



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

February 14, 2017

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3R-C
Chattanooga, TN 37402-2801

**SUBJECT: SEQUOYAH NUCLEAR PLANT – NRC INTEGRATED INSPECTION REPORT
05000327/2016004 and 05000328/2016004**

Dear Mr. Shea:

This letter reissues the SEQUOYAH NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000327/2016004 AND 05000328/2016004 (Original ADAMS Accession Number ML17039A790) to add documentation for an inspection sample in section 1R11, Licensed Operator Requalification Program (71111.11), that was not included in the original report. No findings or violations were associated with this inspection sample.

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Sequoyah Nuclear Plant Units 1 and 2. On January 20, 2017, the NRC inspectors discussed the results of this inspection with Mr. Boerschig and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violation or significance of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC resident inspector at the Sequoyah Nuclear Plant.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; and the NRC resident inspector at the Sequoyah Nuclear Plant.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Alan Blamey, Branch Chief
Division of Reactor Projects Branch 6

Docket Nos.: 05000327, 05000328
License Nos.: DPR-77, DPR-79

Enclosure: Inspection Report
05000327/2016004 and 05000328/2016004
w/Attachment: Supplemental Information

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J.Shea

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DATE	2/13/2017	2/13/2017	2/13/2017		

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Letter to Joseph W. Shea from Alan Blamey dated February 14, 2017.

SUBJECT: SEQUOYAH NUCLEAR PLANT – NRC INTEGRATED INSPECTION REPORT
INSPECTION REPORT 05000327/2016004 and 05000328/2016004

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-327, 50-328

License Nos.: DPR-77, DPR-79

Report Nos.: 05000327/2016004, 05000328/2016004

Licensee: Tennessee Valley Authority (TVA)

Facility: Sequoyah Nuclear Plant, Units 1 and 2

Location: Sequoyah Access Road
Soddy-Daisy, TN 37379

Dates: October 1 – December 31, 2016

Inspectors: G .Smith, Senior Resident Inspector
W. Deschaine, Resident Inspector
C. Kontz, Senior Project Engineer
A. Sengupta, Reactor Inspector
P. Cooper, Reactor Inspector
M. Donithan, Operations Engineer
N. Lacy, Operations Engineer
J. Nadel, Senior Resident Inspector WBN
A. Nielsen, Sr. Health Physicist
R. Kellner, Sr. Health Physicist
J. Panfel, Health Physicist
R. Baldwin, Senior Operations Engineer

Approved by: Alan Blamey, Chief
Reactor Projects Branch 6
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000327/2016004, 05000328/2016004; 10/1-12/31/2016; Sequoyah Nuclear Plant, Units 1 and 2; Fire Protection

The report covered a three-month period of inspection by resident inspectors and announced inspections by region-based inspectors. One Green non-cited violation was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Components Within the Cross Cutting Areas" dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated August 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The NRC identified a non-cited violation (NCV) of the facility's operating license for the licensee's failure to ensure that all fire barrier penetrations in fire zones boundaries protecting safety related areas are functional at all times. Specifically, on eight separate fire barrier penetrations, the licensee failed to recognize that the barrier had become damaged to the point of being nonfunctional. The licensee also failed to implement required compensatory measures for a nonfunctional fire barrier penetration contrary to the approved fire protection report (FPR). The licensee entered the issues into their corrective action program (CAP) as Condition Reports (CRs) 1229468, 1229470, 1243550, 1243970, 1243552, 1243554, 1243555, and 1243557.

The performance deficiency was determined to be more than minor because it was associated with the protection against external events (fire) attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, with the fire barriers being damaged to the point of declaring the fire barrier penetrations nonfunctional, there was no assurance that the fire barrier would prevent the spread of fire through the cable penetration during a design basis fire. The inspectors performed the SDP using NRC Inspection Manual Chapter 0609, "Significance Determination Process", Appendix F, Attachment 2, "Degradation Rating Guidance Specific to Various Fire Protection Program Elements," and assigned a "High" degradation rating, giving no credit for Barrier Protection in accordance with the "Fire Barrier Degradation" section. The inspectors concluded, that the finding was of very low safety significance (Green) due to fully functional automatic suppression systems on either side of the fire barrier (Question 1.4.3-C). Using Manual Chapter 0310, "Aspects Within the Cross-Cutting Areas," the inspectors identified a cross-cutting aspect in the Identification component of the Problem Identification and Resolution area, because the licensee failed to enter the damaged fire barrier into their CAP after it was initially damaged [P.1]

REPORT DETAILS

Summary of Plant Status:

Unit 1 operated at or near 100 percent rated thermal power (RTP) until November 26 when the unit was shut down for a refueling outage. Following the outage, the reactor was taken critical on December 31, 2016 and was in Mode 2 at the end of the inspection period.

Unit 2 operated at or near 100 percent RTP for the entire inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Conditions (tornado warning)

a. Inspection Scope

The inspectors observed the licensee's response to a tornado warning on November 30, 2016. The inspectors reviewed licensee Procedure AOP-N.02, Tornado Watch/Warning, Revision 35, to assess its effectiveness in limiting the risk of tornado-related initiating events and adequately protecting mitigating systems from the effects of a tornado. The inspectors also verified the licensee's performance of required actions. The inspectors verified that the tornado dampers were cycled and the Emergency Diesel Generators (EDGs) were operated as required by AOP-N.02. This activity constituted one inspection sample, as defined in Inspection Procedure (IP) 71111.01.

b. Findings

No findings were identified.

.2 Readiness for Seasonal Extreme Weather Conditions:

After the licensee completed preparations for seasonal low temperature, the inspectors walked down the EDG building and the steam valve vault rooms for both units. These areas were selected because safety related equipment in these areas could be affected by adverse weather. The inspectors reviewed documents listed in the Attachment, observed plant conditions, and evaluated those conditions using criteria documented in procedure 0-PI-OPS-000-006.0, Freeze Protection, Revision 59 This activity constituted one inspection sample, as defined in IP 71111.01

b. Findings

No findings were identified.

.3 Readiness to Cope with External Flooding

The inspectors evaluated the licensee's implementation of flood protection procedures and compensatory measures during impending conditions of flooding or heavy rains. Specifically, the inspectors reviewed flood design documents and the abnormal operating procedure AOP-N.03 Part 1, "External Flooding," Revision 56. The inspectors also reviewed the updated final safety analysis report (UFSAR) and related flood analysis documents to identify those areas containing safety related equipment that could be affected by external flooding and their design flood levels. The inspectors walked down various flood protection barriers, reviewed procedures for coping with external flooding, and reviewed corrective actions for past flooding events. The inspectors verified that the procedures for coping with flooding could reasonably be used to achieve the desired results. For those areas where operator actions are credited, the inspectors assessed whether the flooding event could limit or preclude the required actions. This review constituted one inspection sample, as defined in IP 71111.01. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

Partial System Walkdown

a. Inspection Scope

The inspectors performed partial walkdowns of the following two systems to verify the operability of redundant or diverse trains and components when safety equipment was inoperable. The inspectors focused on identification of discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, walked down control system components, and determined whether selected breakers, valves, and support equipment were in the correct position to support system operation. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the CAP. Documents reviewed are listed in the Attachment. The inspectors completed two samples, as defined in IP 71111.04.

- Unit 2 'A' Safety Injection (SI) train while 'B' SI pump was out-of-service (OOS) for planned maintenance
- Both trains of spent fuel cooling during complete Unit 1 core offload to spent fuel pool

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)Fire Protection Toursa. Inspection Scope

The inspectors conducted a tour of the six areas important to safety listed below to assess the material condition and operational status of fire protection features. The inspectors evaluated whether: combustibles and ignition sources were controlled in accordance with the licensee's administrative procedures; fire detection and suppression equipment was available for use; passive fire barriers were maintained in good material condition; and compensatory measures for OOS, degraded, or inoperable fire protection equipment were implemented in accordance with the licensee's fire plan. Documents reviewed are listed in the Attachment. The inspectors completed six samples, as defined in IP 71111.05.

- Aux Building 734 elevation (Non-RCA Side)
- Aux Building 749 elevation (Non-RCA Side)
- Unit 1 Containment (All Elevations)
- Aux Building 690 Elevation
- Control Building 706 Elevation
- Aux Building 714 elevation

b. Findings

Introduction: The NRC identified a Green non-cited violation (NCV) of the facility's operating license for the failure to ensure that all fire barrier penetrations located within fire zones boundaries protecting safety related areas remained functional at all times. Specifically, on eight separate fire barrier penetrations, the licensee failed to recognize that the barrier had become damaged to the point of being nonfunctional. The licensee also failed to implement required compensatory measures for a nonfunctional fire barrier penetration contrary to the approved fire protection report (FPR).

Description: While conducting fire walkdowns of areas of the plant throughout the quarter, the inspectors identified eight nonfunctional fire barriers. The inspectors determined that each barrier had been damaged at a prior time, but had not been entered into the licensee's CAP. In addition, the applicable Feature Operating Requirement (OR) 14.6.1 action had not been implemented. The inspectors determined that OR 14.6.1 action A would have required a fire watch be established until the barrier could be repaired. The following is a list of the inspection results for each specific fire area walkdown.

- On November 2, 2016, during a fire walkdown of the common areas located on elevation 714 of the auxiliary building, the inspectors noted that two fire barriers were damaged. The inspectors notified the licensee and they declared the fire barriers nonfunctional, entered OR 14.6.1 for each nonfunctional barrier, established a fire watch, and entered the conditions into their CAP as CRs 1229468 and 1229470.
- On December 18, 2016, during a fire walkdown in the 6.9kV shutdown board room 'B' located on elevation 734 of the auxiliary building, the inspectors noted that a fire

barrier was damaged. The inspectors notified the licensee and they declared the fire barrier nonfunctional, entered OR 14.6.1, established a fire watch, and entered the condition into their CAP as CR 1243550.

- On December 18, 2016, during a fire walkdown in the cable spreading room located on elevation 706 of the control building, the inspectors noted that four fire barriers were damaged. The inspectors notified the licensee and they declared the fire barriers nonfunctional, entered OR 14.6.1 for each nonfunctional barrier, established a fire watch, and entered the conditions into their CAP as CRs 1243552, 1243554, 1243555, and 1243557.
- On December 19, 2016, during a fire walkdown of the common areas located on elevation 690 of the auxiliary building, the inspectors noted that a fire barrier was damaged. The inspectors notified the licensee and they declared the fire barrier nonfunctional, entered OR 14.6.1, established a fire watch, and entered the condition into their CAP as CR 1243970.

After these fire barriers were identified by the inspectors, the licensee entered each instance into the CAP and established an hourly fire watch until repairs could be made. The licensee also conducted an extent of condition and found no additional fire barriers that had been damaged.

Analysis: The licensee's failure to ensure that all fire barrier penetrations in fire zone boundaries protecting safety related areas are functional at all times as required by OR 14.6.1, was a performance deficiency. The inspectors identified eight examples of this performance deficiency throughout the quarter. The performance deficiency was determined to be more than minor because it was associated with the protection against external events (fire) attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, with the fire barriers being damaged to the point of declaring the fire barrier penetrations nonfunctional, there was no assurance that the fire barrier would prevent the spread of the fire through the cable penetration in a design basis fire. The inspectors performed the significance determination process (SDP) using NRC Inspection Manual Chapter (IMC) 0609, "Significance Determination Process", Attachment 4, Phase 1 – "Initial Screening and Characterization of Findings", which required further evaluation in accordance with Manual Chapter 0609 Appendix F, Attachment 1, "Fire Protection SDP Phase 1 Worksheet. The finding was assigned to section 1.4.3 "Fire Confinement", where it was determined that in each example, due to the number of cables in each fire area affected, it was unknown whether the reactor would be able to reach and maintain safe shutdown. The issue was then evaluated using Manual Chapter 0609 Appendix F, Attachment 2, and assigned a "High" degradation rating, giving no credit for Barrier Protection in accordance with the "Fire Barrier Degradation" section. The inspectors concluded, that the finding was of very low safety significance (Green) due to fully functional automatic suppression systems on either side of the fire barrier (Question 1.4.3-C). Using IMC 0310, "Aspects Within the Cross-Cutting Areas," the inspectors identified a cross-cutting aspect in the Identification component of the Problem Identification and Resolution area, because the licensee failed to identify the damaged fire barriers and enter them into their CAP. [P.1]

Enforcement: Facility operating licenses DPR-77 and DPR-79 conditions 2.C.(16) and

2.C.(13), respectively, state that TVA shall implement and maintain in effect all provisions of the approved fire protection program referenced in Sequoyah Nuclear Plant's Final Safety Analysis Report as approved in applicable NRC Safety Evaluation Reports. The Sequoyah Fire Protection Report Part II, Section 14.6, "Fire Barrier Penetrations," OR 14.6.1 requires, that all fire barrier penetrations (including cable penetration barriers, fire doors and fire dampers) in fire zone boundaries protecting safety related areas shall be functional at all times. If one or more required fire barrier penetrations are nonfunctional then restore to functional status within 1 hour or establish a fire watch and restore to functional status within 30 days. Contrary to the above, on September 26, November 2, December 18 and 19, 2016, the licensee failed to implement and maintain in effect all provisions of the approved fire protection program referenced in Sequoyah Nuclear Plant's Final Safety Analysis Report as approved in applicable NRC Safety Evaluation Reports. Specifically, the licensee failed to ensure that all fire barrier penetrations in fire zones boundaries protecting safety related areas remained functional at all times as required by OR 14.6.1. After these fire barriers were identified by the inspectors, the licensee restored compliance by declaring the barriers nonfunctional, entering OR 14.6.1, and establishing an hourly fire watch until repairs could be made. Because the finding was of very low safety significance and has been entered into the licensee's CAP as CRs 1216459, 1229468, 1229470, 1243550, 1243970, 1243552, 1243554, 1243555, and 1243557, this violation is being treated as an NCV, consistent with section 2.3.2.a. of the NRC Enforcement Policy: NCV 05000327, 328/2016004-01, Degraded Fire Barrier Penetrations.

1R06 Flood Protection Measures (71111.06)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed one sample concerning the internal flood protection measures associated with the 6.9 KV Shutdown Board Rooms (SDBRs) in order to verify that the internal flooding design and the flood mitigation plans were consistent with the design requirements and risk analysis assumptions. The SDBRs are located in the auxiliary building on elevation 734 and house most of the safety related 6.9 KV and 480 V switchgear. The inspectors verified that equipment essential for reactor shutdown was properly protected from a flood caused by pipe breaks in the SDBRs. Specifically, the inspectors reviewed the licensee's moderate energy line break flooding study to fully understand the licensee's flood mitigation strategy, reviewed licensee drawings and then verified that the assumptions and results remained valid. The inspectors walked down the shutdown board room to verify the assumed flooding sources, adequacy of common area drainage, and flood detection instrumentation operation would not adversely impact the licensee's ability to promptly shut down the reactor given an internal flooding event. The inspectors completed one sample, as defined in IP 71111.06.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors reviewed two thermal performance tests of the Component Cooling Water System (CCS) and reviewed the results of previous thermal performance tests of the CCS heat exchangers to determine whether there were any previously undetected adverse performance trends, whether the acceptance criteria and results appropriately considered differences between testing conditions and design conditions; whether test results were appropriately categorized against pre-established acceptance criteria; and whether the frequency of testing was sufficient to detect degradation prior to loss of heat removal capability below design basis values. The inspectors also reviewed work documents detailing observations and results of the last internal inspection of the heat exchangers. Documents reviewed are listed in the Attachment. The inspectors completed two samples, as defined in IP 71111.07.

- 0B1/0B2 CCS Heat Exchanger Thermal Performance Test
- 1A1/1A2 CCS Heat Exchanger Thermal Performance Test

b. Findings

No findings were identified

1R08 Inservice Inspection Activities (71111.08)

a. Inspection Scope

Non-Destructive Examination Activities and Welding Activities

From December 05, 2016, through December 09, 2016, the inspectors conducted an onsite review of the implementation of the licensee's inservice inspection (ISI) program for monitoring degradation of the reactor coolant system boundary, risk-significant piping and component boundaries, and containment boundaries in Unit 1.

The inspectors either directly observed or reviewed the following non-destructive examinations (NDEs) mandated by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code of Record: 2007 Edition with 2008 Addenda) to evaluate compliance with the ASME Code, Section XI and Section V requirements and, if any indications or defects were detected, to evaluate if they were dispositioned in accordance with the ASME Code or an NRC-approved alternative requirement. The inspectors also reviewed the qualifications of the NDE technicians performing the examinations to determine whether they were current and in compliance with the ASME Code requirements.

- Work Order (WO) 111555175, Radiography Testing, Seal Water Injection 3 inch Bypass Globe Valve SQN-1-VLV-062-0546, Class 2 (observed and reviewed)
- WO 115585875, Visual Testing (VT)-2, N-722 Code Case Bottom Mounted Instrumentation, RPV Lower Head Remote Visual BMI Penetration Examination, 2015, Class 1 (reviewed)
- WO116969176, Ultrasonic Testing (UT), Flow Accelerated Corrosion (FAC), Heater Drain System pipe (reviewed)
- WO 117152358, UT, FAC, Heater Drain System pipe (observed)
- WO 117163960, Penetrant Testing, Integral Attachment, RHR, Class 2 (reviewed)

- WO 117163984, Magnetic Testing, Integral Attachment, A714 Pen RM, Aux Feed Water, Class 2 (reviewed)
- WO 117405460, VT-1, Rigid Support RXB-LWR-RW/IWF, CVCS, Class 1 (reviewed)
- WO117407003, UT, Overlay Weld/N-770-1, Pressurizer, RXB-LWR-BOTPZR, , Class 1 (reviewed)
- WO 118036413, VT-3, Leak Chase Test Boxes/IWE, RXB-LWR-Raceway/SCV, Class MC (reviewed)
- Visual Enhanced, Reactor Pressure Vessel Closure Head Penetration/N-729-1 Examination (reviewed)

The inspectors either directly observed or reviewed the following welding activities, qualification records, and associated documents in order to evaluate compliance with procedures and the ASME Code, Section XI and Section IX requirements. Specifically, the inspectors reviewed the work order, repair and replacement plan, weld data sheets, welding procedures, procedure qualification records, welder performance qualification records, and NDE reports.

- WO 111930198, Reactor Coolant System/Pipe to Globe Valve FSV68-394, Class 2 (observed)
- WO 115615023, Safety Injection/Install 2-Inch Branch Line and Flex Hose Connection, Class 2 (reviewed)
- WO 116483380, Containment Spray System/Remove and Reinstall Piping, Class 2 (reviewed)

During non-destructive surface and volumetric examinations performed since the previous refueling outage, the licensee did not identify any relevant indications that were analytically evaluated and accepted for continued service; therefore, no NRC review was completed for this inspection procedure attribute.

Pressurized Water Reactor (PWR) Vessel Upper Head Penetration Inspection Activities

The inspectors reviewed portions of the bare metal visual examination of the reactor vessel upper head penetrations and reviewed NDE reports for penetration numbers 29, 55, and 77 to determine if the examinations were performed in accordance with the requirements of ASME Code Case N-729-1 and 10 CFR 50.55a(g)(6)(ii)(D). Additionally, the inspectors reviewed the vendor inspection report to determine if the required examination coverage was achieved and if limitations were recorded in accordance with the licensee procedures.

The licensee did not identify any relevant indications that were accepted for continued service. Additionally, the licensee did not perform any welding repairs to the vessel head penetrations since the beginning of the last Unit 1 refueling outage; therefore, no NRC review was completed for these inspection procedure attributes.

Boric Acid Corrosion Control (BACC) Inspection Activities

The inspectors reviewed the licensee's BACC program activities to determine if the activities were implemented in accordance with the commitments made in response to NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," and applicable industry guidance documents.

Specifically, the inspectors performed an onsite records review of procedures and the results of the licensee's containment walkdown inspections performed during the current refueling outage. The inspectors also interviewed the BACC program owner, conducted an independent walkdown of containment to evaluate compliance with licensee's BACC program requirements, and verified that degraded or non-conforming conditions, such as boric acid leaks, were properly identified and corrected in accordance with the licensee's BACC and corrective action programs.

The inspectors reviewed the following engineering evaluations, completed for evidence of boric acid leakage, to determine if the licensee properly applied applicable corrosion rates to the affected components; and properly assessed the effects of corrosion induced wastage on structural or pressure boundary integrity in accordance with the licensee procedures.

- 117360818, SQN-1-VLV-063-0539, SIS Pump Discharge Test
- 1191567, Leaking 0-PMP-063-0015, SIS Pump 1B-B
- 1191588, SQN-1-PMP-078-0019, Ref. WTR PUR Pump A-A

The inspectors reviewed the following condition reports and associated corrective actions related to evidence of boric acid leakage to evaluate if the corrective actions completed were consistent with the requirements of the ASME Code and 10 CFR Part 50, Appendix B, Criterion XVI.

- 1182619, Broken Valve Stem on the Boric Acid Batching Tank Discharge Valve
- 1191588, 0-PMP-078-0019 BACCP Wet, White Boric Acid Identified
- 1210000, U1 1B CCP Has Excessive Boric Acid Buildup on Mechanical Seal

Steam Generator Tube Inspection Activities

The inspectors reviewed the eddy current (EC) examination activities performed in Unit 1 steam generators 1, 2, 3 and 4 during this current refueling outage to verify compliance with the licensee's Technical Specifications, ASME BPVC Section XI, and Nuclear Energy Institute 97-06, "Steam Generator Program Guidelines."

The inspectors reviewed the scope of the EC examinations, and the implementation of scope expansion criteria, to verify these were consistent with the Electric Power Research Institute (EPRI) Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 8. The inspectors reviewed documentation for a sample of EC data analysts, probes, and testers to verify that personnel and equipment were qualified to detect the applicable degradation mechanisms in accordance with the EPRI Examination Guidelines. This review included a sample of site-specific Examination Technique Specification Sheets (ETSSs) to verify that their qualification and site-specific implementation were consistent with Appendix H or I of the EPRI Examination Guidelines. The inspectors also reviewed a sample of EC data for steam generator tubes 1-R92C86, 3-R34C80, and 4-R96C48, with a qualified data analyst, to confirm that data analysis and equipment configuration were performed in accordance with the applicable ETSSs and site-specific analysis guidelines. The inspectors verified that recordable indications were detected and sized in accordance with vendor procedures.

The inspectors selected a sample of degradation mechanisms from the Unit 1

Degradation Assessment report (i.e. Advanced Tube Support Grids wear) and verified that their respective in-situ pressure testing criteria were determined in accordance with the EPRI Steam Generator Integrity Assessment Guidelines, Revision 4. Additionally, the inspectors reviewed EC indication reports to determine whether tubes with relevant indications were appropriately screened for in-situ pressure testing. The inspectors also compared the latest EC examination results with the last Condition Monitoring and Operational Assessment report for Unit 1 to assess the licensee's prediction capability for maximum tube degradation and number of tubes with indications. The inspectors also reviewed these documents to verify that the licensee's evaluation was conservative and that current examination results were bound by the Operational Assessment projections.

The inspectors assessed the latest EC examination results to verify that new degradation mechanisms, if any, were identified and evaluated before plant startup. The review of EC examination results included the disposition of potential loose part indications on the steam generator secondary side to verify that corrective actions for evaluating and retrieving loose parts were consistent with the EPRI Guidelines.

The inspectors' review included the implementation of tube repair criteria and repair methods to verify they were consistent with plant Technical Specifications (TS) and industry guidelines. The inspectors verified that the licensee had selected the appropriate tubes for plugging based on the required criteria. The inspectors reviewed the tube plugging procedure and a sample of tube plugging results for tube 1-R90C70, to determine if the licensee installed the tube plug in accordance with the applicable procedures.

Furthermore, the inspectors interviewed licensee staff and reviewed a sample of results for the inspection conducted in the secondary side internals of steam generators 1 and 4, to verify that potential areas of degradation based on site-specific operating experience were inspected, and appropriate corrective actions were taken to address degradation indications. This review included the results of Foreign Object Search and Retrieval (FOSAR) activities in both steam generators.

Identification and Resolution of Problems

The inspectors reviewed a sample of ISI-related issues entered into the CAP to determine if the licensee had appropriately described the scope of the problem and had initiated corrective actions. The review also included the licensee's consideration and assessment of operating experience events applicable to the plant. The inspectors performed this review to ensure compliance with 10CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements.

The inspectors completed one sample, as defined in IP 71111.08.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

.1 Resident Inspector Quarterly Review of Licensed Operator Requalification

a. Inspection Scope

The inspectors performed one licensed operator requalification program review. The inspectors observed a simulator session on October 13, 2016. The training scenario involved a loss of a 125 VDC vital board in conjunction with a main steam line break inside containment. The inspectors observed crew performance in terms of: communications; ability to take timely and proper actions; prioritizing, interpreting and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; timely control board operation and manipulation, including high risk operator actions; oversight and direction provided by shift manager, including the ability to identify and implement appropriate TS action; and, group dynamics involved in crew performance. The inspectors also observed the evaluators' critique and reviewed simulator fidelity to verify that it matched actual plant response. Documents reviewed are listed in the Attachment. This activity constituted one inspection sample, as defined in IP 71111.11.

b. Findings

No findings were identified

.2 Resident Inspector Quarterly Review of Licensed Operator Performance

a. Inspection Scope

The inspectors observed and assessed licensed operator performance in the main control room (MCR) during periods of heightened activity or risk. The inspectors reviewed various licensee policies and procedures such as OPDP-1, Conduct of Operations, NPG-SPP-10.0, Plant Operations, and 0-GO-5, Normal Power Operation. The inspectors utilized activities such as post-maintenance testing, surveillance testing, unplanned transients, infrequent plant evolutions, plant startups and shutdowns, reactor power and turbine load changes, and refueling and other outage activities to focus on the following conduct of operations 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
- pre-job briefs

Specifically, the inspectors observed licensed operator performance during the following activities:

- Unit 1 reactor plant shutdown
- Unit 2 turbine valve testing

Documents reviewed are listed in the Attachment. This activity constituted one inspection sample, as defined in IP 71111.11.

b. Findings

No findings were identified

.3 Biennial Review by Regional Specialist

a. Inspection Scope

The inspectors reviewed the facility operating history and associated documents in preparation for this inspection. During the week of October 3 - 7, 2016, the inspectors reviewed documentation, interviewed licensee personnel, and observed the administration of operating tests associated with the licensee's operator requalification program. Each of the activities performed by the inspectors was done to assess the effectiveness of the facility licensee in implementing requalification requirements identified in 10 CFR Part 55, "Operators' Licenses." The evaluations were also performed to determine if the licensee effectively implemented operator requalification guidelines established in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," and Inspection Procedure 71111.11, "Licensed Operator Requalification Program." The inspectors also evaluated the licensee's simulation facility for adequacy for use in operator licensing examinations using ANSI/ANS-3.5-1985, "American National Standard for Nuclear Power Plant Simulators for use in Operator Training and Examination." The inspectors observed two shift crews during the performance of the operating tests. Documentation reviewed included written examinations, Job Performance Measures (JPMs), simulator scenarios, licensee procedures, on-shift records, simulator modification request records, simulator performance test records, operator feedback records, licensed operator qualification records, remediation plans, watch standing records, and medical records. The records were inspected using the criteria listed in IP 71111.11. Documents reviewed during the inspection are documented in the List of Documents Reviewed. This activity constituted one inspection sample, as defined in IP 71111.11B.

b. Findings

No findings were identified.

.4 Annual Review of Licensee Requalification Examination Results

a. Inspection Scope

On October 20, 2016, the licensee completed the comprehensive biennial requalification written examinations and the annual requalification operating examinations required to be administered to all licensed operators in accordance with Title 10 of the CFR 55.59(a)(2), "Requalification Requirements," of the NRC's "Operator's Licenses." The inspectors performed an in-office review of the overall pass/fail results of the individual operating examinations, written examinations, and the crew simulator operating examinations in accordance with IP 71111.11, "Licensed Operator Requalification Program." These results were compared to the thresholds established in Section 3.02, "Requalification Examination Results," of IP 71111.11. This activity constituted one

inspection sample, as defined in IP 71111.11A.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Maintenance Effectiveness Inspection

a. Inspection Scope

The inspectors reviewed two maintenance activities, issues, and/or systems listed below to verify the effectiveness of the licensee's activities in terms of: appropriate work practices; identifying and addressing common cause failures; scoping in accordance with 10 CFR 50.65(b); characterizing reliability issues for performance; trending key parameters for condition monitoring; charging unavailability for performance; classification in accordance with 10 CFR 50.65(a)(1) or (a)(2); appropriateness of performance criteria for structure, system, or components (SSCs) and functions classified as (a)(2); and appropriateness of goals and corrective actions for SSCs and functions classified as (a)(1). Documents reviewed are listed in the Attachment. The inspectors completed two samples, as defined in IP 71111.12.

- Cause Determination Evaluation (CDE) 2916 – Loss of 'B' train SDBR Cooling
- CDE 2914 – Loss of Control Room Emergency Ventilation

b. Findings

No findings were identified.

.2 Quality Control (QC)

The inspectors performed a review of three QC verifications, listed in the WOs below, to ensure that maintenance activities were performed in accordance with the Quality Assurance Program. This review included a review of the WOs performed during the fall 2016 Unit 1 refueling outage. All of the WOs involved QC verifications in the field. As part of this activity, the inspectors evaluated the execution of a Dye Penetrant test performed on various new circulating water piping welds. Documents reviewed are listed in the Attachment. The inspectors completed one QC sample, as defined in IP 71111.12.

- WO 117907853, Instrument Line Inspections
- WO 118189307, Replace bearing lube water piping for 1A Circulating Water Pump
- WO 118367708, Repair Emergency Raw Cooling Water (ERCW) piping leak

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

a. Inspection Scope

The inspectors reviewed the following two activities to determine whether appropriate risk assessments were performed prior to removing equipment from service for

maintenance. The inspectors evaluated whether risk assessments were performed as required by 10 CFR 50.65 (a) (4), and were accurate and complete. When emergent work was performed, the inspectors reviewed whether plant risk was promptly reassessed and managed. The inspectors also assessed whether the licensee's risk assessment tool use and risk categories were in accordance with procedure NPG-SPP-07.1, "On-Line Work Management," Revision 17. Documents reviewed are listed in the Attachment. The inspectors completed two samples, as defined in IP 71111.13.

- Elevated risk during discharge test of IV battery
- Unit 2 risk review during 1A Shutdown board cleaning

b. Findings

No findings were identified.

1R15 Operability Evaluations

.1 Prompt Determinations of Operability (PDO) and Past Operability Evaluations (POE)

a. Inspection Scope

For the three operability evaluations described in the CRs listed below, the inspectors evaluated the technical adequacy of the evaluations to ensure that TS operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred. The inspectors compared the operability evaluations to UFSAR descriptions to determine if the system or component's intended function(s) were adversely impacted. In addition, the inspectors reviewed compensatory measures implemented to determine whether the compensatory measures worked as stated and the measures were adequately controlled. The inspectors also reviewed a sampling of CRs to assess whether the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment. The inspectors completed three samples, as defined in IP 71111.15.

- CR 1222397 – 1A Centrifugal Charging Pump mini-flow fails acceptance criteria (PDO)
- CR 1214029 – CREVS 3.0.3 LCO Entry requires Past Operability Evaluation (POE)
- CR 1204345 – Identified non-class 1E fuses in Class 1E applications (PDO)

b. Findings

No findings were identified.

.2 Annual Sample Review of Operator Work Arouns

a. Inspection Scope

The inspectors reviewed the operator workaround (OWA) program to verify that OWAs were identified at an appropriate threshold, were entered into the CAP, and that corrective actions were appropriate and timely. Specifically, the inspectors reviewed the licensee's workaround lists and repair schedules, reviewed CAP word searches,

conducted tours and interviewed operators and operations department support staff. Additionally, the inspectors checked for undocumented workarounds by observing operators perform rounds, reviewed operator deficiency lists, reviewed appropriate system health documents, attended plant health committee meetings, and verified that identified program deficiencies were corrected. The inspectors evaluated all workarounds for their aggregate impact. Documents reviewed are listed in the Attachment. The inspectors completed one sample, as defined in IP 71111.15.

b. Findings and Observations

No findings were identified.

1R18 Plant Modifications (71111.18)

Temporary/Permanent Modifications

a. Inspection Scope

The inspectors reviewed the temporary and permanent modifications listed below and the associated 10 CFR 50.59 screenings, and compared it against the UFSAR and TS to verify whether the modification affected operability or availability of the affected system.

- DCN 23311, Sensaphone Flooding Detection Modification
- WO TMOD 117162052, Ice Condenser Intermediate Deck Vent Curtain Removal Pre Outage

Following installation and testing, the inspectors observed indications affected by the modification, discussed them with operators, and verified that the modification was installed properly and its operation did not adversely affect safety system functions. Documents reviewed are listed in the Attachment. The inspectors completed two samples, as defined in IP 71111.18.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests associated with the five WOs listed below to assess whether procedures and test activities ensured system operability and functional capability. The inspectors reviewed the licensee's test procedure to evaluate whether: the procedure adequately tested the safety function(s) that may have been affected by the maintenance activity; the acceptance criteria in the procedure were consistent with information in the applicable licensing basis and/or design basis documents; and the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed the test data to determine whether test results adequately demonstrated restoration of the affected safety function(s). Documents reviewed are listed in the Attachment. The inspectors completed five samples, as defined in IP 71111.19.

- 117572440, Strainer maintenance on the Metrex Temperature Control Valve installed on the A Train Electric Board Chiller
- 117571800, Belt replacement on the Component Cooling Water and Auxiliary Feed Water pump cooler A-A
- 117571113, Emergency Gas Treatment Exhaust Fan A-A PM
- 117512434, Electric Board Room A/C Temperature Control Valve oil cooler A-A clam inspection
- 117570813, Inspect belts, sheaves, filters & lubricate electrical board room air handling unit A-A

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20)

Unit 1 Refueling Outage Cycle 21

a. Inspection Scope

For the Unit 1 refueling outage that began on November 26, the inspectors evaluated licensee activities to verify that the licensee considered risk in developing outage schedules, followed risk reduction methods developed to control plant configuration, developed mitigation strategies for the loss of key safety functions, and adhered to operating license and TS requirements that ensure defense-in-depth. The inspectors also walked down portions of Unit 1 not normally accessible during at-power operations to verify that safety-related and risk-significant SSCs were maintained in an operable condition. Specifically, between November 26 and December 31, the inspectors performed inspections and reviews of the following outage activities. Documents reviewed are listed in the Attachment. This inspection satisfied one inspection sample for Refueling Activities, as defined in IP 71111.20.

- **Outage Plan.** The inspectors reviewed the outage safety plan and contingency plans to confirm that the licensee had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured maintenance of defense-in-depth.
- **Reactor Shutdown.** The inspectors observed the shutdown in the MCR from the time the reactor was tripped until operators placed it on the residual heat removal (RHR) system for decay heat removal to verify that TS cooldown restrictions were followed. The inspectors also toured the lower containment as soon as practicable after reactor shutdown to observe the general condition of the reactor coolant system (RCS) and emergency core cooling system components and to look for indications of previously unidentified leakage inside the polar crane wall.
- **Licensee Control of Outage Activities.** On a daily basis, the inspectors attended the licensee outage turnover meeting, reviewed CRs, and reviewed the defense-in-depth status sheets to verify that status control was commensurate with the outage safety plan and in compliance with the applicable TS when taking equipment out of service.

The inspectors further toured the MCR and areas of the plant daily to ensure that the following key safety functions were maintained in accordance with the outage safety plan and TS: electrical power, decay heat removal, spent fuel cooling, inventory control, reactivity control, and containment closure. The inspectors also observed a tag-out of the 1A-A EDG to verify that the equipment was appropriately configured to safely support the work and testing. To ensure that RCS level instrumentation was properly installed and configured to give accurate information, the inspectors reviewed the installation of the Mansell level monitoring system. Specifically, the inspectors discussed the system with engineering, walked it down to verify that it was installed in accordance with procedures and adequately protected from inadvertent damage, verified that Mansell indication properly overlapped with pressurizer level instruments during pressurizer drain-down, verified that operators properly set level alarms to procedurally required set-points, and verified that the system consistently tracked RCS level while lowering to reduced inventory conditions. The inspectors also observed operators compare the Mansell indications with locally-installed ultrasonic level indicators during entry into reduced inventory conditions.

- **Refueling Activities.** The inspectors observed fuel movement at the spent fuel pool and at the refueling cavity in order to verify compliance with TS and that each assembly was properly tracked from core offload to core reload. In order to verify proper licensee control of foreign material, the inspectors verified that personnel were properly checked before entering any foreign material exclusion (FME) areas, reviewed FME procedures, and verified that the licensee followed the procedures. To ensure that fuel assemblies were loaded in the core locations specified by the design, the inspectors independently reviewed the recording of the licensee's final core verification.
- **Reduced Inventory Conditions.** Prior to the outage, the inspectors reviewed the licensee's commitments to Generic Letter 88-17. Before entering reduced inventory conditions the inspectors verified that these commitments were in place, that plant configuration was in accordance with those commitments, and that distractions from unexpected conditions or emergent work did not affect operator ability to maintain the required reactor vessel level. While in reduced inventory conditions, the inspectors verified that licensee procedures for closing the containment upon a loss of decay heat removal were in effect, that operators were aware of how to implement the procedures, and that other personnel were available to close containment penetrations, if needed.
- **Heatup and Startup Activities.** The inspectors toured the containment prior to reactor startup to verify that debris that could affect the performance of the containment sump had not been left in the containment. The inspectors reviewed the licensee's mode-change checklists to verify that appropriate prerequisites were met prior to changing TS modes. To verify RCS integrity and containment integrity, the inspectors further reviewed the licensee's RCS leakage calculations and containment isolation valve lineups.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)a. Inspection Scope

For the three surveillance tests identified below, the inspectors assessed whether the SSCs involved in these tests satisfied the requirements described in the TS surveillance requirements, the UFSAR, applicable licensee procedures, and whether the tests demonstrated that the SSCs were capable of performing their intended safety functions. This was accomplished by witnessing testing and/or reviewing the test data. Documents reviewed are listed in the Attachment. The inspectors completed three samples, as defined in IP 71111.22.

Routine Surveillance Tests:

- 0-SI-SXV-001-859.0, Unit 1 Test and Set Main Steam Safety Valves, Revision 17

Ice Condenser Surveillance Test:

- 0-SI-MIN-061-105.0, Ice Condenser – Ice Weighing, Revision 12

Containment Isolation Valve (CIV) Surveillance Tests:

- 0-SI-SLT-043-258.2, Containment Isolation Valve LLRT Sampling System (FCV-43-22 &-23), Revision 16

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

Cornerstones: Occupational Radiation Safety and Public Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controlsa. 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 Auxiliary Building, Unit 1 (U1) lower containment, Independent Spent Fuel Storage Installation, and 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, personnel contamination monitor, and portal monitor instruments. 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 (ED) alarm setpoints, were evaluated for selected Unit 1 Refueling Outage 21 (U1R21) 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 multibadging 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 in HRAs and contaminated areas included upper internals lift and steam generator eddy current testing. 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 associated with radiological hazard assessment and control. 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 activities were evaluated against the requirements of UFSAR Section 12, Technical Specifications (TS) Sections 5.4 and 5.7, 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.

The inspectors completed seven samples, as defined in IP 71124.01.

b. Findings

No findings were identified.

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

a. Inspection Scope

Work Planning and Exposure Tracking: The inspectors reviewed work activities and their collective exposure estimates for the U1R21 outage. The inspectors reviewed ALARA planning packages for activities related to the following high collective exposure

tasks: steam generator maintenance, reactor assembly and disassembly, and reactor coolant pump work. 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 current data. Source term reduction initiatives, including cobalt reduction and zinc injection, were reviewed and discussed with RP staff. The inspectors also reviewed temporary shielding packages for the U1R21 Outage.

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 auxiliary building and containment. While observing job tasks, the inspectors evaluated the use of remote technologies to reduce dose including teleradiology 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, TS Section 5.4, 10 CFR Part 20, and approved licensee procedures. Documents reviewed are listed in the report Attachment.

The inspectors completed five samples, as defined in IP 71124.02.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation

a. Inspection Scope

Engineering Controls: The inspectors reviewed the use of temporary and permanent engineering controls to mitigate airborne radioactivity during U1R21 activities. 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 (including potential alpha activity) and the placement of air samplers in work area "breathing zones."

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 steam generator maintenance activities. Selected Self-Contained Breathing Apparatus (SCBA) units and negative pressure respirators (NPR)s 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 NPR 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 discussed training for various types of respiratory protection devices with licensee staff and interviewed radworkers 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.

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 Chapter 12; TS Section 5.4, 10 CFR Part 20; Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" and approved licensee procedures. Documents reviewed are listed in the report Attachment.

The inspectors completed four samples, as defined in IP 71124.03.

b. Findings

No findings were identified

2RS4 Occupational Dose Assessment

a. Inspection Scope

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

External Dosimetry: The inspectors reviewed National Voluntary Accreditation Program certification data for the licensee's Optically Stimulated Luminescent Dosimeter (OSLD) processor for the current year for Ionizing Radiation Dosimetry. The inspectors observed and evaluated onsite storage of OSLDs. Comparisons between ED and OSLD results, including correction factors, were reviewed and discussed. The inspectors also evaluated licensee procedures for unusual dosimetry occurrences. ED alarm logs were also reviewed as part of Inspection Procedure 71151.

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 declared pregnant workers (DPW)s from July 2014 to December 2016 and discussed guidance for monitoring and instructing DPWs. 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 (SDE). The inspectors also reviewed contamination logs and evaluated events with the potential for SDE.

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

Inspection Criteria: The licensee's occupational dose assessment activities were evaluated against the requirements of UFSAR Section 12; TS Section 5.4; 10 CFR Parts 19 and 20; and approved licensee procedures. Documents reviewed are listed in the report Attachment.

The inspectors completed five samples, as defined in IP 71124.04.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation

a. Inspection Scope

Walkdowns and Observations: During tours of the site areas, the inspectors observed installed radiation detection equipment including the following instrument types: area radiation monitors (ARMs), continuous air monitors, personnel contamination monitors (PCMs), small article monitors (SAMs), and portal monitors (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 methodologies and data for selected ARMs, PCMs, PMs, SAMs, laboratory instruments, and the whole

body counter. The inspectors also reviewed calibration data, methodology used, and the source certifications for 1-RE-90-271 and 272 (U1 Upper Containment Post Accident High Range Monitor), 1-RE-90-273 and 274 (U1 Lower Containment Post Accident High Range Monitor), 1/2-R-90-280 (Post Accident Sample Room Radiation Monitor), and 0-RM-90-135 (Main Control Room). 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 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 including licensee sponsored assessments. 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 3.3, and 3.9; and applicable licensee procedures. Documents reviewed are listed in the report Attachment.

The inspectors completed three samples, as defined in IP 71124.05.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

Occupational Radiation Safety Cornerstone: The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from February 2015 through November 2016. For the assessment period, the inspectors reviewed electronic dosimeter alarm logs and CRs related to controls for exposure significant areas. Documents reviewed are listed in the Attachment.

Public Radiation Safety Cornerstone: The inspectors reviewed the Radiological Control Effluent Release Occurrences PI results for the Public Radiation Safety Cornerstone from February 2015 through September 2016. 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.

The inspectors completed two samples, as defined in IP 71151.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Daily Review

a. Inspection Scope

As required by IP 71152, Identification and Resolution of Problems, and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This was accomplished by reviewing the description of each new CR and attending daily management review committee meetings.

b. Findings and Observations

No findings were identified.

.2 Annual Follow-up of Selected Issues: Reduction of Potential Unnecessary Procedural Reactor Trip Requirements

a. Inspection Scope

The inspectors conducted a detailed review of the potential unnecessary reactor trip requirements contained in AOP-P.03/4 following a loss of Vital Instrument Power Board. The sample was selected as a follow-up item to review corrective actions associated with increased number of reactor trips. The inspectors assessed licensee performance against the performance attributes in NRC IP 71152 to determine if there were indications of licensee performance weakness in the licensee's problem identification and resolution programs. This activity constituted one focused annual inspection sample as defined in IP 71152.

b. Findings and Observations

No finding were identified

.3 Semi-Annual Trend Review

a. Inspection Scope

As required by IP 71152, the 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 was focused on repetitive equipment issues, but also included licensee trending efforts and licensee human performance results. The inspectors review nominally considered the twelve-month period of December 2015 through December 2016, although some examples expanded beyond those dates when the scope of the trend warranted. Specifically, the inspectors considered the results of daily inspector screening discussed in Section 4OA2.1 and

reviewed licensee trend reports for the period in order to determine the existence of any adverse trends that the licensee may not have previously identified. This inspection satisfied one inspection sample for Semi-annual Trend Review, as defined in IP 71152.

b. Findings and Observations

No findings were identified. In general, the licensee had identified trends and appropriately addressed them in their CAP. The inspectors evaluated the licensee trending methodology and observed that the licensee had performed a detailed review. The licensee routinely reviewed cause codes, involved organizations, key words, and system links to identify potential trends in their data. The inspectors compared the licensee process results with the results of the inspectors' daily screening. The inspectors identified that a trend in degraded fire barriers throughout the plant had developed. The licensee acknowledged this trend and captured it in their CAP as CR 1229879.

.4 Annual Follow-up of Selected Issues: CAP Effectiveness within the Training Program

a. Inspection Scope

The inspectors completed a detailed review of CRs 1178609 and 1178985 which dealt with turbine bypass (steam dump) valve operational concerns. The inspectors were particularly interested in proper consideration of potential operability issues.

The inspectors evaluated the following attributes of the licensee's actions:

- complete and accurate identification of the problem in a timely manner
- evaluation and disposition of operability and reportability issues

In conjunction with the partial sample credited in NRC Inspection Report 05000327/2016003 and 05000328/2016003, Section 4OA2.3, (ADAMS Accession No. ML16302A383) this constitutes one sample of the Annual Follow-up of selected issues. Documents reviewed are listed in the attachment.

b. Findings and Observations

No finding were identified

4OA3 Event Follow-up

(Closed) Licensee Event Report (LER) 050000327, 328/2016-003-00, Control Room Door Unable to Close Causes Inoperable Control Room Envelope

a. Inspection Scope

On May 3, 2016 at 08:33, Security received an open door alarm. The subject door was a MCR door leading to the SDBR. The investigating security officer noted that the door was ajar and left a 1/8 inch opening into the control room. The door appeared to be jammed and the officer was unable to immediately close the door. The control room operators were notified and both units entered TS 3.7.10, "Control Room Emergency Ventilation," Action B due to the inoperability of the Control Room Envelope (CRE).

Subsequent inspection of the door revealed that a screw was lodged under the rubber seal at the bottom of the door. The screw was determined to have come from the door latch guard. Maintenance personnel subsequently removed the screw and repaired the door latch. TS LCO 3.7.10 Action B was then exited at 0855. The licensee reported this event to the NRC at 15:13 as an 8-hour non-emergency event notification pursuant to 10CFR50.72 (b) (3) (v) (D). The event was documented in the licensee corrective action program as CR 1166927.

The inspectors reviewed the LER, CR, and POE to verify that the cause of the CRE failure was identified and that corrective actions were appropriate. The licensee ultimately performed a POE and concluded that the temporary loss of ability to close the MCR door did not result in a failure of the CRE boundary to perform its specified safety function which was to ensure MCR operator doses remained below the required limits given a design basis accident.

The inspectors discussed the event with operations, engineering, and licensee management personnel to gain an understanding of the event and assess follow-up actions. The inspectors reviewed operator actions taken to determine whether they were in accordance with licensee procedures and TS, and reviewed unit and system indications to verify whether actions and system responses were as expected and designed. The inspectors verified that timely notifications were made in accordance with 10 CFR 50.72, that licensee staff properly implemented the appropriate plant procedures, and that plant equipment performed as required. This LER is closed.

b. Findings

No findings were identified.

4OA5 Other Activities

Review of the Operation of an Independent Spent Fuel Storage Installation (ISFSI) (60855.1)

a. Inspection Scope

On December 21, the inspectors performed a walk-down of the ISFSI storage pad with the auxiliary unit operator in order to verify that operations were conducted in a safe manner in accordance with approved procedures and without undue risk to the health and safety of the public. The inspectors noted that there were 49 multi-purpose canisters (MPC) positioned on the ISFSI pad. The inspectors verified the MPC vents were in good condition and free of obstruction. The inspectors also verified that appropriate radiation surveys were being performed in the vicinity of the MPCs. The inspectors verified that any ISFSI problems were placed in the CAP. The inspectors also reviewed ISFSI document control practices to verify that changes to the required ISFSI procedures and equipment were performed in accordance with guidelines established in local procedures and 10CFR72.48. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On January 20, 2017, the resident inspectors presented the inspection results to Mr. Boerschig and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

G. Boerschig, Acting Site Vice President
J. Brown, Welding
D. Dimopoulos, Director Plant Support
M. Halter, Senior Manager Radiation Protection
H. Hill, Rad Waste Superintendent
M. Henderson, Manager Engineering Programs
H. Howle, Superintendent Nuclear Operations
J. Johnson, Program Manager Licensing
R. Joplin, Corporate Program Manager Operations Support
M. Leenerts, Shift Manager
M. Lovitt, Chemistry Manager
T. Marshall, Director Operations
J. Mayo, Steam Generator ISI
M. McBrearty, Licensing Manager
M. McMullin, Manager Operations Training
C. Owens, Rad Waste HP
W. Pierce, Director Engineering
P. Pratt, Plant Manager
M. Rasmussen, Director Maintenance
J. Rolph, Radiation Protection Technical Support Superintendent
D. Selph, Operations Training
K. Smith, Director Training
S. Smith, Operations Instructor (lead)
D. Spears, BACCP
C. Taylor, ISI
S. Thomas, Supervisor Operations Training (LOR)
R. Travis, Licensing Engineer

NRC personnel

A. Hon, Project Manager, Office of Nuclear Reactor Regulation

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000327, 328/2016004-01	NCV	Degraded Fire Barrier Penetrations (Section 1R05)
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Closed

05000327, 328/2016-003-00	LER	Control Room Door Unable to Close Causes Inoperable Control Room Envelope (Section 4OA3)
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LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

Section R01: Adverse Weather Protection

Procedures

AOP-N.02, Tornado Watch/Warning, Revision 35
 AOP-N.03 Part 1, Flooding, Revision 56
 0-PI-OPS-510-001.0, Flood Preparation Equipment Inventory, Revision 20
 0-PI-OPS-000.006.0, Freeze Protection, Revision 59
 1-PI-EFT-234-706.0, Freeze Protection Heat Trace Functional Test, Revision 42
 2-PI-EFT-234-706.0, Freeze Protection Heat Trace Functional Test, Revision 23

Section R04: Equipment Alignment

Partial System Walkdowns

Procedures

0-SO-78-1, Spent Fuel Pit Cooling System, Revision 74
 AOP-M.06, Loss of Spent Fuel Cooling, Revision 10
 2-SO-63-5, Emergency Core Cooling System

Other documents

0-47W855-1, Mechanical Flow Diagram of Spent Fuel Pit Cooling System, Revision 50
 SQN-DC-V-27.3, Safety Injection System Design Criteria, Revision 24

Section R05: Fire Protection

Procedures

FPDP-1, Conduct of Fire Protection, Revision 7
 0-PI-FPU-317-299.W, Att. 8, Shift Check List, Revision 43
 NPG-SPP-18.4.7, Control of Transient Combustibles, Rev. 9
 0-SI-FPU-410-703.0, Inspection of FPR Required Fire Doors, Rev. 6
 SQN-FPR-Part-II, SQN Fire Protection Report Part II – Fire Protection Plan, Revision 35

Other documents

AUX-0-690-00, Fire Protection Pre-Fire Plans Auxiliary Building - El. 690, Revision 4
 AUX-0-714-00, Fire Protection Pre-Fire Plans Auxiliary Building - El. 714, Revision 4
 AUX-0-734-00, Fire Protection Pre-Fire Plans Auxiliary Building - El. 734, Revision 4
 AUX-0-749-00, Fire Protection Pre-Fire Plans Auxiliary Building - El. 749, Revision 4
 CON-0-690-00, Fire Protection Pre-Fire Plans Control Building - El. 706, Revision 7
 RXB-0-679-01, Fire Protection Pre-Fire Plans Unit 1 Reactor Building - El. 679, Revision 3
 RXB-0-701-01, Fire Protection Pre-Fire Plans Unit 1 Reactor Building - El. 701, Revision 3
 RXB-0-734-01, Fire Protection Pre-Fire Plans Unit 1 Reactor Building - El. 734, Revision 3

Section R06: Flood Protection Measures

Procedures

AOP-M.08, Internal Flooding, Revision 3
AOP-N.03 Part 1, External Flooding, Revision 56

Calculation

SQS40056, Moderate Energy Line Break Flooding Study, Revision 16

Other documents

TVA letter to NRC dated May 4, 2007. TVA response to GL 2007-01
SQN Probabilistic Risk Assessment – Internal Flooding Analysis, Revision 3

Section R07: Heat Sink Performance

Procedures

0-PI-SFT-070-002.0, Performance Testing of Component Cooling Heat Exchangers OB1, OB2,
Revision 14
0-PI-SFT-070-001.0, Performance Testing of Component Cooling Heat Exchangers 1A1, 1A2,
Revision 21

Work Orders

116990789, Performance Test of Component Cooling Water Heat Exchangers OB1 & OB2
116989995, Performance Test of Component Cooling Water Heat Exchangers 1A1 & 1A2

CRs

1171923, Failed PMT on SQN-2-HEX-070-0015B, Component Cooling Water Heat Exchanger
2A2
1200832, Fouling Limit Exceeded for 1A1/1A2 Component Cooling Water Heat Exchangers
1236235, 1A Component Cooling Water Heat Exchanger pair requires cleaning prior to summer
2017

Section R08: Inservice Inspection Activities

Procedures:

0-PI-DXX-000-105, Boric Acid Leak Monitoring Program, Rev. 2
0-SI-DXI-000-114.4, ASME Section XI ISI/NDE Program Unit and Unit 2, Rev. 0
0-SI-SXI-068-114.4, Steam Generator Tubing Inservice Inspection and Augmented Inspections,
Rev. 1
0-TI-DXX-000-097.1, Boric Acid Corrosion Control program, Rev. 12
IEP-200, Qualification and Certification Requirements for TVA Inspection Services Organization
(ISO) Nondestructive Examination Personnel, Rev. 15
MRS-SSP-3367, Multifrequency Eddy Current Examination of Non-Ferromagnetic Steam
Generator Tubing at Watts Bar Units 1 & 2 and Sequoyah Units 1 & 2, Rev. 0
N-MT-6, Magnetic Particle Examination for ASME and ASME Code Components and Welds,
Rev. 36
N-PT-9, Liquid Penetrant Examination of ASME and ANSI Code Components and Welds,
Rev. 39
N-RT-1, Radiographic Examination of Nuclear Power Plant Components, Rev. 31
N-UT-26, Ultrasonic Thickness Measurement, Rev. 26
N-UT-66, Generic Procedure for the Ultrasonic Examination of Weld Overlay Similar and

Dissimilar Metal Welds, Rev. 10
 N-VT-1, Visual Examination for ASME Section XI Preservice and Inservice, Rev. 47
 N-VT-3, Visual Examination of Weld Ends, Fit-up, Joints, Rev. 31
 N-VT-15, Visual Examination of Class MC and Metallic Liners of Class CC Components of Light Water Cooled Plants, Rev. 11
 N-VT-16, General Visual Examination of Containment Vessel Integrity Verification, Rev. 6
 N-VT-17, Visual Examination for Leakage of PWR Reactor Head Penetrations, Rev. 9
 NPG-SPP-09.7, Corrosion Control Program, Rev. 5
 NPG-SPP-0.9.7.4, Boric Acid Corrosion Control program, Rev. 2
 NTEP-113, PWR Alloy 600 Program and other Augmented Inspection Requirements, Rev. 2
 WDI-STD-088, Underwater Remote Visual Examination of Reactor Vessel Internals, Rev. 13

Drawings:

1B01879, Eddy Current Standard TVA Combo Standard (As Built), Rev. 1
 69-5546, Reactor Cavity, Swap and Shear Key Test Zones, Rev. 3

Self-Assessments:

CRP-ENG-F-13-023, Welding Self-Assessment, 05/2013
 CRP-ENG-F-13-031, Boric Acid Self-Assessment, 08/2013
 SQN-ENG-FSA-16-002, Steam Generator Program, 8/18/16
 SQN-ENG-SSA-17-013, ISI Self-Assessment, 10/2016

Work Orders/Work Requests:

03012007001, Minor Work, Support OPS as needed for Isolation of Upstream Isolation Valves; clean and inspect, dated 8/2003
 06773398000, Clean Boron off Flange; perform Boron Evaluation; verify Bonnet Bolting Torque, dated 4/2006
 111555175, RT, Seal Water Injection 3 inch Bypass Globe Valve SQN-1-VLV-062-0546, dated 11/2016
 115585875, VT-2, N-722 Code Case Bottom Mounted Instrumentation, RPV Lower Head Remote Visual BMI Penetration Examination, 2015, dated 04/2015
 115615023, Safety Injection/Install 2 Inch Branch Line and Flex Hose Connection, dated 11/2014
 116483380, Containment Spray System/Remove and Reinstall Piping, dated 4/2015
 116969176, UT, FAC, Heater Drain System pipe, dated 11/2016
 117152358, UT, FAC, Heater Drain System pipe, dated 11/2016
 117163960, PT, Integral Attachment, RHR, dated 10/2016
 117163984, MT, Integral Attachment, A714 Pen RM, Aux Feed Water, dated 10/2016
 117405460, VT-1, Rigid Support RXB-LWR-RW/IWF, CVCS, dated 11/2016
 117407003, UT, Overlay Weld/N-770-1, Pressurizer, RXB-LWR-BOTPZR, dated 11/2016
 117981869, U1 RCS Leak Search in Lower Containment Partial Results 1-VLV-62-71, dated 12/2016
 118036413, VT-3, Leak Chase Test Boxes/IWE, RXB-LWR-Raceway/SCV, dated 11/2016
 118142993, U1 1B CCP Has Excessive Boric Acid Buildup on Mechanical Seal, dated 09/2016

Condition Reports:

1020417, Lost Weld Data Sheets DCN23193, dated 04/2015
 1038400, Appears to be Dissimilar Metal Corrosion Happening on the Stainless Steel to carbon Steel Piping, dated 06/2015
 114682, Lack of Consistency of how the TVA Nuclear Sites Apply Instrument Uncertainty to Section XI Tests, dated 11/2006

1182619, Broken Valve Stem on the Boric Acid Batching Tank Discharge Valve, dated 06/2016
 1191416, This CR is to Document a Yellow Finding Identified on Welding Health Report, dated 07/2016
 1191567, Leaking 0-PMP-063-0015, SIS Pump 1B-B, dated 07/2016
 1191588, SQN-1-PMP-078-0019, Ref. WTR PUR Pump A-A, dated 07/2016
 1191588, 0-PMP-078-0019 BACCP Wet, White Boric Acid Identified, dated 07/2016
 1210000, U1 1B CCP Has Excessive Boric Acid Buildup on Mechanical Seal, dated 09/2016
 1236019, Unit 1 keyway Welds Fully Corroded, dated 11/2016
 1238708, U1R21 Steam Generator #1 FOSAR
 1238781, Unit 1 BACCP NRC Identified Boric Acid Leak – Dry, White, dated 12/2016
 1239273, insufficient Materials Issue Documentation Prior to Welding, dated 12/2016
 1239868, Enhancement to NPG-SPP-09.7.4, dated 12/2016
 1240124, Enhancement to NPG-SPP-09.7.1, dated 12/2016

Welder Qualifications:

Andrew Beach, Tritool, initial qualification 09/2010, requalification 03/2015 & 09/2016
 Barak Pippin, Tritool, initial qualification 03/2015, requalification 03/2015 & 09/2016
 Dustin Benedict, Tritool, initial qualification 09/2010, requalification 03/2015 & 09/2016
 James Mulhern, Tritool, initial qualification 03/2014, requalification 03/2015
 Justin Lee, Tritool, initial qualification 03/2015, requalification 03/2015 & 01/2016
 Warren Martin, Day Zimmerman, initial qualification 10/2004, requalification 02/2015 & 11/2016

NDE Examiner Qualifications and Visual Acuity Records:

Brandon Calvery, ISO, level II MT dated 11/2015, PT dated 08/2014, UT dated 11/2016, VT dated 11/2014
 Byron Hardt, NIC, level II MT/PT/VT dated 10/2012
 Charles Johnson, ISO, level II MT dated 01/2015, PT dated 07/2014, level III RT dated 08/2014, VT dated 06/2014
 Dennis Allen, ISO, level II MT dated 08/2014, PT dated 07/2014, UT dated 01/2014, VT dated 11/2014
 Duane Rhoades, NIC, level II MT/PT/VT dated 03/2013
 Duncan Maclean, IHIsW, level III MT/PT dated 05/2014, RT/UT/VT dated 06/2014
 Ethan Lagan, Team Industrial, level IIL RT dated 09/2014
 Frank Basuemer, ISO, level II MT/PT dated 08/2014, VT dated 09/2014
 Frank Leonard, ISO, level III MT/PT/VT dated 06/2014, UT dated 07/2014
 ISO, Certificate of Qualification: RT, dated 5/12/15: Todd Kirk
 ISO, Certificate of Qualification: Visual, dated 10/14/16: Todd Kirk
 J. Aaron Case, ISO, level II MT dated 07/2015, PT dated 07/2015, UT dated 07/2015, VT dated 07/2015
 Jacob Edwards, Team Industrial, level IIL RT dated 09/2016
 James Stokes, System One, level IIL UT dated 09/2015
 Kris Kelsey, FAC helper only, has no certifications
 Kristina May, System One, level IIL UT dated 03/2015
 Letter From Daniel Folsom, TVA, to Westinghouse, Analyst Approval Letter for SQN1R21, Dated 12/5/16
 Mathew Welch, ISO, level III PT/UT/VT dated 08/2012
 NDE Technology Certification Summary: D. Anderson, S. Beehner, G. Bowser, M. Brown, G. Causby, R. Drumm, T. Kovalesky, C. Lewis, D. Lewis, E. Lohner, E. McLeod, M. Richmond, K. Schmitz, K. Thompson, C. Wheeler, A. Wrubleski,
 NDE Technology Visual Acuity: D. Anderson, S. Beehner, G. Bowser, M. Brown, G. Causby, R. Drumm, T. Kovalesky, C. Lewis, D. Lewis, E. Lohner, E. McLeod, M. Richmond, K. Schmitz,

K. Thompson, C. Wheeler, A. Wrubleski
 MoreTech Certificate of Qualification: J. Mitchell
 More Tech Vision Examination: J. Mitchell
 Samuel Zipperer, ISO, level II PT dated 07/2014, level III MT dated 06/2016, UT dated 11/2012, VT dated 07/2012
 Vicky Stokes, System One, level IIL UT dated 09/2015
 Westinghouse Certification Record: M. Connor, E. Ericson, D. Evering, D. Lynch, J. Skirpan, R. Tobin, C. Webber,
 Westinghouse Visual Acuity: M. Connor, E. Ericson, D. Evering, D. Lynch, J. Skirpan, R. Tobin, C. Webber,

Miscellaneous Documents:

Areva, Sequoyah Unit 1 Condition Monitoring for Cycle 18 and Operational Assessment for Cycles 19, 20, and 21, 6/18/12
 Document #180-9239654-000, SQN 1R20 RVCH UT Examinations
 EWR-15-DEC-082-029, Engineering Programs to ask Civil for Tmin Values Associated with System 082
 EDMS #L18 161128 803, Steam Generator Eddy Current Examination Guideline, Rev. 5
 EPRI: Steam Generator Management Program: Pressurized Water Reactor Steam Generator Examination Guidelines, Rev. 8
 ETSS #11956.1, EPRI Eddy Current Examination Technique Specification, Rev.2
 ETSS #11956.2, EPRI Eddy Current Examination Technique Specification, Rev.2
 ETSS #96004.1, EPRI Eddy Current Examination Technique Specification, Rev.13
 EDMS #L18 161110 800, Sequoyah Nuclear Power Plant Unit 1, Use of Appendix H and Appendix I Qualified Techniques U1R21 Outage, Rev. 0
 Procedure Qualification Record (PQR) GTA-88-0-1, GT88-0-5, GT88-0-1
 Sequoyah Unit 1 Cycle 21 Reactor Pressure Vessel Closure Head Visual (VT-E) Penetration Examination Final Report December 2016
 SG-SGMP-16-12, Sequoyah U1R21 Steam Generator Degradation Assessment, Rev. 0
 SG-SGMP-16-15, Sequoyah U1R21 Steam Generator Condition Monitoring and Operational Assessment, Rev. 0
 Welding Procedure Specification (WPS) GT-88-0-1-N
 Westinghouse, Probe Authorization, Sequoyah U1R21, 12/5/16
 Westinghouse, Certificate of Calibration, Omni-200, 220452, 2/5/16
 Westinghouse, Certificate of Calibration, Omni-200, 220453, 2/18/16
 Westinghouse, Certificate of Calibration, Omni-200, 220588, 5/24/16
 Zetec, Certificate of Conformance, Ship ID 21558, 9/8/16
 Zetec, Certificate of Conformance, Ship ID 21314, 10/27/16
 Zetec, Certificate of Conformance, Ship ID 15371, 3/6/14

Section R11: Licensed Operator Regualification

Records

LOR Training Attendance records (10 records reviewed)
 Active License Maintenance records (11 records reviewed)
 License Reactivation package (1 record reviewed)
 Remedial Training Records (3 records reviewed)
 Medical Files (7 records reviewed)
 Condition Reports from last two years related to operator on-shift performance (various)
 Condition Reports related to the plant-reference simulator

Written Examinations

2016 BRE RO A Final R0
 2016 BRE RO B Final R0
 2016 BRE SRO A Final R0
 2016 BRE SRO B Final R0

Annual Examination Scenarios

S-10, ATWS W/ MSLB Outside Containment, Rev. 1
 S-97, LOCA with Loss of RHR Recirculation, Rev. 0
 S-98A, SGTR with Failure of Auto Pressurizer Spray, Rev. 0
 S-113, SBO EDG Reset, Rev. 0
 S-125, Low Power SGTR, Rev. 0
 S-35, Loss of 125VDC Vital Board with MSLB in containment, Revision 0

JPMs

RO ADMIN 1360301 002, Perform System Operability Checklist, Rev. 1
 RO 390080101 003 - IP, Throttling Unit 1 Atmospheric Reliefs, Rev. 1
 RO 3110160601 001 - SIM, High Containment Pressure, Place RHR Spray in Service, Rev. 1
 SRO 5030010102 004 - ADMIN, Authorize a Radioactive Liquid Release, Rev. 1
 SRO ADIN 3440190302 017 - ADMIN, Classify the Event, Rev. 1
 RO 140504 001 - IP, Local Alignment of U2 TDAFW LCV Back UP Air, Rev. 4
 RO 680501 001- IP, Respond to Decreasing RCS Pressure from the Aux CR, Rev. 1
 RO 380501 002 - SIM, Isolate Ruptured S/G (with MSIV Failure to Close), Rev. 1
 RO 280020201 002 - SIM, Start Up 1B-B Hydrogen Recombiner, Rev. 1
 RO 640020101 002 - SIM, Perform Load Test on 1B-B D/G (with ERCW Valve failure), Rev. 0

Procedures

NPG-SPP-17.1, Systematic Approach to Training (SAT) Overview, Rev. 12
 NPG-SPP-17.4.1 Exam Security and Exam Database Management, Rev. 8
 NPG-SPP-17.8.1 Licensed Operator Requalification Examination Development and Implementation, Rev. 14
 NPG-SPP-17.8.2 Job Performance Measures Development, Administration, and Evaluation, Rev. 4
 NPG-SPP-17.8.3 Simulator Exercise Guide Development and Revision, Rev. 6
 NPG-SPP-17.8.4 Conduct of Simulator Operations, Rev. 3
 NPG-SPP-17.8.7 Simulator Scenario-Based Testing and Documentation, Rev. 1
 OPDP-10, License Status Maintenance, Reactivation and Proficiency, Rev. 8

Standards

ANSI/ANS-3.5-1985, Nuclear Power Plant Simulators for Use In Operator Training and Examination
 ANSI/ANS-3.4-1983, Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants

Corrective Action Documents

CR 1095789, Concerns Regarding Time Critical Action Validation
 CR 1117403, Adverse Trend of Main Control Room Behaviors
 CR 1136801, Simulator Certification Tests Not Reviewed in a Timely Manner
 CR 1141175, CR to Track 2016 Cert Tests
 Operations Training CRs from December, 2014, to September, 2016.

Simulator Testing, as required by ANSI/ANS 3.5-1985:Simulator Static and Normal Tests

Drift Test, 2015 & 2016

Static Tests at 48, 76, & 100% power, 2015 & 2016

Simulator Transient Tests

2015 & 2016 Transient Tests:

Test 1, Manual Reactor Trip,

Test 2, Loss of Normal and Emergency Feed Water

Test 3, Simultaneous Four Loop MSIV Closure

Test 4, Simultaneous Four Loop Reactor Coolant Pump Trip

Test 5, Single Loop Loss of Flow

Test 6, Manual Turbine Trip without Reactor Trip

Test 7, Maximum Power Rate Ramp

Test 8, Maximum Size LOCA with LOOP

Test 9, Maximum Size Main Steam Line Break

Test 10, Primary System Depressurization Using Pzr Relief Valve

Simulator Malfunction Tests (ANSI 3.5 1985 standard)

2015 Malfunction Tests:

CN09 Loss of Condenser Vacuum

CN23 Hotwell Dump Valve Failure

CN29 Hotwell Makeup Valve Failure

CV01 centrifugal charging pump trip

CV15 Charging Flow Control Problem - Pressurizer Level Swing

FW20 Feedwater Line Break in Turbine Building

NI07 Power Range Signal Failure

RC05 Pressurizer PORV Failure

RD07 Dropped Control Rod

RD08 Control Rods Fail to Move on Demand

RD13 Stuck Control Rod

RP02 Auto SI Initiation Failure

2016 Malfunction Tests:

CV16 Letdown Relief Valve Failure

ED01 Loss of Offsite Power

ED06 Loss of 6.9 KV Shutdown Boards

ED08 Loss of 480 Volt Shutdown Boards

ED12 Loss of 125 volt DC Battery Boards

EG02 Loss of Emergency Diesel Generators

HD12 #1 Feedwater Heater Level Control Failure

IA02 Loss of Non-Essential Control Air

IA03 Loss of Essential Control Air

NI04 Intermediate Range Detector Failure

TH09 Fuel Cladding Failure (with Small Break LOCA)

Section R12: Maintenance EffectivenessProcedures

TI-4, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting – 10CFR50.65, Revision 29

WOs

117907853, Instrument Line Inspections

118189307, Replace bearing lube water piping for 1A Circulating Water Pump

118367708, Repair Emergency Raw Cooling Water (ERCW) piping leak

Other documents

CDE 2914 – Loss of Control Room Emergency Ventilation

CDE 2916 – Loss of B train SDBR A/C

QC Sample – Evaluated various QC activities during Unit 1 outage

Section R13: Maintenance Risk Assessments and Emergent Work EvaluationProcedures

NPG-SPP-07.3, Work Activity Risk Management Process, Revision 19

NPG-SPP-07.2, Outage Management, Revision 6

GOI-6, Apparatus Operations, Revision 174

Section R15: Operability EvaluationsProcedures

NEDP-22, Operability Determinations and Functional Evaluations, Rev. 17

OPDP-8, Operability Determination Process/Limiting Conditions for Operation Tracking, Rev. 23

NPG-SPP-03.5, Regulatory Reporting Requirements, Revision 13

CRs

1222397 – 1A Centrifugal Charging Pump mini-flow fails acceptance criteria (PDO)

1214029 – CREVS 3.0.3 LCO Entry requires Past Operability Evaluation (POE)

1204345 – Identified non-class 1E fuses in Class 1E applications (PDO)

Section R18: Plant ModificationsProcedures

NPG-SPP-09.3, Plant Modifications and Engineering Change Control, Revision 24

NPG-SPP-09.4, 10 CFR 50.59 Evaluations of Changes, Tests, and Experiments, Revision 11

NPG-SPP-09.5, Modifications Temporary Configuration Changes, Revision 9

Plant Modifications

DCN 23311, Sensaphone Flooding Detection Modification

WO TMOD 117162052, Ice Condenser Intermediate Deck Vent Curtain Removal Pre Outage

Section R19: Post Maintenance TestingProcedures

NPG-SPP-06.5, Foreign Material Control, Revision 10

NPG-SPP-06.3, Pre-/Post-Maintenance Testing, Revision 1

NPG-SPP-06.9.1, Conduct of Testing, Revision 10

NPG-SPP-06.9.3, Post-Modification Testing, Revision 7

0-MI-MXX-030-001.0, Pulley Alignment and Belt Tensioning of ESF Coolers, Revision 14

0-MI-MXX-000-008.0, Sheave Alignment and Belt Tensioning of Belt Driven Components,
Revision 18

0-MI-MXX-000-008.2, Sheave Alignment and Belt Tensioning for Electric Board Room AHU,
Revision 1

Work Orders

117572440, Strainer maintenance on the Metrex Temperature Control Valve installed on the A Train Electric Board Chiller
 117571800, Belt replacement on the Component Cooling Water and Auxiliary Feed Water pump cooler A-A
 117571113, Emergency Gas Treatment Exhaust Fan A-A PM
 117512434, Electric Board Room A/C Temperature Control Valve oil cooler A-A clam inspection
 117570813, Inspect belts, sheaves, filters & lubricate electrical board room air handling unit A-A

Section R20: Refueling and Outage ActivitiesProcedures

FHI-3, Movement of Fuel, Revision 78
 0-GO-15, Containment Closure Control, Revision 42
 0-GO-13, Reactor Coolant System Drain and Fill Operations, Revision 89
 NPG-SPP-08.1, Nuclear Fuel Management, Revision 14
 0-PI-OPS-000-011.0, "Containment Access Control During Modes 1-4, Revision 16
 0-GO-10, Electrical Apparatus Operation, Revision 57
 0-SO-82-1, Diesel Generator 1A-A, Revision 56
 0-SO-201-8, 480V Diesel Auxiliary Boards, Revision 12

Other documents

1,2-45N767-5, Wiring Diagrams 6900 Diesel Generators Schematic Diagrams, Revision 20
 1,2-47W839-1, Flow Diagram Diesel Starting Air System, Revision 54
 Tagout: 1-TO-2016-0044, Clearance: 1-202-1290-RFO, 1A-A 6.9kV and 480V shutdown board cleaning, Date: 12/5/2016

Section R22: Surveillance TestingProcedures

NPG-SPP-06.9.1, Conduct of Testing, Revision 10
 0-SI-SXV-001-859.0, Unit 1 Test and Set Main Steam Safety Valves, Revision 17
 0-SI-MIN-061-105.0, Ice Condenser – Ice Weighing, Revision 12
 0-SI-SLT-043-258.2, Containment Isolation Valve LLRT Sampling System (FCV-43-22 &-23), Revision 16

Section 2RS1: Radiological Hazard Assessment and Exposure ControlsProcedures, Guidance Documents and Manuals

RCI-301, Radionuclide Tracking and Assessment (RTA) Program, Rev. 2
 NPG-SPP-05.1, Radiological Controls, Rev. 6
 RCI-24, Control of Very High Radiation Areas, Rev. 15
 RCI-28, Control of Locked High Radiation Areas, Rev. 16
 RCI-412, Radiation Protection Surveys during Initial Spent Fuel Assembly Movement, Rev. 3
 RCI-201, Radiation and Contamination Surveys, Rev. 21
 RCDP-17, Radiological Postings, Rev. 0
 RCI-418.001, Radiological Support of Primary Side Steam Generator Activities, Rev. 3
 NPG-SPP-22.300, Corrective Action Program, Rev. 6

Records and Data

Radiological Survey SQN-M-20161129-15, R161 U1 Reactor Cavity, 11/29/16

Radiological Survey SQN-M-20161129-9, R161 U1 Reactor Cavity, 11/29/16
 Radiological Survey SQN-M-20161128-25, R161 U1 Reactor Cavity, 11/28/16
 Radiological Survey SQN-M-20161201-5, R113 U1 #3 RCP Seal Platform, 12/1/16
 Radiological Survey SQN-M-20161128-6, R103 U1 Raceway, 11/28/16
 Radiological Survey SQN-M-20160415-14, ISFSI Pad, 4/15/16
 Radiological Survey SQN-M-20160903-3, ISFSI Pad, 9/3/16
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ACRONYMS

ALARA	As Low As Reasonably Achievable
AOP	abnormal operating procedure
ARM	Area Radiation Monitor
ASME	American Society of Mechanical Engineers
BACC	boric acid corrosion control
CA	corrective actions
CAP	corrective action program
CCS	component cooling system
CDE	cause determination evaluation
CFR	Code of Federal Regulations
CR	condition report
CRE	control room envelope
DPW	Declared Pregnant Worker
EC	eddy current
ED	Electronic Dosimeter
EDG	emergency diesel generator
EPRI	Electric Power Research Institute
ETSS	Examination Technique Specification Sheets
FAC	flow accelerated corrosion
FME	foreign material exclusion
FOSAR	Foreign Object Search and Retrieval
FPR	fire protection report
GL	general letter
HRA	High Radiation Area
IMC	inspection manual chapter
IP	inspection procedure
ISFSI	Independent Spent Fuel Storage Installation
ISI	inservice inspection
JPM	Job Performance Measures
LER	licensee event report
LHRA	Locked High Radiation Area
MCR	main control room
MPC	multi-purpose canisters
MTOT	main turbine oil tank
NCV	non-cited violation
NDEs	Non-Destructive Examinations
NPR	Negative Pressure Respirator
NRC	U.S. Nuclear Regulatory Commission
OOS	out-of-service
OR	feature operating requirement
OSLD	Optically Stimulated Luminescent Dosimeter
OWA	operator work around
PCM	Personnel Contamination Monitor
PDO	Prompt Determination Operability
PI	Performance Indicator
POE	past operability evaluation
PM	Portal Monitor
PWR	pressurized water reactor
QC	quality control

RCA	Radiological Control Area
RCS	reactor coolant system
RHR	residual heat removal
RP	Radiation Protection
RS	Radiation Safety
RTP	rated thermal power
RWP	Radiation Work Permit
SAM	Small Article Monitor
SCBA	Self-contained Breathing Apparatus
SDBRs	shutdown board rooms
SDE	Shallow Dose Equivalent
SDP	significance determination process
SSCs	structure, system, or components
SI	safety injection
TS	technical specification
TVA	Tennessee Valley Authority
U1	Unit 1
U1R21	Unit 1 Refueling Outage 21
U2	Unit 2
UT	ultrasonic testing
V	volt
VHRA	Very High Radiation Area
VT	visual testing
UFSAR	updated final safety analysis report
WO	work order