



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-1257

August 2, 2017

EA-17-117

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
Florida Power & Light Company
Mail Stop: EX/JB
700 Universe Blvd.
Juno Beach, FL 33408

SUBJECT: ST. LUCIE PLANT – NRC INTEGRATED INSPECTION REPORT
05000335/2017002 AND 05000389/2017002 AND EXERCISE OF
ENFORCEMENT DISCRETION

Dear Mr. Nazar:

On June 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your St. Lucie Plant Units 1 and 2. The enclosed integrated inspection report documents the inspection results, which were discussed on July 11, 2017, with Mr. DeBoer, Site Director, and other members of your staff.

St. Lucie Unit 1 operated with reactor coolant system (RCS) leakage, from approximately November 9, 2016, until the unit was shut down on January 31, 2017. Contrary to Technical Specification (TS) 3.4.6.2, "Reactor Coolant System Operational Leakage," Unit 1 operated with pressure boundary leakage longer than allowed by the required TS action statements. Although a violation of TS occurred, the violation was not attributable to an equipment failure that was avoidable by reasonable licensee quality assurance measures or management controls and therefore, inspectors concluded that there was no performance deficiency associated with the RCS boundary leakage. Using risk-informed tools to assess the condition the NRC concluded that the violation was of very low safety significance and consistent with a Severity Level IV violation. This determination was made because there was not an adverse impact on the RCS, given that the leak was stable, well within the capacity of the charging system, and it would not impact other systems used to mitigate a loss of coolant accident.

Based on these facts, and consultation with the Director of the Office of Enforcement and the Regional Administrator, I have been authorized to exercise enforcement discretion in accordance with Section 3.10 of the Enforcement Policy (ADAMS Accession No. ML16271A446), and refrain from issuing enforcement for the violation. This violation will not be considered in the assessment process or the NRC's Action Matrix.

M. Nazar

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In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding," 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 component of the NRC's Agencywide Documents Access and Management 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/

Joel T. Munday, Director
Division of Reactor Projects

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

Enclosure:
IR 05000335/2017002, 05000389/2017002
w/Attachment: Supplemental Information

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SUBJECT: ST. LUCIE PLANT - NRC INTEGRATED INSPECTION REPORT
05000335/2017002 AND 05000389/2017002 August 2, 2017

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-335, 50-389

License Nos: DPR-67, NPF-16

Report Nos: 05000335/2017002, 05000389/2017002

Licensee: Florida Power & Light Company (FPL)

Facility: St. Lucie Plant, Units 1 and 2

Location: 6501 South Ocean Drive
Jensen Beach, FL 34957

Dates: April 1, 2017 to June 30, 2017

Inspectors: T. Morrissey, Senior Resident Inspector
S. Roberts, Resident Inspector
W. Loo, Senior Health Physicist (Sections 2RS5 and 4OA1)
J. Panfel, Health Physicist (Sections 2RS1, 2RS3, and 4OA1)
J. Rivera, Health Physicist (Sections 2RS2 and 2RS4)
L. Pressley, Senior Project Engineer (Section 4OA5)

Approved by: LaDonna B. Suggs, Chief
Reactor Projects Branch 3
Division of Reactor Projects

Enclosure

SUMMARY

IR 05000335/2017002, 05000389/2017002; 04/01/2017 – 06/30/2017; St. Lucie Nuclear Plant, Units 1 and 2; Integrated Inspection Report.

The report covered a three-month period of inspection by the resident inspectors and region based specialist inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

No findings were identified.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent rated thermal power (RTP). On May 31, 2017, power was lowered to approximately 74 percent RTP in order to complete planned turbine valve testing. The unit was returned to 100 percent RTP that same day. The unit was at 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent rated RTP, and with the exception of minor power adjustments, remained at 100 percent power for the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection (IP 71111.01)

.1 Readiness for seasonal extreme weather conditions

a. Inspection Scope

The inspectors reviewed and verified the status of licensee actions taken in accordance with their procedural requirements prior to the onset of hurricane season. The inspectors reviewed licensee procedures ADM-04.01, "Hurricane Season Preparation," and OP-AA-102-1002, "Seasonal Readiness." The inspectors performed site walk downs of the systems and areas listed below to verify the licensee had made the required preparations. Corrective action program (CAP) action requests were reviewed to determine if the licensee was identifying and resolving conditions associated with adverse weather preparedness. Documents reviewed are listed in the Attachment. This inspection constitutes one sample associated with the site readiness for seasonal extreme weather conditions.

- St. Lucie 230 kilo-volt (kV) switchyard
- Unit 1 and Unit 2 intake cooling water (ICW) systems and structures
- Unit 1 and Unit 2 component cooling water (CCW) systems and structures
- Unit 1 and Unit 2 auxiliary and startup transformer areas
- Unit 1 and Unit 2 turbine buildings
- Unit 1 and Unit 2 auxiliary feedwater (AFW) systems and structures
- St. Lucie plant intake canal debris and turtle net
- St. Lucie plant storm drain retention pond system

b. Findings

No findings were identified.

.2 External Flooding Preparations

a. Inspection Scope

The inspectors performed walkdown inspections of Unit 1 and Unit 2 reactor auxiliary buildings (RABs), including doors, flood protection barriers, penetrations and the integrity of the perimeter structure. The inspectors inspected RAB penetration flood seals located in both units' emergency core cooling system tunnels. These tunnels are located below grade outside the RAB and would be flooded during a design basis flood event. The inspectors walked down a temporary flood mitigation barrier (sandbags) installed at one degraded Unit 1 RAB external door. The licensee's interim flood hazards reevaluation determined that a local intense precipitation (LIP) event would result in a pooling of water outside of this door. The sandbags were installed to minimize water entry into the Unit 1 RAB through the degraded door. During this inspection period, a similarly degraded Unit 2 RAB door was replaced and the sandbags were removed. The inspectors periodically monitored the Unit 2 door replacement activities to ensure the sandbags and a ventilation barrier remained in place during the maintenance. The flood hazard reevaluation determined that an LIP event would not impact safety related equipment, as long as the external doors are closed and are in good condition. The inspectors walked down the site's storm drain retention ponds to verify they were in a satisfactory condition to support water runoff from a precipitation event. In addition, the inspectors walked down Unit 1 and Unit 2 emergency diesel generators (EDGs) and fuel oil tanks, AFW pump areas, and the turbine buildings. The inspectors also reviewed the applicable updated final safety analysis report (UFSAR) sections, technical specifications (TSs), and other licensing basis documents regarding external flooding and flood protection, including specific plant design features to mitigate the maximum flood level. CAP documents and work orders (WOs) related to water intrusion events over the past year were reviewed to ensure that the licensee was identifying and resolving severe weather related issues that could lead to external flooding of safety-related equipment. Documents reviewed are listed in the Attachment. This inspection constitutes one sample associated with the site's readiness to cope with external flooding.

b. Findings

No findings were identified.

.3 Offsite and Alternate Alternating Current (AC) Power System Readiness

a. Inspection Scope

The inspectors evaluated the summer readiness of both the offsite and onsite alternate AC power systems for extreme summer weather. The inspectors walked down the Unit 1 and Unit 2 safety-related EDGs and the turbine driven AFW pumps to verify they would be available during a loss of offsite power event. The inspectors performed a walkdown of the switchyard with plant personnel to verify that the material condition of the offsite power sources was adequate. Open WOs for the offsite and onsite AC power systems were reviewed to ensure degraded conditions were properly addressed. The inspectors verified that licensee and transmission system operator procedures contained communication protocols addressing the exchange of appropriate information when issues arise that could impact the offsite

power system. The inspectors verified that no equipment or operating procedure changes have occurred since the last performance of this inspection which would potentially affect the operation or reliability of the offsite or onsite AC power systems. Documents reviewed are listed in the Attachment. This inspection constitutes one sample associated with the site's summer readiness of offsite and alternate AC power systems.

b. Findings

No findings were identified.

1R04 Equipment Alignment (IP 71111.04)

.1 Partial Equipment Walkdowns (71111.04 Quarterly)

a. Inspection Scope

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, and that those issues were documented in the CAP. Documents reviewed are listed in the Attachment. This inspection constitutes four samples.

- Unit 2, low pressure safety injection (LPSI) 2B train while 2A train was out of service (OOS) for maintenance
- Unit 1, containment spray (CS) 1A train while 1B train was OOS for maintenance
- Unit 1, 1A EDG while 2B EDG was OOS for an extended maintenance outage
- Unit 2, 2A and 2B AFW while 2A EDG was OOS for an extended maintenance outage

b. Findings

No findings were identified.

.2 Complete System Walkdown (71111.04S)

a. Inspection Scope

The inspectors conducted a detailed walkdown and review of the alignment and condition of accessible portions of the Unit 1 chemical and volume control system to verify its capability to meet its design basis function. The inspectors utilized licensee procedure 1-NOP-02.11, "Charging and Letdown Initial Alignment," as well as other licensing and design documents, to verify the system alignment was correct. During the walkdown, the inspectors verified that: (1) valves were correctly positioned and did not exhibit leakage that would impact their function; (2) electrical power was available as required; (3) major portions of the system and components were correctly labeled, cooled, and ventilated; (4) hangers and supports were correctly

installed and functional; (5) essential support systems were operational; (6) ancillary equipment or debris did not interfere with system performance; (7) tagging clearances were appropriate; and (8) valves were locked as required by the licensee's locked valve program. Pending design and equipment issues were reviewed to determine if identified deficiencies significantly impacted the system's functions. Items included in this review were the operator workaround list, the temporary modification list, system health report, system description, and outstanding maintenance work requests/WOs. In addition, the inspectors reviewed the licensee's CAP to ensure that the licensee was identifying and resolving equipment alignment problems. Documents reviewed are listed in the attachment. This inspection constitutes one sample.

b. Findings

No findings were identified.

1R05 Fire Protection (IP 71111.05)

.1 Fire Area Walkdowns (IP 71111.05Q)

a. Inspection Scope

The inspectors toured the following plant areas during this inspection period to evaluate conditions related to control of transient combustibles, ignition sources, and 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 administrative procedure 1800022, "Fire Protection Plan." The licensee's fire impairment lists, updated on an as-needed basis, were routinely reviewed. In addition, the inspectors reviewed the CAP database to verify that fire protection problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment. This inspection constitutes six samples. The following areas were inspected:

- Unit 1 charging pump area
- Unit 2 2B LPSI room
- Unit 1 1A EDG
- Unit 1 fuel handling building ventilation room
- Unit 1 1A and 1B LPSI and shut down cooling rooms
- Unit 1 RAB control element assembly (CEA) and motor generator set room

b. Findings

No findings were identified.

.2 Fire Protection - Drill Observation (IP 71111.05A)

a. Inspection Scope

The inspectors observed two fire drills. On May 13, 2017, the inspectors observed an unannounced fire drill that simulated a digital electro-hydraulic (DEH) pump fire located on the Unit 1 turbine building mezzanine level. On June 3, 2017, the

inspectors observed a second unannounced drill that simulated a fire in a storage cage located on the 19.5 feet elevation of the Unit 2 turbine building. These drills were observed to evaluate the readiness of the plant fire brigade to fight fires. The inspectors verified that the licensee staff identified deficiencies, openly discussed them in a self-critical manner at the post drill critique meeting, and implemented appropriate corrective actions as required. Specific attributes evaluated were: (1) proper wearing of turnout gear and self-contained breathing apparatus (SCBA); (2) proper use and layout of fire hoses; (3) employment of appropriate firefighting techniques; (4) sufficient fire-fighting equipment brought to the scene; (5) effectiveness of command and control; (6) search for victims and propagation of the fire into other plant areas; (7) smoke removal operations; (8) utilization of pre-planned strategies; (9) adherence to the pre-planned drill scenario, and; (10) drill objectives. In addition, the inspectors reviewed the storage, training, expectations for use, and maintenance associated with the SCBA program. Documents reviewed are listed in the Attachment. This inspection constitutes one inspection sample and completes the annual inspection of fire drills and the SCBA program.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (IP 71111.11Q)

.1 Resident Inspector Quarterly Simulator Review

a. Inspection Scope

On April 17, 2017, the inspectors observed and assessed continuing training of a licensed operator crew on the control room simulator during an evaluated simulator scenario. The simulated scenario included a fire alarm requiring an Unusual Event emergency classification due to a fire in protected area not extinguished in 15 minutes, loss of 480V motor control center (MCC) AC related bus, and total loss of feedwater. The inspectors also reviewed simulator physical fidelity and specifically 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 abnormal and emergency operation procedures, and emergency plan implementing procedures
- Control board operation and manipulation, including high-risk operator actions
- Oversight and direction provided by supervision, including ability to identify and implement appropriate TS actions, regulatory reporting requirements, and emergency plan classification and notification
- Crew overall performance and interactions
- Effectiveness of the post-evaluation critique

Documents reviewed are listed in the Attachment. This inspection constitutes one sample.

b. Findings

No findings were identified.

.2 Control Room Observations

a. Inspection Scope

The inspectors observed and assessed licensed operator performance in the plant and main control room, particularly during periods of heightened activity or risk and where the activities could affect plant safety. Documents reviewed are listed in the Attachment. Specifically, the inspectors observed activities in the control room during the following evolution:

- Unit 1: May 31, 2017, down power to approximately 74 percent RTP to support planned turbine valve testing and subsequent return to 100 percent RTP

The inspectors focused on the following conduct of operations attributes as appropriate:

- Operator compliance and use of procedures
- Control board manipulations
- Communication between crew members
- Use and interpretation of plant instruments, indications and alarms
- Use of human error prevention techniques
- Documentation of activities, including initials and sign-offs in procedures
- Supervision of activities, including risk and reactivity management

This inspection constitutes one sample.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (IP 71111.12Q)

a. Inspection Scope

The inspectors reviewed the performance data and associated AR for the equipment 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 ADM-17-08, "Implementation of 10 CFR 50.65, The Maintenance Rule (MR)." The inspectors focused on MR scoping, characterization of maintenance problems and failed components, risk significance, determination of MR a(1) and a(2) 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 attended applicable expert panel meetings and reviewed associated system health reports. The inspectors verified that equipment problems were being identified and entered

into the licensee's CAP. Documents reviewed are listed in the Attachment. This inspection constitutes one sample.

- AR 2094474, Return of Unit 1 control room heating, ventilation and air conditioning (HVAC) to MR a(2)

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors completed in-office reviews, plant walkdowns, and control room inspections of the licensee's online risk assessment of the emergent or planned maintenance activities listed below. The inspectors verified the licensee's risk assessment and risk management activities using the requirements of 10 CFR 50.65(a)(4), the recommendations of Nuclear Management and Resource Council (NUMARC) 93-01, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and licensee procedure ADM-17.16, "Implementation of the Configuration Risk Management Program." The inspectors also reviewed the effectiveness of the licensee's contingency actions to mitigate increased risk resulting from the degraded equipment. The inspectors interviewed responsible senior reactor operators on-shift, verified actual system configurations, and specifically evaluated results from the licensee's online risk monitor (OLRM) for the combinations of OOS risk significant structures, systems, and components listed below. Documents reviewed are listed in the Attachment. This inspection constitutes seven samples.

- Unit 2, Yellow OLRM assessment with the 2B high pressure safety injection (HPSI), 2B LPSI and 2B CS pumps OOS for planned valve testing
- Unit 2, OLRM assessment with 2B LPSI pump and HCV-3636 (loop 1B1 HPSI injection valve) OOS for planned maintenance
- Unit 2, Yellow OLRM assessment with the 2A HPSI, 2A LPSI, and 2A CS pumps OOS for planned maintenance
- Unit 2, OLRM assessment with 2B EDG OOS for planned maintenance
- Unit 2, OLRM assessment with 2A EDG OOS for planned maintenance
- Unit 1, OLRM assessment with 1B HPSI and 1B CS pumps OOS for planned maintenance
- Unit 2, Yellow OLRM assessment with the 2B CCW heat exchanger removed from service for leak investigation

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (IP 71111.15)

a. Inspection Scope

The inspectors reviewed the interim dispositions and operability determinations or functionality assessments of the following ARs to ensure that they were properly supported and the affected structures, systems, and components remained available to perform their safety function with no increase in risk. The inspectors verified the operability determinations or functionality assessments were performed in accordance with licensee procedure EN-AA-203-1001, "Operability Determinations and Functionality Assessments." The inspectors reviewed the applicable UFSAR sections, associated supporting documents and procedures, and interviewed plant personnel to assess the adequacy of the interim dispositions. This inspection constitutes five samples.

- AR 2196500, Unit 2 containment isolation valve closed stroke approaching design limit
- AR 2200071, Unit 2 CCW piping support weld broken
- AR 2194164, Unit 2 safety injection check valve V3247 seat leakage
- AR 2205323, Unit 2 CCW shutdown heat exchanger inlet relief lifting
- AR 2211095, Unit 2 control room outside air radiation monitor surveillance did not properly test the required circuitry

b. Findings

No findings were identified.

1R18 Plant Modifications (IP 71111.18)

a. Inspection Scope

The inspectors reviewed the engineering change (EC) documentation for the modifications listed below. The inspectors reviewed the modifications to verify they were implemented as described in procedure EN-AA-205-1100, "Design Change Packages." The inspectors reviewed the 10 CFR 50.59 screenings and evaluations, fire protection reviews, and environmental reviews to verify that the modifications had not affected system operability and availability. The inspectors reviewed associated plant drawings and UFSAR documents impacted by these modifications and discussed the changes with licensee personnel to verify the installations were consistent with the modification documents. Additionally, the inspectors verified that any issues associated with the modifications were identified and entered into the licensee's CAP. This inspection constitutes two samples.

- EC 288616, Unit 2 temporary packing gland repair for ICW pump 2C cross-tie discharge valve to train A
- EC 288327, Unit 2 number 8 linear power range excore detector replacement

b. Findings

No findings were identified.

1R19 Post Maintenance Testing (IP 71111.19)a. Inspection Scope

For the maintenance WOs listed below, the inspectors reviewed the test procedures and either witnessed the testing, 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 licensee procedure ADM-78.01, "Post Maintenance Testing," were incorporated into test requirements. This inspection constitutes six samples.

- WO 40387435, 2A LPSI suction valve V3444 operator preventative maintenance
- WO 40433184, 1A containment spray pump motor preventative maintenance
- WO 40483739, 2A EDG 24-month inspection and preventative maintenance
- WO 40447189, 2B EDG 24-month inspection and preventative maintenance
- WO 40468053, Unit 2, Replace control room ventilation, (HVA/ACC-3C) hot gas bypass valve with a different type per EC 287346
- WO 40487128, 1C AFW oil reserve drain and flush

b. Findings

No findings were identified.

1R22 Surveillance Testing (IP 71111.22)a. Inspection Scope

The inspectors either reviewed or witnessed the following surveillance tests to verify that the tests met TS, UFSAR, and licensee procedural requirements. The inspectors verified that tests demonstrated the operational readiness and capability of the systems to perform their 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 standby alignment required for the system to perform its safety function. The inspectors verified that surveillance issues were documented in the CAP. Documents reviewed are listed in the Attachment. This inspection constitutes five total samples under the testing activities listed below.

In-Service Tests:

- 1-OSP-09.01C, Auxiliary Feedwater Pump Code Run

Surveillance Tests:

- 1-SMI-63.02A, RPS - Monthly Functional Test - Channel A
- 1-SMI-09.43A, Auxiliary Feedwater Actuation System Monthly Functional Test Channel A
- 1-SMI-69.02, Engineered Safeguards Actuation System - Functional Test

Reactor Coolant System (RCS) Leakage Detection Surveillance:

- 1-OSP-01.03, Reactor Coolant System Inventory Balance

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness (EP)

1EP6 Drill Evaluation (IP 71114.06)

Emergency Preparedness Drills

a. Inspection Scope

On April 19, 2017, and on May 24, 2017 the inspectors observed the simulator control room, technical support center (TSC) and emergency operations facility (EOF) staff during two drills of the site emergency response organization to verify the licensee was properly classifying emergency events, completing the required notifications, and making appropriate protective action recommendations.

The April drill scenario included a loss of decay heat removal for the shutdown Unit 1 that resulted in an RCS temperature rise above 200 degrees Fahrenheit (F), an RCS leak for Unit 2 that resulted in a manual reactor trip and a safety injection actuation, a loss of Unit 2 reactor containment cooling, and a station blackout condition for both units. An Unusual Event, an Alert, a Site Area Emergency, and later, a General Emergency were declared due to degrading plant conditions.

The May drill scenario included a Unit 2 loss of safety system annunciation, a steam generator tube leak, and a reactor trip due to a loss of condenser vacuum. Unit conditions degraded further with a steam generator tube rupture and a failed open main steam safety valve. An Unusual Event, an Alert, a Site Area Emergency, and later, a General Emergency were declared due to degrading plant conditions.

During the drills, the inspectors assessed the licensee's actions to verify that emergency classifications and notifications were made in accordance with licensee emergency plan implementing procedures and 10 CFR 50.72 requirements. The inspectors specifically verified the emergency classifications and notifications were made in accordance with licensee procedures EPIP-01, "Classification of Emergencies," and EPIP-02, "Duties and Responsibilities of the Emergency Coordinator." The inspectors also observed whether the initial activation of the emergency response centers were timely and as specified in the licensee's emergency plan, and that licensee identified critique items and drill weaknesses were captured in the CAP. Documents reviewed are listed in the attachment. This inspection constitutes two samples.

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

2RS1 Radiological Hazard Assessment and Exposure Controls (IP 71124.01)

a. Inspection Scope

Hazard Assessment and Instructions to Workers: During facility tours, the inspectors directly observed radiological postings and container labeling for areas established within the radiologically controlled area (RCA) of the Unit 2 (U2) RAB and containment buildings, and the radioactive waste processing and storage locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. The inspectors reviewed survey records for several plant areas including surveys for airborne radioactivity, gamma surveys with a range of dose rate gradients, surveys for alpha-emitters and other hard-to-detect radionuclides, and pre-job surveys for upcoming tasks. The inspectors also discussed changes to plant operations that could contribute to changing radiological conditions since the last inspection. The inspectors attended pre-job briefings and reviewed Radiation Work Permit (RWP) details to assess communication of radiological control requirements and current radiological conditions to workers.

Control of Radioactive Material: The inspectors observed surveys of material and personnel being released from the RCA using small article monitor (SAM), personnel contamination monitor (PCM), and portal monitors (PMs). The inspectors discussed equipment sensitivity, alarm setpoints, and release program guidance with licensee staff. The inspectors also reviewed records of leak tests on selected sealed sources and discussed nationally tracked source transactions with licensee staff.

Hazard Control: The inspectors evaluated access controls and barrier effectiveness for selected high radiation area (HRA), locked high radiation area (LHRA), and very high radiation area (VHRA) locations and discussed changes to procedural guidance for LHRA and VHRA controls with radiation protection (RP) supervisors. The inspectors reviewed implementation of controls for the storage of irradiated material within the spent fuel pool. Established radiological controls, including airborne controls and electronic dosimeter alarm setpoints, were evaluated for selected Unit 2 Refueling Outage 23 (SL2-23) tasks. In addition, the inspectors reviewed licensee controls for areas where dose rates could change significantly as a result of plant shutdown and refueling operations. The inspectors also reviewed the use of personnel dosimetry, including extremity dosimetry, and multi-badging in high dose rate gradients.

Radiation Worker Performance and RP Technician Proficiency: Occupational workers' adherence to selected RWPs and RP technician proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Jobs observed included valve maintenance activities and steam generator nozzle dam work in high radiation and contaminated areas. The inspectors also evaluated worker responses to dose and dose rate alarms during selected work activities.

Problem Identification and Resolution: The inspectors reviewed and assessed condition reports (CRs) associated with radiological hazard assessment and control. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with licensee procedures. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection activities were evaluated against the requirements of UFSAR Section 12, TS Sections 6.8 and 6.12, 10 CFR Parts 19 and 20, and approved licensee procedures. Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE Circular 81-07, "Control of Radioactively Contaminated Material." Documents and records reviewed are listed in the Attachment. This inspection constitutes seven samples.

b. Findings

No findings were identified.

2RS2 Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls (IP 71124.02)

a. Inspection Scope

Work Planning and Exposure Tracking: The inspectors reviewed work activities and their collective exposure estimates for the most recent U2 outage (SL2-23). The inspectors reviewed ALARA planning packages for activities related to the following U2 high collective exposure tasks: reactor head removal, reactor head coil stacks replacement, reactor coolant pump (RCP) replacement, and safety injection valve repair. For the selected tasks, the inspectors reviewed established dose goals and discussed assumptions regarding the bases for the current estimates with responsible ALARA planners. The inspectors evaluated the incorporation of exposure reduction initiatives and operating experience, including historical post-job reviews, into RWP requirements. Day-to-day collective dose data for the selected tasks were compared with established dose estimates and evaluated against procedural criteria (work-in-progress review limits) for additional ALARA review. Where applicable, the inspectors discussed changes to established estimates with ALARA planners and evaluated them against work scope changes or unanticipated elevated dose rates.

Source Term Reduction and Control: The inspectors reviewed the collective exposure three-year rolling average from (2013 – 2015). The inspectors evaluated historical dose rate trends for reactor coolant system piping and compared them to SL2-23. Source term reduction initiatives, including cobalt reduction and zinc injection, were reviewed and discussed with RP staff. The inspectors also reviewed the use of temporary shielding for SL2-23.

Radiation Worker Performance: As part of inspection procedure 71124.01, the inspectors observed pre-job ALARA briefings and radiation worker performance for various HRA jobs in the RAB and containment. While observing job tasks, the inspectors evaluated the use of remote technologies to reduce dose including tele dosimetry and remote visual monitoring.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with ALARA program implementation. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: ALARA program activities were evaluated against the requirements of UFSAR Section 12.1, TS Section 6.8, 10 CFR Part 20, and approved licensee procedures. Documents reviewed are listed in the report Attachment. This inspection constitutes five samples.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (IP 71124.03)

a. Inspection Scope

Engineering Controls: The inspectors reviewed the use of temporary and permanent engineering controls to mitigate airborne radioactivity during SL2-23. The inspectors observed the use of portable air filtration units for work in contaminated areas of the RCA and reviewed filtration unit testing certificates. The inspectors evaluated the effectiveness of continuous air monitors to provide indication of increasing airborne levels and the placement of air samplers in work area "breathing zones." The inspectors also evaluated alarm set point determinations on air monitors for the inclusion of different nuclide hazards.

Respiratory Protection Equipment: The inspectors reviewed the use of respiratory protection devices to limit the intake of radioactive material. This included review of devices used for routine tasks and devices stored for use in emergency situations. The inspectors reviewed ALARA evaluations for the use of respiratory protection during reactor cavity clean-up and various valve work. Selected SCBA units and negative pressure respirators staged for routine and emergency use in the main control room and other locations were inspected for material condition, SCBA bottle air pressure, number of units, and number of spare masks and availability of air bottles. The inspectors reviewed maintenance records for selected SCBA units for the past two years and evaluated SCBA and negative pressure respirator compliance with National Institute for Occupational Safety and Health certification requirements. The inspectors also reviewed records of air quality testing for supplied-air devices and SCBA bottles.

The inspectors observed the use of air-supplied suits during SL2-23 activities. The inspectors discussed training for various types of respiratory protection devices with licensee staff and interviewed radiation workers and control room operators on use of the devices, including SCBA bottle change-out and use of corrective lens inserts. The inspectors reviewed respirator qualification records (including medical qualifications) for several main control room operators and emergency responder personnel. In addition, inspectors evaluated qualifications for individuals responsible for testing and repairing SCBA vital components.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with airborne controls and respiratory protection activities. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection program activities associated with airborne radioactivity monitoring and controls were evaluated against details and requirements documented in the UFSAR Chapters 11 and 12; applicable TS; 10 CFR Part 20; Regulatory Guide (RG) 8.15, "Acceptable Programs for Respiratory Protection" and approved licensee procedures. Documents reviewed are listed in the Attachment. This inspection constitutes four samples.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (IP 71124.04)

a. Inspection Scope

Source Term Characterization: The inspectors reviewed the plant radiation characterization being monitored, including gamma, beta, alpha, and neutron, and reviewed the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry: The inspectors reviewed National Voluntary Laboratory Accreditation Program (NVLAP) certification data for the licensee's Thermoluminescent Dosimeter (TLD) processor for the current year for ionizing radiation dosimetry. The inspectors observed and evaluated onsite storage of TLDs. Comparisons between ED and TLD results, including correction factors, were reviewed and discussed. The inspectors also evaluated licensee procedures for unusual dosimetry occurrences. ED alarm logs were reviewed as part of IP 71124.01.

Internal Dosimetry: The inspectors reviewed and discussed the in vivo bioassay program with the licensee. Inspectors reviewed procedures that addressed methods for determining internal or external contamination, releasing contaminated individuals, and the assignment of dose. The inspectors evaluated the licensee's program for in vitro monitoring. The inspectors also reviewed contamination logs and evaluated events with the potential for internal dose.

Special Dosimetric Situations: The inspectors reviewed records for select declared pregnant workers between April 2015 and March 2017, and discussed guidance for monitoring and instructing declared pregnant workers. Inspectors reviewed the licensee's program for monitoring external dose in areas of expected dose rate gradients, including the use of multi-badging and extremity dosimetry. The inspectors evaluated the licensee's neutron dosimetry program including instrumentation used to perform neutron surveys. In addition, the inspectors reviewed the licensee's program for evaluation of shallow dose equivalent. The inspectors also reviewed contamination logs and evaluated events with the potential for shallow dose equivalent.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with occupational dose assessment. The inspectors evaluated the licensee's ability to identify and resolve issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: The licensee's occupational dose assessment activities were evaluated against the requirements of UFSAR Section 12.4; TS Section 6.8; 10 CFR Parts 19 and 20; and approved licensee procedures. Documents reviewed are listed in the report Attachment. This inspection constitutes five samples.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (IP 71124.05)

a. Inspection Scope

The inspectors reviewed the licensee's radiation monitoring instrumentation programs to verify the accuracy and operability of radiation monitoring instruments used to monitor areas, materials, and workers to ensure a radiologically safe work environment during normal operations and under postulated accident conditions.

Walkdowns and Observations: During tours of the site areas, the inspectors observed installed radiation detection equipment including the following instrument types: area radiation monitors, continuous air monitors, PCMs, SAMs, and PMs. The inspectors observed the calibration status, physical location, material condition and compared technical specifications for this equipment with UFSAR requirements. In addition, the inspectors observed the calibration status and functional checks of selected in-service portable instruments and discussed the bases for established frequencies and source ranges with RP staff personnel. The inspectors reviewed periodic source check records for compliance with plant procedures and manufacturer's recommendation for selected instruments and observed the material condition of sources used.

Calibration and Testing Program: The inspectors reviewed calibration data for selected area radiation monitors, PCMs, PMs, SAMs, and laboratory instruments as well as the last calibration and methodology for the whole body counter. The inspectors reviewed calibration data, methodology used, and source certification for the containment high range monitor and selected portable radiation survey instruments; the inspectors also observed the channel calibration of the U2 containment isolation signal for the containment area radiation monitor. The current output values for the portable instrument calibrator and the instrument certifications used to develop them were reviewed by the inspectors. The inspectors reviewed the licensee's process for investigating instruments that are removed from service for calibration or response check failures and discussed specific instrument failures with plant staff. In addition, the inspectors reviewed 10 CFR Part 61 data to determine if sources used in the maintenance of the licensee's radiation detection instrumentation were representative of radiation hazards in the plant and scaled appropriately for "hard to detect" nuclides.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with radiological instrumentation. The inspectors evaluated the licensee's ability to identify and resolve issues.

Inspection Criteria: Operability and reliability of selected radiation detection instruments were reviewed against details documented in the following: 10 CFR Part 20; NUREG-0737, "Clarification of TMI Action Plan Requirements"; UFSAR Chapters 11 and 12, TS Section 3, and applicable licensee procedures. Documents reviewed are listed in the report Attachment. This inspection constitutes three samples.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (IP 71151)

a. Inspection Scope

Cornerstone: Barrier Integrity

The inspectors checked licensee submittals for the performance indicators (PIs) listed below to verify the accuracy of the PI data reported during the period of April 1, 2016 through March 31, 2017. The PI definitions and guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," and licensee procedure ADM-25.02, "NRC Performance Indicators," were used to check the reporting for each data element. The inspectors checked operator logs, plant status reports, condition reports, and PI data sheets to verify that the licensee had identified the required data, as applicable. The inspectors interviewed licensee personnel associated with PI data collection, evaluation, and distribution. This inspection constitutes two samples in each PI area, or four samples total.

- Unit 1 RCS Leakage
- Unit 2 RCS Leakage
- Unit 1 RCS Activity
- Unit 2 RCS Activity

Cornerstone: Radiation Safety

Occupational Radiation Safety: The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from March 1, 2016 through March 31, 2017. For the assessment period, the inspectors reviewed ED alarm logs and CRs related to controls for exposure significant areas. Documents reviewed are listed in the Attachment. This inspection constitutes one sample.

Public Radiation Safety: The inspectors reviewed the Radiological Control Effluent Release Occurrences PI results for the Public Radiation Safety Cornerstone from March 1, 2016 through March 31, 2017. For the assessment period, the inspectors reviewed cumulative and projected doses to the public contained in liquid and gaseous release permits and CRs related to Radiological Effluent Technical Specifications/ODCM issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. Documents reviewed are listed in the Attachment. This inspection constitutes one sample.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (IP 71152)

.1 Daily Review

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," 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 ARs, and by reviewing the licensee's electronic AR database. Additionally, RCS unidentified leakage was checked on a daily basis to verify no substantive or unexplained changes occurred.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review:

a. Inspection Scope

Inspectors performed a review of the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review focused on repetitive equipment issues, but also considered the plant status reviews, plant tours, licensee trending efforts, and the results of daily inspector CAP item screenings discussed in section 4OA2.1. The inspectors' review nominally considered the six month period of January 2017 through June 2017, although some examples expanded beyond those dates when the scope of the issue warranted. The inspectors verified that the ARs were dispositioned in accordance with the CAP as specified in licensee procedure PI-AA-104-1000, "Condition Reporting." Documents reviewed included department self-assessment and trend reports as well as engineering system health reports. Documents reviewed are listed in the Attachment. This inspection constitutes one sample.

b. Findings and Observations

No findings were identified. The inspectors identified one trend associated with MCC bucket starter degraded mechanical interlocks. Since September 2014, five degraded mechanical interlocks on different MCC bucket starters had to be replaced. Two were found during planned preventive maintenance activities and three were replaced emergently when their associated motor operated valve (MOV) failed to operate properly. The inspector's observations were discussed with the licensee who entered this issue in the CAP as AR 2212311. The AR documents the need to review mechanical interlock events to determine if additional actions are required to address mechanical interlock reliability. Additional information related to this trend is documented in Section 4OA2.4.

.3 Annual Sample: Unit 1 and Unit 2 Control Element Drive Mechanism (CEDM) Coil Reliability

a. Inspection Scope

The inspectors selected AR 2164521 which documented degradation of the CEDM coils removed during the 2016 Unit 1 refueling outage (RFO) for a more in-depth review. The inspectors reviewed the AR report to ensure that the licensee performed an appropriate evaluation, and specified and prioritized corrective actions in accordance with their CAP. The inspectors interviewed plant personnel and evaluated the AR in accordance with the requirements of the licensee's CAP as specified in licensee's procedure PI-AA-104-1000, "Condition Reporting." This inspection constitutes one sample.

b. Observations and Findings

No findings were identified. The licensee had experienced upper gripper coil failures over the last few operating cycles. During the last RFO for each unit, all upper gripper coils were replaced with coils designed with a higher operating temperature. The licensee initially determined that the other four coils on each coil stack (lower gripper, pull down, load transfer and lift coils) were not susceptible to degradation since they are not continuously energized during the operating cycle. During the 2016 Unit 1 RFO, several coil stacks were replaced with a new upper gripper high temperature coils and with like-for-like lower temperature coils for the remaining four coils in each stack. During inspection of coils removed, the licensee identified degradation of the potting material for the coils that had not been continuously energized. The licensee found similar degradation of the Unit 2 coils removed during the 2017 Unit 2 RFO. Although physically degraded, none of the coils failed during operation or testing prior to removal. The inspectors concluded that the licensee was timely in the corrective actions associated with the replacement of all the upper gripper coils with high temperature coils. In addition, the licensee's evaluation of the newly found degraded coils was thorough and corrective actions proposed should address this issue prior to experiencing CEDM coil failure.

.4 Annual Sample: Failure of Shutdown Cooling to Low Pressure Header A isolation valve HCV-3657 to operate from the unit 2 control room

a. Inspection Scope

The inspectors selected AR 2191977 which documented the failure of safety injection system valve HCV-3657 to operate from the Unit 2 control room, for in depth review. The inspectors reviewed the AR report to ensure that the licensee performed an appropriate evaluation, and specified and prioritized corrective actions in accordance with the CAP. The inspectors interviewed plant personnel and evaluated the AR in accordance with the requirements of the licensee's CAP as specified in licensee's procedure PI-AA-104-1000, "Condition Reporting." This inspection constitutes one sample.

b. Observations and Findings

No findings were identified. During the outage, the Unit 2 control room operator noted that the shutdown cooling (SDC) "A" train valve HCV-3657, used for temperature control, was not responding to a manual demand to open. After a brief inspection to determine if circuit breaker thermals had tripped, local control was established and HCV-3657 was determined to be operable but degraded. The licensee later determined the cause to be a failure of an internal mechanical interlock. The interlock was replaced returning the "A" SDC train back into service. Mechanical interlock operation was verified per electrical preventive maintenance procedure 0-PME-47.04, "Periodic Maintenance of 600 Volt and Below Motor Control Center Buckets/AC and DC Starters", every nine years with a manufacturer's recommendation of ten years.

The inspectors reviewed WOs 40224642, 40018274, 40350168, 40351741, 40520832, and 40351737. All of the reviewed WOs had similar issues with the same model of mechanical interlock, CAT ID 178287. Through the review of these WOs, the inspectors discovered that since September 2014, there were two additional interlock failures, totaling five mechanical interlocks requiring replacement since September 2014. The licensee referenced four WO's in the apparent cause evaluation (ACE); WOs 40224642 and 40018274, where the interlocks were replaced through preventative maintenance, and WO's 40350169 and 40351741, where the mechanical interlock required replacement due to their removal for use under WO 40351737. The licensee never referenced or reviewed WOs 40520832, associated with the failure of HCV-3515 (2A2 LPSI header control valve), or 40351737, associated with the failure of MV-09-10 (2B AFW flow control valve to 2B steam generator). Both were operational interlock failures, of which, WO 40351737 had an associated apparent cause evaluation report. Additionally, the inspectors determined that the interlock failure associated with WO 40520832 had not been evaluated as a potential maintenance rule functional failure. Subsequent analysis by the licensee determined the failure of HCV-3515 was not a maintenance rule functional failure.

The inspectors concluded that the licensee was complete, accurate, and timely in repairing and returning the "A" SDC train to service, however the ACE failed to include or discuss two mechanical interlock failures, one of which occurred in the same month as the failure associated with valve HCV-3657. The ACE also failed to address a possible negative trend associated with these mechanical interlocks with

five having to be replaced since September 2014. The licensee has placed the need for both an interlock reliability review, and the missed maintenance rule functional failure evaluation into the CAP as AR 2212311 and AR 2212297, respectively. The inspectors identified mechanical interlock failures as a trend, as documented in Section 4OA2.2.

4OA3 Follow-up of Events and Notice of Enforcement Discretion

.1 (Closed) Licensee Event Report (LER) 05000389/2017-001-00, "Delay in Initiating Immediate Technical Specification Required Action During Fuel Movements"

a. Inspection Scope

The LER documented that irradiated fuel assemblies were moved without notification of the control room, which resulted in the movement of irradiated fuel without the TS required number of operable trains of control room ventilation. The inspectors reviewed the LER and associated ACE to verify the accuracy and completeness of the LER and the appropriateness of the licensee's corrective actions. The inspectors also reviewed the LER to identify any licensee performance deficiencies (PDs) associated with the event.

b. Findings

On March 1, 2017, post-refueling fuel inspection activities were in progress in the Unit 2 spent fuel pool under the direction of the fuel handling supervisor. Concurrence of the shift manager or unit supervisor was not obtained prior to commencing inspection activities. At approximately 1023 hours, operations cross-tied the control room ventilation system in a pre-planned evolution through the 'AB' electrical bus that resulted in a single operable air conditioning unit. Control room operators notified the fuel handling team of the plant status change in order to assure future fuel movements were not made in the current plant configuration. During this conversation, the control room was notified that fuel inspections were in progress. Immediately after, at 1203 hours, the control room ventilation was placed in recirculation mode to comply with TS. Operations directed that fuel inspection activities in the spent fuel pool be stopped. Two independent operable control room ventilation trains are required by TS, or immediately either the remaining train be placed in operation in the recirculation mode, or that the movement of irradiated fuel be stopped.

The licensee determined the cause of this event was inadequate procedure instructions for coordination of fuel handling activities in the fuel handling building spent fuel pool. In procedure 2-NOP-67.02, "Spent Fuel Handling Machine Operation," there was a lack of guidance for obtaining permission prior to moving irradiated fuel assemblies. Unit 2 TS action statement 3/4.7.7 for MODES 5 and 6 or during movement of irradiated fuel assemblies, states, "with one control room emergency air cleanup system inoperable for reasons other than an inoperable control room envelope boundary, immediately initiate and maintain operation of the remaining operable control room emergency air cleanup system in the recirculation mode or immediately suspend movement of irradiated fuel assemblies."

Performing fuel handling activities while the Unit 2 control room's single emergency air cleanup system was not in recirculation mode, resulted the licensee's failure to comply with TS action statement 3/4.7.7, and was a PD.

Using Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," More-than-Minor screening questions, the inspectors determined that the PD and resulting TS violation was minor given the PD: (1) was not viewed as a precursor to a significant event; (2) if left uncorrected, did not have the potential to lead to a more significant safety concern; (3) was not related to a performance indicator; and (4) although associated with a barrier integrity cornerstone attribute, did not adversely affect the associated cornerstone objective. The inspectors answered these questions based on the fact that the control room ventilation system would have correctly responded in the event of: (1) a Unit 2 containment isolation activation signal (CIAS); (2) a high radiation alarm from the outside air intake (OAI) radiation monitors; or (3) loss of power to the radiation monitors. Additionally, the control room was not in a single failure condition and for this event to significantly affect the barrier integrity cornerstone, there would have to be a simultaneous fuel handling incident, a loss of offsite power, and a failure of the 2A EDG. This issue was documented in the licensee's CAP as AR 2193564 and corrective actions have been completed to restore compliance. The failure to comply with TS action statement 3.7.7 constitutes a minor violation that is not subject to enforcement action in accordance with the NRC's Enforcement Policy. This LER is closed.

.2 (Closed) LER 05000335/2017-001-00, and 2017-001-01 "Reactor Coolant Pressure Boundary Leak on the 1B2 Reactor Coolant Pump Lower Seal Heat Exchanger"

a. Inspection Scope

The LER documented a condition prohibited by TS associated with RCS pressure boundary leakage.

The inspectors reviewed the LER and the associated root cause evaluation (AR 2182938) to verify the accuracy and completeness of the LER and the appropriateness of the licensee's corrective actions. The inspectors also reviewed the LER and AR to identify any licensee performance deficiencies associated with the issue.

b. Findings

Description: On January 31, 2017, Unit 1 was shutdown to investigate and repair the source of RCS leakage in the vicinity of the 1B2 RCP seal package. The unidentified leakage rate measured was 0.17 gallons per minute (gpm), which is well below the TS limit of 1 gpm of unidentified leakage. Typical RCS unidentified leak rates are in the range of 0.05 - 0.07 gpm. The licensee's investigation revealed the source of the leakage as RCS pressure boundary leakage from the RCP lower seal cooler. St. Lucie Unit 1 TS 3.4.6.2, "Reactor Coolant System Operational Leakage," Action "a" was entered and the unit was placed in cold shutdown (Mode 5, less than 200 degrees F) in accordance with the TS.

The 1B2 RCP rotating assembly and pump cover with the integral lower seal heat exchanger were replaced during the fall refueling outage which occurred between

September 26 and November 8, of 2016. The RCP integral lower seal heat exchanger was a tube-in-tube heat exchanger that was permanently attached to the pump cover. The inner tube contained high pressure RCS water and the outer tube contained low pressure CCW. The heat exchanger was connected to the CCW supply and return piping utilizing flanges with the flange nuts torqued to 225-230 foot-pounds (ft-lbs,) as specified by the manufacturer. The manufacturer specified a change in the torque requirements in 2015 from a previous value of 125 ft-lbs when it was identified that the 125 ft-lbs specification was not the proper torque value for the size of the flange used.

The leakage emanated from a crack in the inner tube material near the toe of a weld where the inner tube exits from the outer tube. The location was in the vicinity of a CCW system connection flange. Based on a review of containment atmospheric particulate monitor data and reactor cavity leakage flow instrument data, the licensee determined that the RCS pressure boundary leak started on November 9, 2016 or shortly thereafter. This was approximately one week after the RCP was started near the conclusion of the refueling outage.

The licensee determined that the most probable cause of the cracked seal cooler tubing was due to a deficiency in the lower seal heat exchanger design that allowed stresses to approach or exceed the yield strength of the tubing when the flanges were torqued to connect the CCW piping to the cooler. The resultant plastic deformation of the tubing and associated flaw formation allowed low stress; high cycle fatigue from normal RCP operation, to propagate the flaw until it was through-wall, causing the pressure boundary leakage. A finite element analysis model, developed by an outside engineering firm for the RCP seal cooler, was used to support this conclusion. The finite element analysis model determined that when the CCW flange connection was torqued to 230 ft-lbs, a tensile stress was imparted that approached or exceeded the minimum yield strength of the lower seal heat exchanger tubing and possibly caused plastic deformation and subsequently an outside diameter surface flaw in the failure region. A counter torque could not reasonably be applied during installation due to the design of the CCW flange connection.

This issue was documented in the licensee's corrective action program as AR 2182938. Licensee corrective actions included; 1) removing the 1B2 RCP seal cooler heat exchanger flaw and completing a weld repair of the heat exchanger outlet tubing; 2) visually inspecting all Unit 1 and Unit 2 RCP lower seal heat exchangers to identify any leakage and the presence of any outer diameter surface flaws, and; 3) determining whether a lower torque value can be used when connecting CCW to the seal cooler heat exchanger, or by implementing a different method of torqueing the CCW flanges that would reduce the stress on the tubing to an acceptable level.

Enforcement: St. Lucie Unit 1 TS limiting condition for operation 3.4.6.2, "Reactor Coolant System Operational Leakage," required, in part, that RCS operational leakage shall be limited to no pressure boundary leakage during plant operations in Mode 1 through 4. With any pressure boundary leakage, Unit 1 had to be placed in hot standby (Mode 3) within 6 hours, and in cold shutdown (Mode 5) within the following 30 hours. Contrary to the above, Unit 1 experienced RCS pressure boundary leakage from approximately November 9, 2016, until the unit was shut down on January 31, 2017, and later cooled down to Mode 5 on February 1, 2017.

The inspectors utilized the enforcement policy examples of Section 6.1, and available risk-informed tools to assess the safety significance of the RCS pressure boundary leakage and related violation. Based on the fact that the through-wall crack leak rate was stable, was within the capacity of the charging system, and would not impact other systems used to mitigate a loss of coolant accident, the inspectors concluded the safety significance of the violation was very low and consistent with Severity Level IV. Additionally, the risk aspects were discussed and confirmed with a regional Senior Risk Analyst. This issue was documented in the licensee's corrective action program as AR 2182938.

The NRC exercised enforcement discretion in Enforcement Action (EA)-2017-117, in accordance with Section 3.10 of the Enforcement Policy because the violation was not associated with a licensee performance deficiency. Specifically, the violation was not attributable to an equipment failure that was avoidable by reasonable licensee quality assurance measures or management controls and therefore inspectors concluded that there was no performance deficiency associated with the RCS boundary leakage. The RCP cover with its integrated lower seal cooler was replaced with a new component and installed in accordance with vendor instructions.

This enforcement discretion will not be considered in the assessment process or the NRC's Action Matrix. This LER is closed.

.3 Unit 2 Loss of 2A3 4.16 kV Engineered Safeguard (ES) Bus

a. Inspection Scope

On May 15, 2017, at 1800 hours, with Unit 2 operating at approximately 100 percent RTP and the 2A EDG out of service for a planned outage, Unit 2 experienced a loss of the 2A3 4.16 kV ES bus. The 2A EDG received a valid start signal from the undervoltage condition on the 2A3 bus but did not start since the EDG had been removed from service for maintenance. The licensee entered several abnormal operating procedures including: 2-AOP-47.01A, "Loss of Safety Related AC Bus – Train A," 2-AOP-47.01AB, "Loss of Safety Related Bus - AB Swing Bus," 2-AOP-25.01, "Loss of RCB Cooling Fans," and 2-AOP-02.03, "Charging and Letdown." TS 3.8.3.1, Action A, was entered that required the bus to be re-energized in 8 hours, or be in hot standby within the next 6 hours. At 1930 hours, after starting the second ICW and CCP swing pumps on the AB bus aligned to B power, TS 3.0.3 was entered with two offsite power sources TS inoperable. The offsite power feeder to the 2A3 bus was open from the 2A3 bus lockout and the second off site power feed to the 2B3 4.16 kV bus was TS inoperable but available when two trains of ICW and CCW were powered from the same offsite power supply. TS 3.0.3 was entered due to the inoperability of two inoperable offsite power sources and one EDG, and required the unit to be in hot standby in 7 hours. Licensee initial troubleshooting determined that the two 2A3 secondary potential transformer fuses were blown, and no grounds or shorts were found in the circuitry. The fuses were replaced and offsite power was restored to the 2A3 4.16 kV bus at 2340 hours. The 2A ICW and CCW pumps were restarted and the 2C ICW and CCW pumps were secured. The licensee exited the TS requiring a unit shutdown and realigned equipment as necessary after the bus was restored. The licensee entered this issue in the CAP as AR 2205200 and will complete a root cause evaluation for this issue. The inspectors evaluated system response and operator actions associated with this event to verify systems

responded as expected and operator actions were in accordance with licensee procedures. The inspectors verified the event did not meet an emergency action level and the licensee made a timely event notification to the NRC.

b. Findings

No findings were identified.

4OA5 Other Activities

.1 Followup Inspection for Three or More Severity Level IV Traditional Enforcement Violations in the Same Area in a 12-Month Period (IP 92723)

a. Inspection Scope

The inspector reviewed the licensee's analysis for each of the Severity Level IV (SL IV) violations. The inspector also reviewed a common cause evaluation which covered the group of SL IV violations. The inspector's reviews included but were not limited to: 1) assurance that the causes of the violations were understood, 2) that the extent of condition and extent of cause for the violations were identified, and 3) that both completed and proposed corrective actions for the violations were appropriate and sufficient to address the causes. The violations, all within the area of impeding the regulatory process, occurred between the third quarter of 2015 and the second quarter of 2016, were as follows:

- 05000389/2015003-03, "Untimely 10 CFR 50.72 Notification," (AR 2075703),
- 05000335/2016008-02, "Failure to Update UFSAR to Reflect Station Blackout Coping Time Basis," (AR 2117284),
- 05000335, 389/2016011-01, "Failure to Meet the Quality Requirements Specified By NFPA 805," (AR 2151311),
- 05000335, 389/2016011-02, "Failure to modify the Diesel Oil Storage Tank Overflow Line as required by a Fire Protection License Requirement," (AR 2151322).

Additionally, the inspector reviewed violation 05000335, 389/2015004-02, "Non-willful Compromise of a Remedial Examination Required by 10 CFR 55.59 Affected the Equitable and Consistent Administration of the Exam," (AR 2067887). This SL IV violation was characterized in the area of actual consequences and was identified in the fourth quarter of 2015. The inspector reviewed the analysis and corrective actions for any commonalities to the violations listed above. Documents reviewed are listed in the Attachment.

b. Findings and Observations

No findings were identified. In general, the inspector concluded the following:

- The licensee's evaluations of the violations identified how each issue was identified, how long it existed, and possible opportunities for identification,
- The group of SL IV violations received an appropriate level of evaluation to identify causes,

- The evaluations included appropriate consideration of prior occurrences,
- The evaluations appropriately addressed extent of condition and extent of cause of the problems,
- Corrective actions for each cause and for the group of violations were appropriate, and were appropriately prioritized and scheduled, and
- Measures of success were developed and being monitored to determine the effectiveness of the corrective actions.

4OA6 Meetings

Exit Meeting Summary

On April 7, 2017, the Health Physicist inspectors discussed the results of the radiation safety inspection with Mr. Snyder, Licensing Manager, and other members of the licensee staff. The inspectors noted that proprietary information reviewed, if any, would be handled accordingly.

On May 19, 2017, a regional inspector discussed the results of the follow up inspection for three or more SL IV traditional enforcement violations in a 12-month period with Mr. DeBoer, Site Director, and other members of the licensee staff. The inspector noted that proprietary information reviewed, if any, would be handled accordingly.

The resident inspectors presented the results of their inspection to Mr. DeBoer, Site Director, and other members of licensee management on July 11, 2017. 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.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel:

D. Andrews, Lead Communications Specialist
R. Bailey, Performance Analyst
R. Baird, Training Manager
G. Bowen, Emergency Preparedness Manager
E. Burgos, Chemistry Section Supervisor
D. Cecchett, Licensing Engineer
D. DeBoer, Site Director
A. Dong, Maintenance Director
J. Francis, Health Physics Manager
K. Frehafer, Licensing Engineer
M. Haskin, Projects Site Manager
M. Jones, Engineering Director
W. Parks, Operations Director
F. Pollack Assistant Operations Manager - Line
R. Sciscente, Licensing Engineer
M. Snyder, Licensing Manager
T. Spillman, Assistant Operations Manager – Training
T. Summers, Southern Region Vice President
A. Wier, Emergency Preparedness Coordinator

NRC Personnel:

LaDonna B. Suggs, Chief, Branch 3, Division of Reactor Projects

LIST OF ITEMS OPENED AND CLOSED

Closed

05000389/2017-001-00	LER	Delay in Initiating Immediate Technical Specification Required Action During Fuel Movements (Section 4OA3.1)
05000335/2017-001-00, -01	LER	Reactor Coolant Pressure Boundary Leak on the 1B2 Reactor Coolant Pump Lower Seal Heat Exchanger (Section 4OA3.2)

LIST OF DOCUMENTS REVIEWED

Section 1R01 Adverse Weather Protection

OP-AA-102-1002, Seasonal Readiness
0-AOP-53.02, Low Voltage Switchyard Voltage
0-AOP-53.03, High Voltage Switchyard Voltage
0-AOP-53.04, Reduced Offsite Transmission Capability
WM-AA-200, Work Management Process Overview
ADM-16.01, PSL Switch Yard Access / Work Control
AR 2047934, Engineering guidance to mitigate the effects of local intense precipitation flooding
1-ARP-01-S00, Control Room Panel S RTGB-106
1-ARP-01-R00, Control Room Panel R RTGB-106
2-ARP-01-LA00, Control Room Panel LA PACB
1, 2-AOP-24.01, RAB Flooding
Drawing 2998-G-839, Flood Control Stop Logs
NEE-131-PR-001, Interim Actions as Recommended in the Flooding Hazards Re-evaluation Report (FPL-072-PR-002)
U2 Technical Specification 3/4.7.6, Flood Protection, Amendment No. 82
U1, U2 UFSAR Section 2.4.3, Probable Maximum Flood on Streams and Rivers
U1, U2 UFSAR Section 3.4, Water Level (Flood) Design

Section 1R04 Equipment Alignment

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1-NOP-02.11, Charging and Letdown Initial Alignment
2-NOP-03.21, Low Pressure Safety Injection Initial Alignment
1-NOP-59.01A, 1A Emergency Diesel Generator Standby Alignment
2-NOP-09.11, Auxiliary Feedwater System Initial Alignment
1-NOP-07.41, Containment Spray System Initial Alignment

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Section 1R11 Licensed Operator Regualification Program and Licensed Operator Performance

2-NOP-50.01AB, 125V DC Bus 2AB (Class 1E) Normal Operation
2-AOP-09.02, Auxiliary Feedwater
2-AOP-09.04, Feedwater, Condensate and Heater Drain Pump Abnormal Operation
2-AOP-25.02, Ventilation Systems
2-AOP-47.01B, Loss of a Safety Related AC Bus – Train B
2-EOP-01, Standard Post Trip Actions
2-EOP-06, Total Loss of Feedwater
1-GOP-123, Turbine Shutdown - Full Load to Zero Load
1-GOP-201, Reactor Plant Startup - Mode 2 to Mode

1-GOP-101, Reactor Operating Guidelines during Steady State and Scheduled Load Changes

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EPIP-02, Duties and Responsibilities of the Emergency Coordinator

EPIP-08, Offsite Notifications and Protective Action Recommendations

Section 1R12 Maintenance Effectiveness

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Section 1R13 Maintenance Risk Assessments and Emergent Work Control

OP-AA-104-1007, Online Aggregate Risk

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ADM-17.16, Implementation of the Configuration Risk Management Program

Section 1R22 Surveillance Testing

ADM-29.02, ASME Code Testing of Pumps and Valves

Section 1EP6 Drill Evaluation

2-EOP-01, Standard Post Trip Actions

2-EOP-02, Reactor Trip Recovery

2-EOP-04, Steam Generator Tube Rupture SGTR

2-EOP-03, Loss of Coolant Accident (LOCA)

2-EOP-10, Station Blackout SBO

2-EOP-15, Functional Recovery

EPIP-01, Classification of Emergencies

EPIP-02, Duties and Responsibilities of the Emergency Coordinator.

EPIP-04, Activation and Operation of the Technical Support Center

EPIP-06, Activation and Operation of the Emergency Operations Facility

EPIP-08, Off-Site Notifications and Protective Action Recommendations

Section 2RS1: Radiological Hazard Assessment and Exposure Controls

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 RP-AA-104-1000, ALARA Implementing Procedure, Rev. 11
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 RP-SL-106-1002, Respiratory Protection Manual, Rev. 03
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 Air Sample Data Sheet 172-618, 172-621, and 172-627 U2 RCB 62' @ Elevator, 03/13/17
 Air Sample Data Sheet 172-619, U2 RCB 62' FME Area, 03/13/17
 Air Sample Data Sheet 172-620 and 172-625, U2 RCB Head Stand, 03/13/17
 Air Sample Data Sheet 172-622, U2 RCB 45' Elevator, 03/13/17
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Section 2RS4: Occupational Dose Assessment

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HPP-30, Personnel Monitoring, Rev. 57

PI-AA-104-1000, Condition Reporting, Rev. 12

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AR 02134286

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Section 2RS5: Radiation Monitoring Instrumentation

Procedures, Guidance Documents, and Manuals

1-PMI-26.01, Area Radiation Monitor Calibration, Rev. No. 4

2-SMI-26.66B, Calibration of Channel MB Containment Isolation Signal Area Radiation Monitor, Rev. No. 10

2-SMI-26.66C, Calibration of Channel MC Containment Isolation Signal Area Radiation Monitor, Rev. No. 10

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HP-13A, Operation of Portable Survey Instruments, Current Rev. No. 36

HP-13B, Calibration of Portable Count Rate Instruments, Current Rev. No. 20

HP-13C, Calibration of Portable Dose Rate Survey Instruments, Current Rev. No. 30

HP-13F, Calibration and Operation of the Eberline Model AMS-4 Air Monitoring System, Current Rev. No. 15

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 RP-SL-105-1006, Multichannel Analyzers, Rev. No. 0
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Section 4OA5 Other Activities

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LIST OF ACRONYMS

AC	Alternating Current
ACE	Apparent Cause Evaluation
ADAMS	NRC's Agency-wide Documents Access and Management System
ADM	Administrative Procedure
AFAS	AFW Actuation System
AFW	Auxiliary Feedwater
ALARA	As Low as is Reasonably Achievable
AOP	Abnormal Operating Procedure
AP	Abnormal Procedure
AR	Action Request
ARM	Area Radiation Monitor
AC	Alternating Current
ASME	American Society of Mechanical Engineers
CAM	Continuous Air Monitor
CAP	Corrective Action Program
CCW	Component Cooling Water
CEA	Control Element Assembly
CEDM	Control Element Drive Mechanism
CFR	Code of Federal Regulations
CIAS	Containment Isolation Actuation Signal
CR	Condition Report
CS	Containment Spray
CVCS	Chemical and Volume Control
DC	Direct Current
DEH	Digital Electro-Hydraulic
DPW	Declared Pregnant Worker
EC	Engineering Change
ECCS	Emergency Core Cooling System
ED	Electronic Dosimeter
EDG	Emergency Diesel Generator
EN	Engineering Procedure
EOF	Emergency Operations Facility
EOP	Emergency Operating Procedure
EP	Emergency Preparedness
EPIP	Emergency Plan Implementing Procedure
ES	Engineered Safeguards
FEA	Finite Element Analysis
FPL	Florida Power and Light
GOP	General Operating Procedure
HCV	Hydraulic operated Control Valve
HP	Health Physics
HPSI	High Pressure Safety Injection
HPT	Health Physics Technician
HRA	High Radiation Area
HVAC	Heating, Ventilation and Air Conditioning
HVS	Heating and Ventilation Supply
HX	Heat Exchanger
ICW	Intake Cooling Water
IMC	Inspection Manual Chapter

IP	Inspection Procedure
ISFSI	Independent Spent Fuel Storage Installation
kV	kilo-volt (1000 volts)
LER	Licensee Event Report
LHRA	Locked High Radiation Area
LIP	Local Intense precipitation
LOCA	Loss of Coolant Accident
LOOP	Loss of Offsite Power
LPSI	Low Pressure Safety Injection
MCC	Motor Control Center
MFRV	Main Feed Regulating Valve
MOV	Motor Operated Valve
MR	Maintenance Rule (10 CFR 50.65)
MV	Motor Valve
MVAR	Mega Volt Amps Reactive
NEI	Nuclear Energy Institute
NOP	Normal Operating Procedure
NRC	Nuclear Regulatory Commission
NCV	Non-cited Violation
NPR	Negative Pressure Regulators
NUMARC	Nuclear Management and Resource Council
NVLAP	National Voluntary Laboratory Accreditation Program
OAI	Outside Air Intake
ODM	Operational Decision-Making
OLRM	Online Risk Monitor
OOS	Out of Service
OP	Operating Procedure
OSP	Operations Surveillance Procedure
PARS	Publically Available Record
PCM	Personnel Contamination Monitor
PD	Performance Deficiency
PI	Performance Indicator or Performance Improvement
PI&R	Problem Identification and Resolution
PM	Portal Monitors
PMM	Preventative Maintenance Procedure
PP	Power Panel
PSL	Plant St. Lucie
RAB	Reactor Auxiliary Building
RCA	Radiologically Controlled Area
RCB	Reactor Containment Building
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RG	Regulatory Guide
RFO	Refueling Outage
RP	Radiation Protection
RS	Radiation Safety
RTGB	Reactor Turbine Gage Board
RTSG	Reactor Trip Switchgear
RTP	Rated Thermal Power
RWP	Radiation Work Permit
SAM	Small Article Monitor

SBO	Station Blackout
SCBA	Self-Contained Breathing Apparatus
SDE	Shallow Dose Equivalent
SFP	Spent Fuel Pool
SL2-23	Unit 2 Refueling Outage 23
SL IV	Severity Level IV
SME	Surveillance Maintenance Procedure
SMI	Surveillance Maintenance Instrumentation & Controls
SSC	Structure, System, and Component
SUT	Startup Transformer
TLD	Thermoluminescent Dosimeter
TSC	Technical Support Center
TSAS	Technical Specification Action Statement
TS	Technical Specifications
TYRA	Three-Year Rolling Average
U1	Unit 1
U2	Unit 2
UFSAR	Updated Final Safety Analysis Report
V	Volt
VHRA	Very High Radiation Area
WBC	Whole Body Count
WO	Work Order
WR	Work Request