



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

April 30, 2008

Florida Power and Light Company
ATTN: Mr. J.A. Stall, Senior Vice President
Nuclear and Chief Nuclear Officer
P.O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: ST. LUCIE NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT
05000335/2008002, 05000389/2008002

Dear Mr. Stall:

On March 31, 2008, the US Nuclear Regulatory Commission (NRC) completed an inspection at your St. Lucie Plant. The enclosed integrated inspection report documents the inspection findings which were discussed on April 3, 2008, with Mr. Johnston and other members of your staff.

The inspection examined activities conducted under your license as they related 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 NRC-identified findings of very low safety significance (Green). Additionally, one licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, 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 St. Lucie facility.

In accordance with 10 CFR 2.390 of the NRC's Rules of Practice, a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the 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/

Marvin D. Sykes, Chief
Reactor Projects Branch 3
Division of Reactor Projects

Docket Nos.: 50-335, 50-389
License Nos.: DPR-67, NPF-16

Enclosure: Inspection Report 05000335/2008002, 05000389/2008002
w/Attachment: Supplemental Information

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Enclosure

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Letter to J. Art Stall from Marvin D. Sykes dated April 30, 2008

SUBJECT: ST. LUCIE NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT
05000335/2008002, 05000389/2008002

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-335, 50-389

License Nos.: DPR-67, NPF-16

Report No: 05000335/2008002, 05000389/2008002

Licensee: Florida Power & Light Company (FP&L)

Facility: St. Lucie Nuclear Plant, Units 1 & 2

Location: 6501 South Ocean Drive
Jensen Beach, FL 34957

Dates: January 1 to March 31, 2008

Inspectors: T. Hoeg, Senior Resident Inspector
S. Sanchez, Resident Inspector
J. Rivera-Ortiz, Reactor Inspector

Approved by: M. Sykes, Chief
Reactor Projects Branch 3
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000335/2008-002, 05000389/2008-002; 01/01/2008 - 03/31/2008; St. Lucie Nuclear Plant, Units 1 & 2; Identification and Resolution of Problems and Event Follow-up

The report covered a three month period of inspection by resident inspectors and a region based reactor inspector. Two Green NCVs were identified. The significance of most findings is identified 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 4, dated December 2006.

A. NRC Inspector Identified & Self-Revealing Findings

Cornerstone: Initiating Events

- Green. The inspectors identified a Non-Cited Violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for failure to take timely and effective corrective actions to prevent recurrence of Reactor Coolant System (RCS) pressure boundary leakage through the Reactor Coolant Pump (RCP) seal lines, which resulted in a violation of TS 3.4.6.2. The licensee entered the finding in their corrective action program for resolution as Condition Report 2008-7054.

The finding is greater than minor in accordance with Inspection Manual Chapter (IMC) 0612, Power Reactor Inspection Reports, Appendix B, Issue Screening. Specifically, this finding is associated with the equipment performance attribute of the Initiating Events Cornerstone and affects the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The finding was determined to be of very low safety significance because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. This finding was related to the appropriate and timely corrective actions aspect of the corrective action program component in the problem identification and resolution crosscutting area (IMC 0305 aspect P. 1.d). (Section 4OA2.3)

Cornerstone: Mitigating Systems

- Green. The inspectors identified a Non-Cited Violation (NCV) of 10 CFR 50, Appendix B, Criterion VI, Document Control, for inadequate document control that resulted in copies of several revised emergency operating procedures (EOPs) not being distributed to the designated locations in the Unit 2 control room where they could be used by licensed operators in the event of an emergency. The licensee entered the finding in their corrective action program for resolution as Condition Report 2008-5224.

The finding is greater than minor since not distributing the latest revision of EOPs to the location where it would be used, if left uncorrected could become a more significant safety concern potentially impacting multiple EOPs important to safety and safe shutdown of the plant. The finding affects the Mitigating Systems Cornerstone attribute of procedural quality. This finding was determined to be of very low safety significance since it had not resulted in a loss of a safety function or in any inoperable equipment. A

contributing cause of this finding was related to the resources attribute of the human performance cross-cutting area in the aspect of complete, accurate, and up-to-date procedures (MC 0305 aspect H.2.c). (Section 4OA2.2)

B. Licensee Identified Violations

Violations of very low safety significance, which were identified by the licensee, have been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. The violations and corrective actions are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status:

Unit 1 began the inspection period at full Rated Thermal Power (RTP) and operated at or near full RTP until March 13, 2008, when power was reduced to 40 percent to repair a condensate pump motor. Unit 1 was returned to full RTP on March 14, 2008, where it operated for the remainder of the inspection report period. Unit 2 was in a forced outage at the beginning of this inspection period to replace a reactor coolant pump seal. On January 6, 2008, Unit 2 reached full RTP where they operated until January 29, 2008, when the Unit was shutdown to repair a leaking reactor coolant pump seal line. On February 9, 2008, Unit 2 was returned to full RTP and operated at or near full RTP for the remainder of the inspection report period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection

a. Inspection Scope

On January 2-3, 2008, the inspectors reviewed the status of licensee actions in accordance with ADM-04.03, Cold Weather Preparations. The inspectors verified conditions were met for entering the procedure and that equipment status was verified as directed by the procedure. The inspectors performed a walkdown of the following safety-related equipment on both units that are exposed to the outside weather conditions to identify any potential adverse conditions. Condition reports (CRs) were checked to assure that the licensee was identifying and resolving weather related issues.

- Condensate Storage Tanks
- Auxiliary Feedwater Pumps

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment

.1 Partial Equipment Walkdowns

a. Inspection Scope

The inspectors conducted three partial alignment verifications of the safety-related systems listed below. These inspections included reviews using plant lineup procedures, operating procedures, and piping and instrumentation drawings, which were compared with observed equipment configurations to verify that the critical portions of the systems were correctly aligned to support operability. The inspectors also verified that the licensee had identified and resolved equipment alignment problems that could

cause initiating events or impact the capability of mitigating systems or barriers by entering them into the corrective action program.

- 2A Emergency Diesel Generator (EDG) while 2B EDG was being tested
- 1A Low Pressure Safety Injection (LPSI) Train during maintenance on 1B LPSI Train
- 1B Containment Spray (CS) Train during maintenance on 1A CS Train

b. Findings

No findings of significance were identified.

1R05 Fire Protection

.1 Fire Area Walkdowns

a. Inspection Scope

The inspectors toured various plant areas during this inspection period to evaluate conditions related to control of transient combustibles and ignition sources, the material condition and operational status of fire protection systems including fire barriers used to prevent fire damage or fire propagation. The inspectors reviewed these activities against provisions in the licensee's procedure 1800022, Fire Protection Plan, and 10 CFR Part 50, Appendix R. The licensee's fire impairment list, updated on an as-needed basis, was routinely reviewed. In addition, the inspectors reviewed the CR database to verify that fire protection problems were being identified and appropriately resolved. The following five areas were inspected:

- Unit 1 Control Room
- Unit 1 1E Battery Rooms
- 2A EDG Room
- 2B EDG Room
- 1B LPSI Pump Room

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualification Program

.1 Resident Inspector Quarterly Review

a. Inspection Scope

On March 12, 2008, the inspectors observed and assessed licensed operator continuing training requalification activities. The inspectors observed the operator's actions during a simulated steam generator tube rupture with complications to verify that operator performance was adequate and that evaluators were identifying and documenting crewperformance problems. The inspectors also reviewed simulator fidelity and evaluated the following attributes related to the operating crew's performance:

- Clarity and formality of communication
- Ability to take timely action to safely control the unit
- Prioritization, interpretation, and verification of alarms
- Correct use and implementation of off-normal and emergency operation procedures, emergency plan implementing procedures, and annunciator response procedures
- Timely control board operation and manipulation, including high-risk operator actions
- Oversight and direction provided by shift supervision, including the ability to identify and implement appropriate technical specification actions, regulatory reporting requirements, and emergency plan classification and notification
- Group dynamics involved in crew performance.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed system performance data and associated CRs for the two systems listed below to verify that the licensee's maintenance efforts met the requirements of 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants and licensee Administrative Procedure 0-ADM-17.08, Implementation of the Maintenance Rule. The inspectors focused on maintenance rule scoping, characterization of maintenance problems and failed components, risk significance, determination of (a)(1) classification, corrective actions, and the appropriateness of established performance goals and monitoring criteria. The inspectors also interviewed responsible engineers and observed some of the corrective maintenance activities. The inspectors checked that when operator actions were credited to prevent failures, the operator was dedicated at the location needed to accomplish the action in a timely manner, and that the action was governed by applicable procedures. In addition, the inspectors verified that equipment problems were being identified and entered into the corrective action program.

- Unit 1 480 Volt AC System
- Unit 2 480 Volt AC System

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the risk assessments for the following six systems, structures, and components (SSCs), or a combination thereof, that were non-functional due to planned and/or emergent work. The inspectors also observed and/or reviewed the scope of work to evaluate the effectiveness of licensee scheduling, configuration control, and management of online risk in accordance with

10 CFR 50.65(a)(4) and applicable licensee program procedure ADM-17.16, Implementation of the Configuration Risk Management Program. The inspectors interviewed responsible Senior Reactor Operators on-shift, verified actual system configurations, and specifically evaluated results from the online risk monitor (OLRM) and the outage risk monitor for the combinations of Out of Service (OOS) risk significant SSCs listed below:

- 1A Charging Pumps, Fans HVS-1A and HVE- 6A OOS
- Unit 2 Reduced Inventory for Reactor Coolant Pump Seal Line Repairs
- 2A Component Cooling Water (CCW) Pump, 2A Charging Pump, and 2A Shutdown Cooling Heat Exchanger OOS
- 2B EDG and Valve MV-07-1B OOS
- 1B LPSI Pump, 1B High Pressure Safety Injection (HPSI) Pump, and Valve HCV-3646 OOS
- 1B Intake Cooling Water (ICW) System Train, 1B CCW System Train, 1B HPSI Pump, and Fan HVS-1B OOS

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

For the six operability evaluations described in the CRs listed below, the inspectors evaluated the technical adequacy of the evaluations to ensure that technical specification (TS) operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR) to verify that the system or component remained available to perform its intended safety function. In addition, the inspectors reviewed compensatory measures implemented to verify that the compensatory measures worked as stated and the measures were adequately controlled. The inspectors also reviewed a sampling of CRs to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations.

CR 08-6707, 2A Reactor Coolant Pump Vibration Sensor Failure
 CR 08-6695, Unit 1 Valve HCV-3646 Erratic Motor Operation
 CR 08-7372, Unit 2 Valve FCV-26-1 Failed Position Indication
 CR 08-9000, Unit 2 Control Element Assemblies Failed Position Indication
 CR 08-9654, 2B ICW Pump High Vibration
 CR 08-9876, Potential Part 21 for Electrical Relay Coils

b. Findings

No findings of significance were identified

1R18 Plant Modifications

a. Inspection Scope

The inspectors conducted plant tours and discussed system status with engineering and operations personnel to check for the existence of temporary modifications that may not have been appropriately identified and evaluated. The inspectors reviewed the temporary modification listed below for Unit 2 to ensure that it did not adversely affect the operation of the affected system. The inspectors reviewed the applicable 10 CFR 50.59 screening and evaluation, fire protection review, environmental review, and ALARA screening review. The inspectors reviewed all associated plant drawings and UFSAR documents impacted by this modification and discussed the changes with plant staff:

- Temporary System Alteration (TSA) 2-08-001, Control Element Drive Mechanism #10 Reed Switch Position and Display

b. Findings

No findings of significance were identified.

1R19 Post Maintenance Testing

a. Inspection Scope

For the six post maintenance tests (PMTs) listed below, the inspectors reviewed the test procedures and either witnessed the testing and/or reviewed test records to determine whether the scope of testing adequately verified that the work performed was correctly completed and demonstrated that the affected equipment was functional and operable. The inspectors verified that the requirements of Procedure ADM-78.01, Post Maintenance Testing, were incorporated into test requirements. The inspectors reviewed the following work orders (WO):

- Unit 2, WO #36020543, CEDMCS Troubleshooting
- Unit 1, WO #37012552, Valve HCV-3647 Planned Maintenance
- Unit 1, WO #36017948, 1A LPSI Pump Suction Valve Stem Lubrication
- Unit 1, WO #37002522, Valve HCV-3627 Motor Planned Maintenance
- Unit 1, WO #37027850, Valve TCV-14-4B Replacement
- Unit 2, WO #38007267, 2B MG Set Output Breaker Replacement

b. Findings

No findings of significance were identified.

1R20 Refueling and Other Outage Activities

Unit 2 Forced Outage

On January 29, 2008, Unit 2 unidentified leakage increased from 0.05 to 0.28 gallons per minute requiring a controlled plant shutdown to investigate the source of the leak. The inspectors observed the controlled reactor plant shutdown and associated Mode changes.

.1 Monitoring and Shutdown Activities

a. Inspection Scope

The inspectors observed portions of the plant shutdown and cooldown in accordance with licensee procedure 2-GOP-305, Hot Standby to Cold Shutdown, to verify that cooldown restrictions and similar procedural requirements were followed.

b. Findings

No findings of significance were identified.

.2 Monitoring of Heatup and Startup Activities

a. Inspection Scope

On January 8, 2008, the inspectors reviewed activities during reactor restart and power escalation to verify that reactor parameters were within safety limits and that the startup evolutions were done in accordance with licensee procedure 2-GOP-302, Reactor Startup Mode 3 to Mode 2. Sections of the reactor physics testing were observed or reviewed with reactor engineering personnel. The inspectors conducted a walkdown of containment prior to reactor restart to verify no evidence of leakage and verify that debris filters were properly positioned to maintain operability of the containment sump.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors either reviewed or witnessed the following seven surveillance tests to verify that the tests met the TS, UFSAR, and licensee's procedural requirements and demonstrated the systems were capable of performing the intended safety functions. In addition, the inspectors evaluated the effect of the testing activities on the plant to ensure that conditions were adequately addressed by the licensee staff and that after completion of the testing activities, equipment was returned to the positions/status required for the system to perform the intended safety function. The tests reviewed included one inservice test (IST) and one reactor coolant system leakage detection surveillance. The inspectors verified that surveillance issues were documented in the CAP.

- Unit 2, 2-OSP-69.01, Nuclear/Delta T Power
- Unit 2, 2-OSP-59.01B, 2B-EDG Monthly Surveillance Test
- Unit 2, OSP-37.01, Emergency Cooling Water Canal Periodic Test
- Unit 1, OP-1-0010125A, High Pressure Safety Injection Valve Stroke Testing
- Unit 2, 2-OSP-09.01C, 2C Auxiliary Feedwater Pump Monthly Test
- Unit 2, 2-OSP-66.01, Control Element Assembly Quarterly Exercise
- Unit 2, 2-OSP-01.03, RCS Inventory Balance

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation

.1 Emergency Preparedness Drill

a. Inspection Scope

On January 17, 2008, the inspectors observed an operating crew in the simulator and technical support center staff during a drill of the site emergency response organization. The drill included a steam generator tube leak and rupture with an atmospheric dump valve stuck open. During the drill, the inspectors assessed operator actions to verify that emergency classification and notifications were made in accordance with the licensee emergency plan implementing procedures and 10 CFR 50.72 requirements. The inspectors specifically reviewed the Notice of Unusual Event and Alert classifications and verified that notifications were made in accordance with licensee procedure EPIP-01, Classification of Emergencies. The inspectors also evaluated whether the initial activation of the emergency response centers was timely and as specified in the licensee's emergency plan. Technical Specifications required actions during the drill were reviewed to assess correct implementation. Licensee identified critique items were discussed with the licensee and reviewed to verify that drill issues were identified and captured.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

40A1 Performance Indicator Verification

Initiating Events and Mitigating Systems Cornerstones

a. Inspection Scope

The inspectors checked licensee submittals for the performance indicators (PIs) listed below for the period January 1, 2007, through December 31, 2007, to verify the accuracy

of the PI data reported during that period. Performance indicator definitions and guidance contained in NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Rev. 5, and licensee procedure 0-ADM-032, NRC Performance Indicators St. Lucie, were used to check the reporting for each data element. The inspectors checked licensee event reports (LERs), operator logs, plant status reports, CRs, system health reports, and PI data sheets to verify that the licensee had identified the cumulative safety system unavailability and required hours, as applicable. The inspectors interviewed licensee personnel associated with performance indicator data collection, evaluation, and distribution.

- Unit 1 Unplanned Scrams per 7000 Critical Hours
- Unit 2 Unplanned Scrams per 7000 Critical Hours
- Unit 1 Unplanned Scrams With Loss of Normal Heat Removal
- Unit 2 Unplanned Scrams With Loss of Normal Heat Removal
- Unit 1 Unplanned Transients per 7000 Critical Hours
- Unit 2 Unplanned Transients per 7000 Critical Hours

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered into the Corrective Action Program

As required by Inspection Procedure 71152, Identification and Resolution of Problems, and to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a screening of items entered daily into the licensee's CAP. This review was accomplished by reviewing daily printed summaries of CRs and by reviewing the licensee's electronic condition report database. Documents reviewed are listed in the attachment. Additionally, reactor coolant system (RCS) unidentified leakage was checked on a daily basis to verify no substantive or unexplained changes.

.2 Semi-Annual Review to Identify Trends

a. Inspection Scope

As required by Inspection Procedure 71152, Identification and Resolution of Problems, the inspectors reviewed the licensee's 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 daily inspector corrective actions item screening discussed in Section 4OA2.1 above, plant status reviews, plant tours, document reviews, and licensee trending efforts. The inspectors' review nominally considered the six month period of October 2007 through March 2008. Corrective actions associated with a sample of the issues identified in the licensee's CAP were reviewed for adequacy.

b. Assessment and Observations

Introduction: The inspectors identified a Green NCV of 10 CFR 50 Appendix B,

Criterion VI, Document Control. Inadequate document control resulted in multiple copies emergency operating procedures (EOPs) not being distributed to the designated location within the Unit 2 control room for use in the event of an emergency.

Description: During the month of January 2008 the inspectors became aware of three instances where the licensee had used working copies of safety related procedures that were out of revision as documented in the licensee's CAP. One of the instances involved a licensee identified violation (Section 40A7). As a result, the inspectors performed a trend review to gather additional information and determine the extent of condition. During discussions with Operations Department personnel and review of existing working copies of control room EOPs, the inspectors learned that several working copies of EOPs located in the Unit 2 control room were out of revision. The EOPs found out of revision included 2-EOP-03 - Loss of Coolant Accident, 2-EOP-04 - Steam Generator Tube Rupture, 2-EOP-06 - Total Loss of Feedwater, 2-EOP-15 - Functional Recovery, and 2-EOP-99 - Appendices/Figures/Tables/Data Sheets.

After additional review, the inspectors determined that when the master copy (controlled) of the EOPs was revised, the new controlled copy revision was placed in a storage cabinet in the control room; however, the latest revision was not placed at the reactor operators' desk to be used as a working copy during an actual emergency. In the event of an emergency, it is very likely that the operators would have used the out of revision working copy EOP. The inspectors reviewed associated CRs and licensee compliance with administrative procedure QI-6-PSL-1, Document Control. Procedure QI-6-PSL-1 is a non-safety-related information-use-only procedure that requires the document user, who in this case was the Operations Department, to be responsible for verifying the latest revision prior to use. The inspectors determined that there was no formal process or procedure in place that required the control room reactor operator's working desk copy of the EOPs to be treated as controlled copies. The licensee immediately corrected the condition by removing the old revisions and replacing them with the latest revision and entering the deficiency into their CAP.

Analysis: The inspectors determined that not replacing the EOP working copies in the Unit 2 control room after being revised and issued was a performance deficiency. The finding is associated with the procedure quality attribute of the Mitigating Systems Cornerstone. The finding was considered more than minor because if left uncorrected would become a more significant safety concern potentially impacting operation of safety-related systems, structures, or components. This finding was determined to be of very low safety significance in accordance with NRC IMC 0609, Appendix A, Attachment 1, SDP screening work sheet since it had not resulted in any loss of safety function or in any inoperable equipment. The inspectors also found that the cause of this finding was related to the resources attribute of the human performance cross-cutting area in the aspect of complete, accurate, and up-to-date procedures (IMC 0305 aspect H.2.c).

Enforcement: 10 CFR 50 Appendix B, Criterion VI, Document Control, states in part that measures shall be established to ensure that procedures, including changes, are distributed to and used at the location where the prescribed activity is performed. Contrary to this, the licensee's document control process was not adequate and did not ensure that revised EOPs were distributed to the Unit 2 control room location where they would be used in the event of an emergency. Because this failure to maintain proper document control is of very low safety significance (Green) and has been entered into the CAP as CR 2008-5224, this violation is being treated as an NCV, consistent with

Section VI.A of the NRC Enforcement Policy: NCV 05000389/2008002-03: Failure to Distribute EOP Revisions to the Required Location for Usage.

.3 Annual Sample: Review of Reactor Coolant System Pressure Boundary Leakage through Reactor Coolant Pump (RCP) 2B2 Seal Housing Weld

a. Inspection Scope

The inspectors selected CR 2007-42387, RCP 2B2 Leak Under the Vapor Seal Drain Connection, for a detailed review of the circumstances that led to a pressure boundary leak through a weld on the RCP seal housing. The inspectors reviewed the licensee's evaluation of the conditions that caused the weld failure and the corrective actions generated to prevent recurrence. The inspectors evaluated the CR in accordance with the licensee's corrective action process as specified in licensee procedure NAP-204, Condition Reporting.

b. Findings and Observations

Introduction: The inspectors identified a Green non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action during the annual sample review of corrective action documents. The inspectors determined that the licensee failed to take timely and effective corrective actions to prevent recurrence of RCS pressure boundary leakage through the RCP seal lines.

Description: On August 18, 2007, the licensee manually tripped Unit 2 as a result of increased RCS unidentified leakage indications. The licensee found that the source of the leak was a cracked socket weld on the 2B1 RCP shaft seal assembly. The leak was located at a pipe-to-elbow weld on the outboard side of the first flanged coupling of the 2B1 RCP seal injection $\frac{3}{4}$ inch diameter line. The socket weld had a circumferentially oriented crack that started at a location with lack of root penetration and it propagated through the fillet weld throat. The licensee evaluation of this weld failure determined that the root cause was low stress/high cycle fatigue induced by RCP vibration in combination with a resonance condition of the seal injection line with the RCP operating vibration frequency. As part of the event evaluation, the licensee determined that the analytical values for the second mode natural frequency of the seal injection lines were close to one of the operating vibration frequencies of the RCP. Among the corrective actions for this event, the licensee replaced the affected section of the seal injection line on all RCPs using different socket weld dimensions (2:1 tapered leg ratio) to improve fatigue resistance.

On December 21, 2007, Unit 2 was in Mode 3 returning from a refueling outage, when a containment walk down inspection identified RCS pressure boundary leakage at the weld connecting the $\frac{3}{4}$ inch diameter seal injection line with the seal housing of the 2B2 RCP (CR 2007-42387). This weld failure occurred on the same line as in the first event (i.e. seal injection line), but on a different RCP and a different weld location. The affected weld was a J-groove weld fabricated by the RCP seal housing vendor and had a circumferentially oriented crack which originated from the outside diameter of the pipe at the weld toe. A preliminary licensee evaluation of the failure determined that the cause was low stress/high cycle fatigue driven by RCP vibration. An additional contributing condition identified during disassembly of the affected line was that the outboard face of the seal injection line flange had sprung away from the assembled

position to a misaligned position relative to the other face of the flange, which indicated the presence of a pre-existing stress condition (cold spring). Additionally, the licensee performed an informal impact test on the affected seal injection line to identify any potential resonance of the line with the RCP pump frequencies. The licensee found that a frequency mode in the vertical direction was close to the vane pass frequency of the RCP, confirming the existence of a potential resonance issue as identified in the first RCS pressure boundary leak event. In regard to the corrective actions for this event, the licensee replaced the affected seal injection housing assembly and generated an action item to develop a plan to monitor vibration on the RCP seal injection lines to support long term solution. The reactor plant was returned to power operations. Further analysis performed after plant start up determined, in part, that: a) the cold spring condition was a contributing cause, but not the primary cause of the weld failure; b) the natural frequency of the seal injection line was very close to the vane passing frequency of the RCP; and c) the primary cause was due to low stress/high cycle fatigue caused by RCP vibration.

On January 28, 2008, the licensee manually tripped the plant as a result of increased RCS unidentified leakage indications. The licensee found that the source of the leak was a cracked socket weld on the 2B1 RCP. The leak was located at a pipe-to-flange weld on the outboard side of the first flanged coupling of the 2B1 RCP upper cavity seal pressure sensing line. The licensee determined that the root cause of the weld failure was low stress/high cycle fatigue caused by RCP vibration. The failure analysis also identified trans-granular cracking indications in the weld root. Among the corrective actions for this event, the licensee replaced an additional 12 seal assembly lines using the aforementioned 2:1 tapered leg ratio, performed an additional impact test and vibration analysis to identify resonance, and acquired RCP seal line vibration data during plant shutdown and startup. Further licensee analysis determined that a potential resonance issue may also exist for the upper seal cavity line because one of its natural frequencies is close to a multiple of the RCP vane pass frequency.

The inspectors determined that the corrective actions associated with the December event and CR 2007-42387 were narrowly focused and inadequate because the licensee did not fully encompass the resonance vibration aspect of the weld failures. For the first two events, the licensee focused on replacing the affected components and no specific actions were taken to effectively correct the resonance condition, which was a significant contributor to all the weld failures. The potential of a resonance problem was identified in the evaluation of the first event and additional confirmatory data was obtained in the evaluation of the second event. The replacement of all failed components with a more robust design did not fully address the resonance condition. The vibration monitoring efforts were treated as a long term plan, which was not commensurate with the significant contribution of resonance vibration to all seal line failures. After the third event, the licensee decided to acquire vibration data on the RCP seals to verify the actual vibration condition of these lines. Even though the third failure occurred on a different line, further analysis identified that a potential resonance condition was also associated to the cause of this weld failure.

Analysis: The inspectors determined that the licensee failed to take timely and effective corrective actions to prevent recurrence of RCS pressure boundary leakage through the RCP seal lines. The finding was considered more than minor because it is associated with the equipment performance attribute of the Initiating Events Cornerstone and affects the cornerstone objective of limiting the likelihood of those events that upset plant

stability and challenge critical safety functions during shutdown as well as power operations. The finding was determined to be of very low safety significance in accordance with NRC IMC 0609, Attachment 0609.04, SDP Phase 1 screening worksheet, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. RCP seal injection flow is isolated during normal plant operations; it is only used during RCS fill and vent operations to provide flushing flow to prevent foreign material (e.g., crud) in the RCS water from entering the seal cavity. Therefore, the loss of seal injection flow to the RCP would have no adverse impact on plant operation or safe shutdown capability. A licensee calculation determined that the rupture of an RCP seal injection line would be bounded by the make up capability of the chemical and volume control system; therefore water injection from the emergency core cooling system would not be required to mitigate the break. The inspectors also determined that the cause of this finding was related to the “appropriate and timely corrective actions” aspect of the “corrective action program” component in the “problem identification and resolution” crosscutting area (MC 0305 aspect P. 1.d).

Enforcement: Criterion XVI of 10 CFR Part 50, Appendix B, 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. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.” Contrary to this requirement, the licensee failed to take timely and effective corrective actions to prevent recurrence of RCS pressure boundary leaks through the RCP seal lines welds. Specifically, the licensee did not address or correct the resonance vibration aspect associated with the cause of multiple weld failures on the RCP seal injection lines. Because the licensee entered the issue into their CAP as CR 2008-7054 and the finding is of very low safety significance (Green), this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000389/2008002-02: Failure to Take Timely and Effective Corrective Actions to Prevent RCS Pressure Boundary Leakage through the RCP Seal Lines.

4OA3 Event Follow-up

.1 (Closed) LER 2007-001, Reactor Shutdown Due to Unidentified Reactor Coolant System (RCS) Leakage

a. Inspection Scope

The inspectors reviewed the LER to evaluate the licensee’s assessment of the event and to identify any licensee performance deficiencies associated with the cause.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

The resident inspectors presented the inspection results to Mr. Johnston and other members of his staff on April 3, 2008. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary information. The licensee did not identify any proprietary information.

4OA7 Licensee Identified Violations

The following finding of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600 for being dispositioned as a NCV:

- 10 CFR 50 Appendix B, Criterion VI, Document Control, requires that measures be established to ensure that procedures, including changes, are distributed to and used at the location where the prescribed activity is performed. On January 23, 2008, St. Lucie declared an unusual event due to an unplanned and uncontrolled hydrogen gas release on the owner controlled area. The latest revision of required procedure EPIP-02, Duties and Responsibilities of the Emergency Coordinator, Revision 25 was not used for declaration of the event. The EPIP-02 procedure in the control room at the time of the event was the previous Revision 24 and was used in conjunction with declaration of the unusual event. This event is documented in the licensee's CAP as CR 2008-2553. This finding is of only very low safety significance since it did not result in a loss of safety function or inoperable equipment.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

E. Armando, Site Quality Manager
M. Page, Assistant Operation Manager
D. Calabrese, Emergency Preparedness Supervisor
D. Cecchett, Licensing Engineer
C. Costanzo, Plant General Manager
K. Frehafer, Licensing Engineer
T. Cosgrove, Site Engineering Manager
B. Jacques, Security Manager
G. Johnston, Site Vice President
R. McDaniel, Fire Protection Supervisor
L. Neely, Work Control Manager
W. Parks, Operations Manager
T. Patterson, Licensing Manager
G. Swider, Systems Engineering Manager
M. Delowery, Maintenance Manager
R. Walker, Emergency Preparedness

NRC personnel:

M. Sykes, Chief, Branch 3, Division of Reactor Projects
S. Ninh, Senior Project Engineer, Division of Reactor Projects

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened/Closed

05000389/2008002-01	NCV	Failure to Take Timely and Effective Corrective Actions to Prevent RCS Pressure Boundary Leakage through the RCP Seal Lines
05000389/2008002-02	NCV	Failure to Distribute EOP Revisions to the Required Location for Usage
005000389/2007001-00	LER	Reactor Shutdown Due to Unidentified RCS Leakage

LIST OF DOCUMENTS REVIEWED

Condition Reports

2007-42819	2008-00253	2008-03563	2008-04275
2008-00761	2008-00257	2008-03415	2008-04024
2008-00854	2008-00272	2008-03412	2008-02741
2008-01191	2008-00576	2008-03355	2008-02660
2008-01451	2008-00598	2008-03226	2008-02553
2008-02337	2008-00668	2008-03109	2008-02546
2008-02348	2008-00691	2008-03080	2008-02379
2008-02369	2008-00743	2008-02721	2008-01617
2008-02553	2008-00764	2008-02610	2008-01229
2008-04076	2008-00821	2008-02553	2008-00761
2008-04094	2008-00927	2008-02546	2008-00667
2008-04176	2008-02101	2008-02070	2008-00471
2008-04681	2008-02191	2008-01059	2008-00444
2008-04768	2008-02465	2008-00561	2008-3080
2008-05001	2008-04994	2007-4383	2008-7372
2008-10088	2008-6834	2007-42387	2008-7377
2008-8292	2008-7002	2008-7394	2008-7383

Procedures

NAP-02, Conduct of Operations, Revision 3
 0010721, NRC Required Non-Routine Notifications and Reports, Revision 59
 QI-5-PR/PSL-3, Verification Guide For Emergency Operating Procedures
 HP-49, Dewatering Radioactive Bead Resins, Revision 13
 2-OSP-100.15, Remote Shutdown Monitoring Monthly Channel Check, Revision 8

Drawings

FPL St. Lucie Plant Unit 2 Isometric Number RC-28, Revision 4
 FPL St. Lucie Plant Unit 2 Isometric Number RC-13, Revision 5
 P&ID 2998-G-096, 2B Emergency Diesel Generator Air Start Package, Revision 5

Miscellaneous

Altran Solutions Technical Report, Failure Analysis of the 2B2 Lower Seal cavity Injection Line J-Weld, February 2008

Altran Solutions Technical Report, Failure Analysis of the 2B1 RCP Seal Cavity Vent Socket Weld Crack Evaluation, September, 2007

FPL Change Request Notice 04201-16534, Change Fitting Welds Shown as Butt Welds on CRN 04201-16068

Temporary System Alteration 2-08-002, Unit 2 Reactor Coolant Pump Vibration Monitoring Equipment

Operational Decision Bulletin, Unit 2 CEA System – Hold Bus, January 2, 2008

PSL Operations Event Report 08-001, Unplanned LCO Entry

Work Orders (WO)

36020030

36018474

36021268

36019326