and related damage to safety-related components. The licensee's procedure resulted in

allowing reactor coolant to leak back into the low pressure safety injection system. In addition to the crosscutting aspect of human performance related to procedure development, this issue had crosscutting aspects related to problem identification and resolution in that the licensee failed to recognize that the back leakage had established conditions that were conducive to water hammer. The licensee then vented the system using the low pressure safety injection pump, which resulted in three water hammer events.

The licensee's inadequate procedure and poor problem identification, which resulted in three low pressure safety injection water hammer events, constituted a performance deficiency and a finding. This finding is greater than minor because it could be reasonably viewed as a precursor to a significant event (i.e., the loss of low pressure safety injection when called upon to mitigate an accident). Additionally the finding affected the availability and reliability of mitigating system equipment (Flow Instrument FI-328). This finding was evaluated using the significance determination process and was determined to be a finding of very low safety significance because the finding was: (1) not a qualification deficiency confirmed to result in a loss of function, (2) did not result in a loss of safety system function, (3) did not represent an actual loss of safety function of a single train, (4) did not represent an actual loss of safety function of risk significant equipment >24 hours, and (5) did not screen as risk significant due to external events. The inspectors also determined that the cause of the finding was related to a failure to identify a condition adverse to quality. This condition has been entered into the licensee's corrective action program (Section 1R15).

B. Licensee-Identified Violations

None

## REPORT DETAILS

### Summary of Plant Status

The unit began this inspection period in Mode 1 at full rated thermal power and operated at 100 percent until October 17 when power was decreased on the unit to 78 percent. The unit remained at approximately 87 percent power for the next 5 days while the turbine generator condensers were cleaned. On October 22, reactor power was increased to 100 percent, where the plant remained until the end of the inspection period.

### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

#### 1R01 Adverse Weather Protection (71111.01)

##### a. Inspection Scope

The inspectors reviewed Procedure OI-EW-1, "Extreme Weather," Revision 12, and Procedure AOP-01, "Acts of Nature," Revision 18 for responding to extreme weather, specifically cold weather preparations (one inspection sample). The inspectors evaluated the design features and implementation of the procedure to protect the auxiliary feedwater system and raw water system from the effects of adverse weather.

##### b. Findings

No findings of significance were identified.

#### 1R04 Equipment Alignments (71111.04)

##### Partial Equipment Walk-downs

##### a. Inspection Scope

The inspectors performed partial walkdowns (two inspection samples) of the following trains of equipment during outages, operation, or testing of redundant trains. The inspectors verified that the following systems were properly aligned in accordance with system piping and instrumentation drawings and plant procedures:

- Main steam supply to turbine-driven auxiliary feedwater Pump FW-10, while motor-driven auxiliary feedwater Pump FW-6 was out of service
- High pressure safety injection (HPSI) Pump SI-2A, while HPSI Pump SI-2B was out of service

##### b. Findings

No findings of significance were identified.



1R05 Fire Protection (71111.05)

.1 Routine Fire Inspection Tours

a. Inspection Scope

The inspectors performed routine fire inspection tours (eight inspection samples) and reviewed relevant records for plant areas important to reactor safety. The inspectors observed the material condition of plant fire protection equipment, the control of transient combustibles, and the operational status of barriers. The inspectors compared in-plant observations with commitments in the licensee's Updated Fire Hazards Analysis Report. The following fire areas were inspected:

- Fire Area 33 - Component Cooling Water Heat Exchangers C and D Area (Room 18)
- Fire Area 37 - Battery Room 1 (Room 54)
- Fire Area 1 - Safety Injection and Containment Spray Pump Area 1 (Room 21)
- Fire Area 6.8 - Spent Fuel Pool Pump and Heat Exchanger Area (Room 5)
- Fire Area 13 - Mechanical Penetration Area (Room 13)
- Fire Area 36B - West Electrical Switchgear Room
- Fire Area 1 - Safety Injection and Containment Spray Pump Area 1 (Room 22)
- Fire Area 6.3 - West Corridor 4 Area

b. Findings

No findings of significance were identified.

.2 Annual Fire Drill Observation

a. Inspection Scope

On October 10, 2005, the inspectors observed and evaluated the readiness of licensee personnel to prevent and fight fires (one inspection sample). The inspectors placed an inspection emphasis on proper donning of fire gear, use of a self-contained breathing apparatus, entry into the fire area, fire brigade leader's directions, simulated use of firefighting equipment, and communications. The inspectors discussed any observations with the evaluator following the drill scenario.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

The inspectors reviewed the Probabilistic Risk Assessment Summary Notebook for internal flooding events. The inspectors performed walkdowns of the auxiliary feedwater pumps and air compressors to verify that equipment was not subject to damage as a result of internal flooding (one inspection sample). The inspectors reviewed the internal flooding analysis that demonstrated safety-related equipment in other rooms were not vulnerable to this internal flooding.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification Program (71111.11)

a. Inspection Scope

The inspectors performed one quarterly licensed operator requalification observation. On November 11, 2005, the inspectors observed licensed operator requalification training activities, including the licensed operators' performance and the evaluators' critique (one inspection sample). The inspectors compared performance in the simulator with performance observed in the control room during this inspection period. The focus of the inspection was on high-risk licensed operator actions, operator activities associated with the emergency plan, and previous lessons-learned items. These items were evaluated to ensure that operator performance was consistent with protection of the reactor core during postulated accidents.

Following the completion of the annual operating examination testing cycle, which ended the week of August 30, 2005, the inspectors reviewed the overall pass/fail results of the annual individual job performance measure operating tests, and simulator operating tests administered by the licensee during the operator licensing requalification cycle. Eight separate crews participated in simulator operating tests and job performance measure operating tests, totaling 51 licensed operators. All of the crews tested passed the simulator portion of the annual operating test and the job performance measure portion of the test. These results were compared to the thresholds established in Manual Chapter 609, Appendix I, *Operator Requalification Human Performance Significance Determination Process*.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors reviewed the licensee's implementation of the requirements of the Maintenance Rule (10 CFR 50.65) to verify that they had conducted appropriate evaluations of equipment functional failures, maintenance preventable functional failures, the unplanned capacity loss factor, and system unavailability. The inspectors discussed the evaluations with the licensee personnel. The following maintenance rule items (two inspection samples) were reviewed:

- Emergency Diesel Generator 2
- Electrohydraulic Control Pump EHC-4B

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed risk assessments by the licensee (three inspection samples) for equipment outages as a result of planned and emergent maintenance to evaluate the licensee's effectiveness in assessing risk for these activities. The inspectors compared the licensee's risk assessment and risk management activities against requirements of 10 CFR Part 50.65 (a)(4). The inspectors discussed the planned and emergent work activities with planning and maintenance personnel. The inspectors verified that plant personnel were aware of the appropriate licensee-established risk category, according to the risk assessment results and licensee program procedures. The inspectors reviewed the effectiveness of risk assessment and risk management for the following activities:

- Maintenance on raw water pump Breaker AC-10A, cleaning and inspecting raw water/component cooling water Heat Exchanger AC-1C, eddy current testing Instrument Air Compressor CA-1A, pressurizer level check surveillance, venting low pressure safety injection (LPSI) header, replacement of condensate makeup control Valve LCV-1190 backup nitrogen supply bottles, surveillance testing and postmaintenance testing of the motor-driven Fire Pump FP-1A on December 14, 2005
- Venting of LPSI piping on November 20, 2005
- Maintenance on raw water Pump AC-10D, following the failure of the component to start on September 5, 2005

b. Findings

No findings of significance were identified.

1R14 Operator Performance During Nonroutine Evolutions and Events (71111.14)

a. Inspection Scope

The inspectors reviewed the licensee's response to various reactor coolant pump (RCP) seal failures during and immediately following the refueling outage.

b. Findings

Introduction: The inspectors identified a noncited violation (NCV) of Criterion XVI, "Corrective Action," for a failure to identify and correct a condition adverse to quality on a reactor coolant pump seal when another pump was disassembled for maintenance. Specifically, the licensee did not recognize that a material nonconformance (inadequately sized O-rings) was applicable to components installed in the plant. Installation of the incorrect O-ring resulted in subsequent failure of the reactor coolant pump seal.

Description: During Refueling Outage R22, the station replaced the seals on RCPs RC-3C and RC-3D. Following removal of the seals from the RCPs, the licensee inserted new O-rings into the seals. (Soft parts such as O-rings and quad-rings cannot be reused). Prior to inserting the reconditioned seals in the plant, Procedure MM-RR-RC-0016, "Testing of Reactor Coolant Pump Seals," Revision 2, was performed. This surveillance test ensured that the seal cartridge assembly was ready for installation by verifying that the seal met the required acceptance criteria. The test verified that the pressure decrease across each of the three stages was approximately 700 psid, and that the seal leakoff values were approximately 1 gpm. On or about February 28, 2005, the licensee tested RCP RC-3C, which resulted in a middle seal pressure of 1525 psi, which failed to meet the acceptance criteria of 1361 psi to 1461 psi. System Engineering evaluated the condition and used engineering judgment to declare the results as acceptable on February 28, 2005. This seal, once determined to be "satisfactory," was re-inserted into RCP RC-3C on March 2, 2005.

On March 15 and 22, 2005, the RCP RC-3D seal failed its testing for allowable pressure decreases across the upper and middle portions. The licensee identified, through discussions with the vendor, that the diameter (thickness) measurement of the O-rings was below the vendor specification of 0.118" +/- 0.004". Further investigation revealed that other O-rings kept in the licensee's warehouse were also nonconforming with the required diameter. The apparent cause of the nonconforming O-rings was that the vendor's mold was undersized.

These O-rings were part of a refurbishment kit for the Flowserve N7500 RCP. The O-rings had catalogue identification Number 117196-1 and Flowserve part Number 7002749. During the extent of condition review for O-ring dimensional tolerances, the licensee also found several other O-ring types (including catalogue identification

Number 117202-1, Flowserve part Number 10109193, and item Number 747-5) out of tolerance. Because this finding is likely to have generic concerns, the manufacturing details are being included in this inspection report to ensure other licensees are aware of this issue.

On May 22, 2005, the licensee commenced heatup and pressurization of the reactor coolant system (RCS) in preparation for returning to power operations. The damaged seal went undetected until May 24, 2005, when operators commenced starting RCP RC-3C. Initial indications of the degraded seal were that the controlled bleed off water, which leaves the seal, had elevated temperatures and flow rates. At approximately 3:30 p.m. on May 24, operators commenced cooldown of the reactor and on May 25, 2005, at 1:48 p.m., the RCS was placed in midloop conditions in order to repair the seal. The plant remained in reduced inventory to replace the seal until 12:12 a.m. on May 26, 2005 (approximately 10 hours). During this reduced inventory activity, RCS time-to-boil was 70 minutes. The inspectors considered this an unplanned entry into reduced RCS inventory. Additionally, the inspectors considered the lower inventory of the RCS to be an affected mitigating system for the prevention of boiling conditions in the reactor vessel. The seal replacement following the unplanned reduced inventory condition was successfully completed.

Analysis: The inspectors determined that this issue is more than minor because it affected the mitigating systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors used Appendix G, "Shut-down Operations Significance Determination Process," of Manual Chapter 0609, "Significance Determination Process," to further determine the significance of this finding. Using Checklist 3, "PWR Cold Shut-down and Refueling Operation - RCS Open and Refueling Cavity Level < 23' Or RCS Closed and No Inventory in Pressurizer, Time to Boiling < 2 hours," in Attachment 1, "Phase 1 Operational Checklists for both PWRs and BWRs," of Appendix G of Manual Chapter 0609, the inspectors determined this finding did not require quantitative assessment and, therefore, screened as a Green finding. A contributing cause of the finding is related to the crosscutting element of problem identification and resolution in that engineering did not identify that the RCP RC-3C seal was degraded/nonconforming despite several indications (e.g., the failure of the RCP RC-3D seal).

Enforcement: Title 10 of CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states in part that "measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected." Contrary to the above, on March 15, 2005, a nonconformance on the RCP RC-3D seal was identified. However, the licensee did not appropriately review the extent of condition and identify that the improperly sized O-rings were installed in RCP RC-3C. This required an additional entry into a reduced RCS inventory condition during the refueling outage. The pump seal was subsequently replaced with the properly sized O-rings, and dimensions of other subject parts in the stores were verified, so no safety issue currently exists at this facility. This violation of Appendix B, Criterion XVI, is being treated as an

NCV, consistent with Section VI.A of the Enforcement Policy (NCV 285/2005005-01). This violation was entered into the licensee's corrective action program as Condition Report (CR) 200502675.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed operability evaluations (five inspection samples) to verify that the evaluations provided adequate justification that the affected equipment could still meet its Technical Specification, Updated Safety Analysis Report, and design bases requirements. The inspectors also discussed the evaluations with cognizant licensee personnel. The inspectors reviewed the operability evaluations and cause assessments for the following:

- TCV-202, Reactor Coolant System Loop 2A Letdown Temperature Control Valve, change in mean seat diameter and effects on containment isolation (CR 200505532)
- FT-1395, Steam Generator RC-2A Inlet Flow Transmitter, the replaced transmitter indicated higher feedwater flow than the old transmitter (CR 200505624)
- RM-063, accident range stack gas radiation monitor remote rate meter, questionable adequacy of the quarterly channel functional test (CR 200505511)
- 161 kV grid voltage indicating higher than normal and consequential effects on 4.16 kV electrical buses 1A3 and 1A4 (CR 200505649)
- LPSI system operability following steam voiding and water hammer events (CR 200505030)

b. Findings

Introduction: The inspectors identified an NCV of Criterion V, "Instructions, Procedures and Drawings," for an inadequate procedure that resulted in several water hammer events on the LPSI system and related damage to safety-related components. The licensee's procedure resulted in allowing reactor coolant to leak back into the LPSI system. In addition to the crosscutting aspect of human performance related to procedure development, this issue had crosscutting aspects related to problem identification and resolution in that the licensee failed to recognize that the back leakage had established conditions that were conducive to water hammer. The licensee then vented the system using the LPSI pump, which resulted in three water hammer events.

Description: The purpose of the LPSI system is to inject water into the core during a design basis event, e.g., a loss of coolant accident. At the highpoint of the LPSI piping, ultrasonic detectors monitor for gas voids that might potentially challenge the ability of the system to perform it's function. Since startup of the plant following Refueling



Outage R22, the ultrasonic LPSI detectors have indicated frequent accumulations of gas from the safety injection tanks due to leakage past the LPSI check valves and isolation valves. The licensee's interim corrective action has been to vent the gas from the system while long-term corrective actions were developed.

On September 15, 2005, the HPSI pump was used to pressurize the common header between LPSI, HPSI, and the safety injection tank systems. The licensee believed that this "hydraulic lock" would help seat the check valves and minimize further leakage, preventing further accumulations of gas. This procedure was conducted in accordance with OI-SI-1, "Safety Injection - Normal Operation," Attachment 14. On October 18, 20, and 24 during venting and flushing operations of the LPSI system, water hammer events occurred that initially were not recognized as potentially significant water hammer events. The licensee subsequently determined that the cause of the water hammer events was the use of the "hydraulic lock" procedure, which lessened the differential pressure across the RCS check valve, allowing roughly 500EF water to slowly seep into the LPSI injection headers.

The inspectors noted that indications were available to operators of the conditions favorable to a water hammer event (e.g., excessive piping temperatures), as well as the occurrences themselves. For example, operators inside containment on October 20, 2005, noted that the normally rigid tubing used to vent the LPSI piping was hot and became pliable. This condition was described in CR 200504996. Following starts of the LPSI pumps on all three occasions, auxiliary building operators noticed loud "bangs" emanating from the piping during the evolution. This condition was described in CR 200505030. On October 20 at 11:07 a.m., steam was noted to have issued from the vent valves when the system was vented, which was documented in the control room log. The inspectors considered these prior opportunities to identify a condition adverse to quality, namely that water hammer events had occurred and that the conditions favorable to a water hammer existed.

Following the water hammer events, the licensee identified that YS-351 (LPSI Valve HCV-327 pipe void detector) and FI-328 (LPSI flow indicator Loop 1B) were reading incorrectly and had likely been damaged by the events. The licensee documented these conditions in CR's 200505032 and 200505056, respectively. On October 24, 2005, the licensee and the inspectors conducted walkdowns of the LPSI system in order to visually inspect for other damage to the piping, hangers, etc. No other damaged equipment was identified. The licensee subsequently repaired the damaged equipment.

Analysis: The inspectors determined that the licensee's inadequate procedure and poor problem identification, which resulted in three LPSI water hammer events, constituted a performance deficiency and a finding. This finding is greater than minor because it could be reasonably viewed as a precursor to a significant event (i.e., the loss of LPSI when called upon to mitigate an accident). Additionally the finding affected the availability and reliability of mitigating system equipment (Flow Instrument FI-328). This finding was evaluated using the significance determination process and was determined to be a finding of very low safety significance because the finding was: (1) not a qualification deficiency confirmed to result in a loss of function, (2) did not result in a

loss of safety system function, (3) did not represent an actual loss of safety function of a single train, (4) did not represent an actual loss of safety function of risk significant equipment >24 hours, and (5) did not screen as risk significant due to external events. The inspectors also determined that the cause of the condition had a problem identification aspect (failure to identify a condition adverse to quality) and a human performance aspect (procedural quality).

Enforcement: Title 10 of CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," states, in part, that "activities affecting quality shall be prescribed by documented instruction, procedures, or drawings of a type appropriate to the circumstance and shall be accompanied in accordance with these instructions, procedures, or drawings." Contrary to the above, an inadequate procedure (that caused the RCS leakage into the LPSI header) and poor problem identification performance resulted in water hammer events on three occasions. This violation of Appendix B, Criterion V, is being treated as an NCV, consistent with Section VI.A of the Enforcement Policy (NCV 285/2005005-02). This violation was entered into the licensee's corrective action program as CR's 200505030 and 200505084.

1R16 Operator Workarounds (71111.16)

.1 Selected Operator Workaround

a. Inspection Scope

The inspectors performed a selected review of an operator workaround due to the failure of FI-328, LPSI flow indicator Loop 1B, following a steam voiding and water hammer event. The inspectors discussed human reliability in responding to an initiating event with Operations supervision, specifically the effect of the operator workaround on the operator's ability to implement abnormal or emergency operating procedures. The inspectors discussed the planned corrective actions for the deficiency with Operations supervision.

b. Findings

No findings of significance were identified.

.2 Cumulative Effects of Operator Workarounds

a. Inspection Scope

The inspectors performed a review of operator workarounds, control room deficiencies, and control room burden lists. The inspectors focused on the cumulative effects of the workaround (one inspection sample) on the reliability/availability of mitigating systems and the corresponding impact on operators to respond in a correct and timely manner to plant transients and accidents. The inspectors reviewed the deficiencies against the licensee's Procedure OPD-4-17, "Control Room Deficiencies, Operator Burdens, and



Operator Work-around,” Revision 14, that described the programs for handling workarounds and deficiencies. The inspectors discussed the programs and planned corrective actions for the deficiencies with Operations supervision.

b. Findings

No findings of significance were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

The inspectors observed and/or reviewed postmaintenance tests to verify that the test procedures adequately demonstrated system operability (six inspection samples). The inspectors also verified that the tests were adequate for the scope of the maintenance work performed and that the acceptance criteria were clear and consistent with design and licensing basis documents. The following activities were included in the scope of this inspection:

- Work Order (WO) 00190957-01 - Replace regulator gage on IA-HCV-489B-FR, HCV-489 instrument air supply filter/regulator.
- WO 00213766-01 - Install Diesel Generator 2 jacket water filter skid, filter jacket water during diesel generator run then remove jacket water filter skid. Office Review.
- WO 00223644-01 - Remove PI-325-1, install hydro pump to quantify LPSI system leakage, remove hydro pump and install PI-325-1.
- WO 00222918-01 - Replace YS-351 (LPSI Valve HCV-327 pipe void detector).
- WO 00212648-01 - Lube SI-2B coupling, change oil, and obtain oil sample.
- WO 00201023-01 - Calibrate PI-323B HPSI Pump SI-2B discharge pressure indicator.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed and/or reviewed the performance and documentation for the following surveillance tests (three inspection samples) to verify that the structures, systems, and components were capable of performing their intended safety functions and to assess operational readiness:

- OP-ST-ESF-0009 - Channel A Safety Injection, Containment Spray and Re-circulation Actuation Signal Test, Revision 45
- OP-ST-FP-0001C – Fire Protection System Inspection and Test, Revision 16
- OP-ST-CCW-3005B – Component Cooling Category A and B Valve Exercise Test (for the C and D valves), Revision 9

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed Temporary Modification EC 36650 for reversing the logic of the reactor vessel flange leakoff indication Pressure Switch PS-139 and its associated 10 CFR 50.59 screening (one inspection sample). The inspectors verified the modification had no affect on system operability or availability. The inspectors reviewed the postinstallation test results to confirm that the test was satisfactory and that there was no adverse impact of the temporary modification on the permanent system.

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP1 Exercise Evaluation (71114.01)

a. Inspection Scope

The inspectors reviewed the objectives and scenario for the 2005 biennial emergency preparedness exercise to determine if the exercise would acceptably test major elements of the emergency plan. The scenario included a steam generator tube rupture and a fuel handling accident. A subsequent seismic event increased the steam generator tube rupture, caused significant damage to the spent fuel pool and several fuel assemblies in the spent fuel pool, and ruptured a main steam line. These series of events resulted in a significant release of radioactivity to the environment. The licensee activated all of their emergency facilities to demonstrate their capability to implement the emergency plan.

The inspectors evaluated exercise performance by focusing on the risk-significant activities of classification, notification, protective action recommendations, and assessment of offsite dose consequences in the simulator control room and the following emergency response facilities:

- Technical Support Center
- Operations Support Center
- Emergency Operations Facility

The inspectors also assessed personnel recognition of abnormal plant conditions, the transfer of emergency responsibilities between facilities, communications, protection of emergency workers, emergency repair capabilities, and the overall implementation of the emergency plan to verify compliance with the requirements of 10 CFR 50.47(b), 10 CFR 50.54(q), and Appendix E to 10 CFR Part 50. The inspectors also reviewed emergency facility logs, emergency notification forms, dose assessment records, and emergency news center press releases to independently assess licensee performance during the exercise.

The inspectors attended the postexercise critiques in each of the above emergency response facilities and in the simulator control room to evaluate the initial licensee self-assessment of exercise performance. The inspectors attended the formal presentation of critique items to plant senior management.

The inspectors completed one sample during the inspection.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

Cornerstone: Emergency Preparedness

The inspectors sampled submittals for the performance indicators listed below for the period July 1, 2004, through September 30, 2005. The definitions and guidance of Nuclear Engineering Institute 99-02, "Regulatory Assessment Indicator Guideline," Revisions 2 and 3, were used to verify the licensee's basis for reporting each data element in order to verify the accuracy of performance indicator data reported during the assessment period.

- Drill and Exercise Performance
- Emergency Response Organization Participation
- Alert and Notification System Reliability

The inspectors reviewed a 100 percent sample of drill and exercise scenarios, a sample of licensed operator simulator training sessions, notification forms, and attendance and critique records associated with training sessions, drills, and exercises conducted during the verification period. The inspectors reviewed the qualification, training, and drill participation records for a sample of 10 emergency responders. The inspectors

reviewed alert and notification system maintenance records and procedures and a sample of siren test results. The inspectors also interviewed licensee personnel that were responsible for collecting and evaluating the performance indicator data. The inspectors completed three samples during the inspection.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review of Identification and Resolution of Problems

a. Inspection Scope

The inspectors chose one issue (one inspection sample) for more in-depth review to verify that the licensee personnel had taken corrective actions commensurate with the significance of the issue. On March 1, 2005, instrument air supply Check Valve IA-HCV-1107A-C failed its surveillance test (CR 200500836). The inspectors reviewed the corrective actions associated with this condition. When evaluating the effectiveness of the licensee's corrective actions, the following attributes were considered:

- Complete and accurate identification of the problem in a timely manner commensurate with its significance and ease of discovery
- Evaluation and disposition of operability and report ability issues
- Consideration of extent of condition, generic implications, common cause, and previous occurrences
- Classification and prioritization of the resolution of the problem commensurate with its safety significance
- Identification of corrective actions which are appropriately focused to correct the problem
- Completion of corrective actions in a timely manner commensurate with the safety significance of the issue

b. Findings

No findings of significance were identified.

## .2 Semiannual Trend Review

### a. Inspection Scope

The inspectors performed a semiannual assessment (one inspection sample) of the licensee's corrective action program. The assessment covered trends of CRs written since the beginning of 2004 that had a human performance aspect to them. The inspectors reviewed a sample of CRs across a distribution of safety significance (from high to low). The focus of the inspection was determining whether the licensee had a correct understanding of the contribution of human performance errors to various conditions adverse to quality. The inspectors reviewed the information against the licensee's monthly error rate targets while using the human performance categorization guidance found in Inspection Manual Chapter 0305.

### b. Findings and Observations

No findings of significance were identified.

## .3 Crosscutting Issue Aspects

The inspectors identified two findings with problem identification and resolution crosscutting aspects. One, related to reactor coolant pump seals, was identified in Section 1R14, and a second was documented in Section 1R15 related to the failure to identify conditions leading to water hammer in the LPSI system.

## 4OA5 Other Activities

The inspectors reviewed the final report for INPO assessment of Fort Calhoun Station conducted in January and February of 2005. The inspectors reviewed the report to ensure that issues identified were consistent with the NRC perspective of licensee performance. No issues were identified that required further NRC followup.

## 4OA6 Meetings

### Exit Meeting Summary

On December 8, 2005, immediately following presentation of the facility's exercise critique to senior management by Mr. C. Simmons, Superintendent, Emergency Planning, the senior emergency preparedness inspector discussed inspection results with Mr. D. Bannister, Plant Manager, and other members of the licensee's staff. The inspector verified that no proprietary information was provided during the inspection.

The results of the resident inspector activities were presented to Mr. D. Bannister, Plant Manager, and other members of licensee management on January 20, 2005. The inspectors confirmed that no proprietary information was examined during the inspection period. Licensee management acknowledged the inspection findings.

The inspectors discussed the results of the requalification inspection with Mr. David Weaver, Operations Training Supervisor, of the licensee's management on January 23, 2006. The licensee acknowledged the findings presented. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee Personnel

D. Bannister, Plant Manager  
B. Blessie, Supervisor, Operations-Engineering  
G. Cavanaugh, Supervisor, Regulatory Compliance  
A. Clark, Manager, Security and Emergency Planning  
M. Core, Manager, System Engineering  
B. Fried, Emergency Preparedness  
D. Guinn, Licensing Engineer  
R. Meng, Emergency Preparedness  
C. Simmons, Supervisor, Emergency Planning

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

#### Opened and Closed

05000285/2005005-01	NCV	Failure to identify improperly sized reactor coolant pump seal O-rings (Section 1R14)
05000285/2005005-02	NCV	Low pressure safety injection water hammer events caused by inadequate procedure (Section 1R15)

### **LIST OF DOCUMENTS REVIEWED**

#### **Section 1R14: Operator Performance During Nonroutine Evolutions and Events**

Letter from Flowserve to OPPD (Mark Bare), dated May 27, 2005

Letter from Flowserve to OPPD (Merl Core), dated June 8, 2005

Work Order Package 00172992-01, "RC-3C Seal Test"

Work Order Package 00200978-01, "RC-3D Seal Test"

Work Order Package 00172911-01, "RC-3D Seal Test"

Root Cause Analysis for Condition Report 200502675, "Reliability of Reactor Coolant Pump Mechanical Seals"

Root Cause Analysis for Condition Report 200502849, "Reliability of Reactor Coolant Pump Mechanical Seals"

Operator Logs from May 22-26, 2005

Condition Reports: 200401771, 200403208, 200501464, 200501969, 200502675, and 200503372

Receipt Inspection Packet for Flowserve Rotating Equipment, dated October 31, 2002

**Section 1R15: Operability Evaluations**

Work Order Package 00221920-01, "Flow Indication on FI-328 Is Not Indicating Correctly"

Operator Logs from October 19-26, 2005

Operator Logs from September 15, 2005

Condition Reports: 200504996, 200505019, 200505030, 200505032, 200505056, 200505084, 200505086, 200505134, 200505185, and 200505207

**Section 1EP1: Exercise Evaluation**

Emergency Plan Implementing Procedures (EPIP)

- OSC-1, "Emergency Classification," Revision 38
- OSC-2, "Command and Control Position Actions/Notifications," Revision 44
- OSC-15, "Communicator Actions," Revision 23
- OSC-21, "Activation of the Operations Support Center," Revision 15
- TSC-1, "Activation of the Technical Support Center," Revision 25
- TSC-8, "Core Damage Assessment," Revision 16
- EOF-1, "Activation of the Emergency Operations Facility," Revision 15
- EOF-6, "Dose Assessment," Revision 33
- EOF-7, "Protective Action Guidelines," Revision 16
- EOF-21, "Potassium Iodide Issuance," Revision 6
- RR-11, "Technical Support Center Director Actions," Revision 15
- RR-19A, "Operations Liaison Actions," Revision 7
- RR-21, "Operations Support Center Director Actions," Revision 14
- RR-25, "EOF Dose Assessment Coordinator Actions," Revision 23

Emergency Planning Tests

- EPT-22, "Letters of Agreement (Verification of RERP Appendix A)," Revision 12
- EPT-42, "Verification of Emergency Response Organization (ERO) Qualification Status," Revision 12

**Section 4OA1: Performance Indicator Verification**

Emergency Planning Department Manual

- EPDM-14, "Emergency Preparedness Performance Indicator Program," Revision 6



Emergency Planning Tests

- EPT-1, "Alert Notification System Silent Test," Revision 14
- EPT-2, "Alert Notification System Growl Test," Revision 18
- EPT-3, "Alert Notification Complete Cycle Test," Revision 13

**Miscellaneous**

Procedure OI-SI-1, "Low Pressure Safety Injection System," Revision 88

Work Order Package 00201023-01, "Calibrate PI-323B"

Work Order Package 00212648-01, "SI-2B, Lube Coupling, Change Oil & Obtain Oil Sample"

Condition Reports: 200505056, 200505511, 200505649, 200505134, 200505431, and 200505744

**LIST OF ACRONYMS**

CFR	<i>Code of Federal Regulations</i>
CR	Condition Report
HPSI	high pressure safety injection
LPSI	low pressure safety injection
NCV	noncited violation
NRC	Nuclear Regulatory Commission
RCP	reactor coolant pump
RCS	reactor coolant system
WO	work order