UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD.
ARLINGTON, TX 76011-4511

August 12, 2016

Mr. Fadi Diya, Senior Vice President
and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT – NRC INTEGRATED INSPECTION REPORT 05000483/2016002 AND NOTICE OF VIOLATION

Dear Mr. Diya,

On June 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Callaway Plant. On July 19, 2016, the NRC inspectors discussed the results of this inspection with you and other members of your staff. Inspectors documented the results of this inspection in the enclosed inspection report.

NRC inspectors documented five findings of very low safety significance (Green) in this report. Four of these findings involved violations of NRC requirements. The NRC evaluated these violations in accordance Section 2.3.2.a of the NRC Enforcement Policy, which appears on the NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html. The NRC is treating three violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the NRC Enforcement Policy. We determined that one violation did not meet the criteria to be treated as an NCV because compliance has not been restored within a reasonable period after the violation was originally identified. Specifically, NRC inspectors identified and documented a noncompliance in NRC Integrated Inspection Report 05000483/2010006 dated December 17, 2010. This finding was a violation of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion XVI, for the failure to take timely corrective actions for water hammer transients and corrosion on essential service water system components. As of the end of this inspection (more than 65 months later), compliance had still not been restored. The inspectors determined that the licensee did not provide an adequate justification for the delay.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice of Violation (Notice) when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC's review of your response to the Notice will also determine whether further enforcement action is necessary to ensure your compliance with regulatory requirements.

If you contest the NCVs or their significance 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 IV, 1600 East Lamar Blvd., Arlington, Texas 76011-4511; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at the Callaway Plant.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 Regional Administrator, Region IV; and the NRC resident inspector at the Callaway Plant.

In accordance with 10 CFR 2.390, “Public Inspections, Exemptions, Requests for Withholding,” a copy of this letter, its enclosure, and your response will be available electronically for public inspection in the NRC’s Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA David Proulx Acting for/

Nicholas H. Taylor, Branch Chief
Project Branch B
Division of Reactor Projects

Docket No. 50-483
License No. NPF-30

Enclosures:
1. Notice of Violation
2. Inspection Report 05000483/2016002
   w/ Attachment 1: Supplemental Information
   Attachment 2: Request for Information

cc w/ encl: Electronic Distribution

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 Regional Administrator, Region IV; and the NRC resident inspector at the Callaway Plant.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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Letter to Fadi Diya from Nicholas H. Taylor August 12, 2016

SUBJECT: CALLAWAY PLANT – NRC INTEGRATED INSPECTION REPORT 05000483/2016002 AND NOTICE OF VIOLATION

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NOTICE OF VIOLATION

Union Electric Company
Callaway Plant

Docket No. 50-483
License No. NPF-30

During an NRC inspection conducted June 6-30, 2016, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

> 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that conditions adverse to quality are promptly identified and corrected.
>
> Contrary to the above, from November 2010 through June 2016, the licensee failed to promptly correct a condition adverse to quality. Specifically, the licensee failed to adequately resolve water hammer and corrosion issues which were previously identified by the NRC as non-cited violation 05000483/2010006-01. The failure to resolve these issues resulted in subsequent safety-related equipment failures.

This violation is associated with a Green Significance Determination Process finding.

Pursuant to the provisions of 10 CFR 2.201, Union Electric Company is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Regional Administrator, Region IV, 1600 East Lamar Blvd., Arlington, Texas 76011-4511 and a copy to the NRC Senior Resident Inspector at the facility that is the subject of this Notice, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation," and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for

withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days of receipt.

Dated this 12th day of August 2016

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	05000483
License:	NPF-30
Report:	05000483/2016002
Licensee:	Union Electric Company
Facility:	Callaway Plant
Location:	Junction Highway CC and Highway O Steedman, MO
Dates:	April1 through June 30, 2016
Inspectors:	T. Hartman, Senior Resident Inspector M. Langelier, P.E., Resident Inspector J. Drake, Senior Reactor Inspector P. Hernandez, Health Physicist J. Josey, Senior Resident Inspector, Comanche Peak R. Kopriva, Senior Reactor Inspector J. O'Donnell, Health Physicist
Approved By:	Nicholas H. Taylor Chief, Project Branch B Division of Reactor Projects

SUMMARY

IR 05000483/2016002; 04/01/2016 - 06/30/2016; Callaway Plant, Equipment Alignment, Heat Sink Performance, Operability Determinations and Functionality Assessments, Problem Identification and Resolution, Follow-up of Events and Notices of Enforcement Discretion.

The inspection activities described in this report were performed between April 1 and June 30, 2016, by the resident inspectors at the Callaway Plant and inspectors from the NRC's Region IV office. Five findings of very low safety significance (Green) are documented in this report. Four of these findings involved violations of NRC requirements. The significance of inspection findings is indicated by their color (Green, White, Yellow, or Red), which is determined using Inspection Manual Chapter 0609, "Significance Determination Process." Their cross-cutting aspects are determined using Inspection Manual Chapter 0310, "Aspects within the Cross-Cutting Areas." Violations of NRC requirements are dispositioned in accordance with the NRC Enforcement Policy. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process."

Cornerstone: Initiating Events

- Green. The inspectors reviewed a self-revealed finding for the licensee's failure to follow the plant procedure for foreign material exclusion. Specifically, after finding foreign material (broken cable ties) within the main generator excitation transformer, established as a foreign material exclusion Level 2 area, the licensee failed to determine the reason for the foreign material and enter the issue into the corrective action program for resolution as required by Procedure APA-ZZ-00801, "Foreign Material Exclusion," Revision 32.

  The licensee's failure to follow the plant procedure for foreign material exclusion was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Initiating Events Cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, after identifying several broken cable ties on the floor inside a foreign material exclusion Level 2 area the licensee did not determine the reason for the foreign material nor enter the condition into the corrective action program as required by Procedure APA-ZZ-00801. Because the licensee failed to understand what caused the cable tie degradation, a subsequent cable tie failure resulted in a plant trip. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, the finding was determined to be of very low safety significance because it did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. This finding has a cross-cutting aspect of training in the human performance area because the organization did not provide training and ensure knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values. Specifically, several groups within the licensee's organization were unaware the excitation transformer cabinet was classified as a foreign material exclusion Level 2 area nor the requirements if foreign material is found within the foreign material exclusion area [H.9]. (Section 4OA3)

Cornerstone: Mitigating Systems

- Green. The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to account for the essential service water pipe stresses caused by pressure fluctuations of the known column closure water hammer phenomenon. The licensee failed to properly account for essential service water piping membrane stress and impact loads as required by the 1974 ASME Code, Section III, paragraphs ND-3112.4 and ND-3111. Specifically, the licensee's design calculations for the essential service water system did not account for the pressure fluctuations caused by a known column closure water hammer phenomenon that occurs during a loss of off-site power or load sequencer testing. The licensee completed a prompt operability determination assuring the system was operable under the current conditions and was completing engineering evaluations of the data collected to demonstrate the operability of the system under design conditions. The licensee entered this issued into the corrective action program as Callaway Action Requests 201603472 and 201603819.

  The inspectors determined that the licensee's failure to account for the pressure fluctuations caused by a known column closure water hammer phenomenon in the design calculations for the essential service water system was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the design control attribute of the Mitigating Systems Cornerstone and adversely affected the associated objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of conservative bias in the human performance area because the licensee failed to demonstrate that a proposed action was safe in order to proceed, rather than unsafe in order to stop. Specifically, when the licensee recognized that the column separation water hammer phenomenon was occurring in the essential service water system, they only applied the forces to the containment coolers, not the entire system [H.14]. (Section 1R04)

- Green. The inspectors identified a non-cited violation of 10 CFR 50.55a, "Codes and Standards," for the licensee's failure to repair various ASME Code Class 3 components in accordance with ASME Code, Section XI requirements. Specifically, the licensee did not follow the applicable ASME Code requirements when making repairs to various components in the ASME Code Class 3 essential service water system. The licensee reasonably determined the essential service water system remained operable, and completed the necessary repairs and testing to restore compliance with ASME Code. The licensee entered this issue into their corrective action program as Callaway Action Requests 201603640 and 201604282.

The inspectors determined that the programmatic failure to repair various ASME Code Class 3 components in the essential service water system in accordance with ASME Code was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the associated objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety significant for greater than 24 hours in accordance with the licensee's maintenance rule program. Specifically, the licensee performed a historical system health review and reasonably determined the essential service water system remained operable because periodic system walkdowns by the system owner and shiftly rounds by operations had not identified significant system leaks, and the appropriate repairs and testing were completed on the affected components. This finding has a cross-cutting aspect of training in the human performance area because the organization did not provide training and ensure knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values. Specifically, the licensee failed to ensure training of the personnel was adequate to recognize that the repair of the leaks constituted repairs in accordance with ASME Code, Section XI and thus failed to include the necessary ASME testing requirements in the work performance packages to ensure adequate performance of an activity which affected testing of a safety-related modification/repair to risk-significant systems, and thereby ensure nuclear safety [H.9]. (Section 1R07)

- Green. The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to perform an adequate operability assessment when a degraded or nonconforming condition was identified. Specifically, after the licensee identified that a severe water hammer transient would occur following a loss of off-site power, the licensee generated an operability evaluation that relied on judgement and inaccurate information which failed to establish a reasonable expectation of operability. Following questions from inspectors the licensee determined that this judgement was not correct and performed a new evaluation to ensure operability of the essential service water system. The licensee entered this issue into their corrective action program as Callaway Action Request 201605488.

  The licensee's failure to properly assess and document the basis for operability when a severe water hammer occurred in the essential service water system was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, severe water hammer transients in the essential service water system due to a loss of off-site power, result in a condition where structures, systems, and components necessary to mitigate the effects of accidents may not have functioned as required. Using Inspection Manual Chapter 0609, Appendix A, "The Significance

Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic event, and (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of conservative bias in the human performance area because the licensee failed to demonstrate that a proposed action was safe in order to proceed, rather than unsafe in order to stop. Specifically, the licensee's use of unsupported judgement and incorrect data resulted in an evaluation that failed to demonstrate a reasonable expectation of operability [H.14]. (Section 1R15)

- Green. The inspectors identified a cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," associated with the licensee's failure to take timely corrective action for a previously identified condition adverse to quality. Specifically, the licensee failed to adequately resolve water hammer and corrosion issues that were previously identified by the NRC as non-cited violation 05000483/2010006-01 and the failure to resolve these issues resulted in subsequent safety-related equipment failures. The licensee performed an operability determination that established a reasonable expectation of operability pending implementation of corrective actions. The licensee entered this issue into their corrective action program as Callaway Action Request 201604440.

  The licensee's failure to take timely and adequate corrective actions to correct a condition adverse to quality was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct water hammer and corrosion issue resulted in the licensee declaring safety-related room coolers and chillers inoperable until an analysis of system operability was completed. This affected their capability to respond to initiating events to prevent undesirable consequences Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of resources in the human performance area because the licensee did not ensure that personnel, equipment, procedures, and other resources were available and adequate to support nuclear safety. Specifically, by failing to address water hammer and corrosion issues, station management failed to ensure that the essential service water system was

available and adequately maintained to respond during a loss of off-site power event [H.1]. (Section 4OA2.3)

PLANT STATUS

Callaway began the inspection period at 86 percent power while coasting down at the end of the operating cycle and on April 2, 2016, the licensee shut the plant down to start Refueling Outage 21. The reactor was restarted on May 9. On May 14, at approximately 90 percent power (during power ascension), the plant reduced power to approximately 65 percent to address a main feedwater pump issue. The licensee repaired the feedwater pump on May 15 and recommenced power ascension. The plant returned to 100 percent power on May 16. The plant remained at full power for the remainder of the inspection period.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Summer Readiness for Off-site and Alternate AC Power Systems

a. Inspection Scope

On June 7, 2016, the inspectors completed an inspection of the station's off-site and alternate-ac power systems. The inspectors inspected the material condition of these systems, including transformers and other switchyard equipment to verify that plant features and procedures were appropriate for operation and continued availability of off-site and alternate-ac power systems. The inspectors reviewed outstanding work orders and open Callaway action requests for these systems. The inspectors walked down the switchyard to observe the material condition of equipment providing off-site power sources.

The inspectors verified that the licensee's procedures included appropriate measures to monitor and maintain availability and reliability of the off-site and alternate-ac power systems.

These activities constituted one sample of summer readiness of off-site and alternate-ac power systems, as defined in Inspection Procedure 71111.01.

b. Findings

No findings were identified.

.2 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

On April 26, 2016, the inspectors completed an inspection of the station's readiness for impending adverse weather conditions. The inspectors reviewed plant design features, the licensee's procedures to respond to severe weather including thunderstorms, tornadoes and high winds, and the licensee's implementation of these procedures. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant.

These activities constituted one sample of readiness for impending adverse weather conditions, as defined in Inspection Procedure 71111.01

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

Partial Walk-Down

a. Inspection Scope

The inspectors performed partial system walk-downs of the following risk-significant systems:

- May 24, 2016, train A motor-driven auxiliary feedwater system
- June 2, 2016, train B class 1E switchgear
- June 8, 2016, train A essential service water
- June 9, 2016, train B essential service water

The inspectors reviewed the licensee's procedures and system design information to determine the correct lineup for the systems. They visually verified that critical portions of the trains were correctly aligned for the existing plant configuration.

These activities constituted four partial system walk-down samples as defined in Inspection Procedure 71111.04.

b. Findings

Introduction. The inspectors identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to account for the essential service water pipe stresses caused by pressure fluctuations of the known column closure water hammer phenomenon.

Description. With the current essential service water system design, every loss of off-site power at Callaway would result in a water column separation and subsequent re-pressurization by the loss of normal service water pumps and the sequencing start of the essential service water pumps. This phenomenon was not specifically described in the licensee's Updated Final Safety Analysis Report, however, it had been clearly identified in previous Callaway Action Requests 199800739, 199800740, 199800741, 200207750, 200404532, 200703197, 200703247, 200703257, 200703491, 200810348, 200810384, 200811050, 201003386, 201109846, 201303346, 201303370, 201303451, 201303502, 201303702, 201303736, 201407222, 201407245, 201407246, 201407248, 201602824, 201603472, 201603484, 201604058, and 201604063. This system characteristic was also described in Callaway's response to NRC Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity during Design-Basis Accident Conditions," January 28, 1997. Additionally, there was external operating experience concerning water hammer phenomena and the impact on system piping.

Callaway is designed to ASME Code, Section III Nuclear Power Components, 1974 and 1974 winter addenda and ANSI B31.1 1973 piping code including the 1973 summer addendum. Piping analyses are performed to ensure that design Class II and III piping systems perform their safety-related functions during plant normal, upset, and faulted conditions. Pipes are subject to various loading conditions like pressures, dead load, thermal, earthquake, and seismic/thermal anchor motions. The 1974 ASME Code, Section III, paragraph ND-3112.4, "Design Allowable Stress Values," part c states, in part,

> The wall thickness of a component computed by these rules shall be determined so that the maximum direct membrane stress due to any combination of loadings that are expected to occur simultaneously does not exceed the maximum allowable stress permitted at the temperature that is expected to be maintained in the metal under the condition of loading being considered.

Section III, paragraph ND-3111, "Loading Criteria," of the ASME Code, states in part, "The loading that shall be taken into account in designing a component shall include, but are not limited to, the following: … (b) Impact loads, including rapidly fluctuating pressures."

Calculation 0096-020-CALC-01, Revision 0, "Callaway Water Hammer Load Calculation," Section 2.0 states in part,

> ... both Wolf Creek and Callaway are SNUPPS plants, many similarities exist. This calculation compares the conditions which can affect the impact velocity and the amount of air in the system, and adjusts the results from the Wolf Creek pressure vs. time data to account for those differences.

Even though Callaway recognized the similarities between Wolf Creek and their unit, they failed to reevaluate their essential service water when Wolf Creek recognized that their initial assumptions regarding water hammer phenomena were incorrect. WCN005-PR-0, a report from ENERCON, which addressed water hammer phenomena in the essential service water system, stated on page 6,

> The results shown in the Table in Section 5.1 of the ALTRAN Report 96225-TR02 were evaluated by an ENERCON structural expert. His opinion was that the loads shown were significant enough in every case to warrant further detailed analysis. This analysis requires the generation of a detailed FTH (Force Time History) that would result from the CCWH (column closure water hammer) generated in the ESW (essential service water) for a LOOP (loss of off-site power) event. The report recommended that these FTH's would then be evaluated using a structural piping program and the results added to the existing stresses. Ultimately a new stress analysis of record would be generated. This would be a revision of the existing one. Modifications to supports may be required to qualify the system.

The analysis later stated, “To perform the reanalysis for the startup of the ESW pumps following a LOOP requires that Force Time Histories (FTH) be generated. These are required for the structural analysis.”

The ALTRAN report referenced by ENERCON was report number 09-0223-TR-001, Revision 0. This report, on page 6 of 14, stated in part, “The water hammer pressures calculated are to be used for preliminary structural assessment of the piping system’s ability to withstand this loading and to determine if a more detailed force time history needs to be generated.” On page 7 the report continued, “Experience has shown that the concerns resulting from water hammer events are: (1) Over-pressure of pipes and components, e.g., ruptured tubes in heat exchangers, and (2) Pipe and component nozzle stress due to bending moments created by the CCWH force time history (FTH).”

Despite the internal and external operating experience, the licensee only updated the design calculation for the containment coolers to include the pressures associated with the water hammer phenomena, but did not included these stresses in the design calculations for the remainder of the essential service water system. The basic engineering disposition written to address the potential effects of water hammer impact loads on the structural integrity of the pressure boundary did not include the pressure stresses induced in the pipe due to the water hammer phenomenon. It stated, in part,

> This Basic Engineering Disposition is to document that the potential effects of water hammer impact loads on the structural integrity of the pressure boundary have been evaluated for piping affected by pitting corrosion. Because water hammer pressure waves are of short duration and are self-limiting (secondary) loads, assuring that the pitted pipe meets ASME Boiler and Pressure Vessel Code (Code) requirements for design loads is sufficient to conclude that the pressure boundary has sufficient margin to withstand impact from water hammer.

This engineering evaluation failed to meet the requirements of ASME Code Section III, paragraph ND-3111, “Loading Criteria,”, which states in part, “The loading that shall be taken into account in designing a component shall include, but are not limited to, the following: ... (b) Impact loads, including rapidly fluctuating pressures.” In addition, operating experience at Callaway has consistently demonstrated that the pressure boundary lacks sufficient margin to withstand the impact from the water hammer as documented in the multiple Callaway action requests concerning system leaks after a water hammer event has occurred.

Although this was a deficiency affecting the design and qualification of the essential service water system, the licensee was able to demonstrate that the operability and function of the essential service water system had not been lost because the leaks that occurred were less than the allowable losses from the ultimate heat sink. The spray from the leaks did not adversely impact any other equipment, and the components affected maintained structural integrity.

Analysis. The inspectors determined that the licensee’s failure to account for the pressure fluctuations caused by a known column closure water hammer phenomenon in the design calculations for the essential service water system was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the design control attribute of the Mitigating Systems

Cornerstone and adversely affected the associated objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of conservative bias in the human performance area because the licensee failed to demonstrate that a proposed action was safe in order to proceed, rather than unsafe in order to stop. Specifically, when the licensee recognized that the column separation water hammer phenomenon was occurring in the essential service water system, they only applied the forces to the containment coolers, not the entire system [H.14].

Enforcement. Title 10 CFR Part 50 Appendix B, Criterion III, "Design Control," states, in part, that for those structures, systems and components to which this appendix applies, design control measures shall provide for verifying or checking the adequacy of designs. Contrary to the above, from June 4, 1985, to the present, for the safety-related essential service water system, to which 10 CFR Part 50 applies, the licensee failed to provide for verifying or checking the adequacy of designs. Specifically, the licensee did not include the pressures induced by the water hammer phenomenon in the design calculation for the essential service water system as required by the 1974 ASME Code, which the licensee is committed to follow. The licensee performed a historical system health review and reasonably determined the essential service water system remained operable because periodic system walkdowns by the system owner and shiftly rounds by operations had not identified significant system leaks, and the appropriate repairs and testing were completed on the affected components. In addition, the licensee conducted an instrumented run of the system simulating a loss of off-site power and collected data on the pressure spikes experienced by the system. Following the completion of the test the licensee conducted a system walkdown to inspection for indications of damage to the system. Based on the results of this evolution, the licensee completed a prompt operability determination assuring the system was operable under the current conditions, and was completing engineering evaluations of the data collected to demonstrate the operability of the system under design conditions. This violation is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy because it was of very low safety significance, and was entered into the licensee's corrective action program as Callaway Action Requests 201603472 and 201603819:
NCV 05000483/2016002-01, "Failure to Account for Water Hammer Stresses in Essential Service Water System Calculations."

1R05 Fire Protection (71111.05)

Quarterly Inspection

a. Inspection Scope

The inspectors evaluated the licensee's fire protection program for operational status and material condition. The inspectors focused their inspection on five plant areas important to safety:

- May 12, 2016, train B battery and switchboard rooms (C-15)
- June 2, 2016, train A electrical penetration room (A-18)
- June 3, 2016, boric acid tank rooms (A-3)
- June 9, 2016, train A control room air conditioning room (A-22)
- June 9, 2016, train A battery and switchboard rooms (C-16)

For each area, the inspectors evaluated the fire plan against defined hazards and defense-in-depth features in the licensee's fire protection program. The inspectors evaluated control of transient combustibles and ignition sources, fire detection and suppression systems, manual firefighting equipment and capability, passive fire protection features, and compensatory measures for degraded conditions.

These activities constituted five quarterly inspection samples, as defined in Inspection Procedure 71111.05.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors completed an inspection of the readiness and availability of risk-significant heat exchangers. The inspectors verified the licensee used the industry standard periodic maintenance method outlined in EPRI NP-7552 for the heat exchangers. Additionally, the inspectors walked down the heat exchangers to observe the performance and material condition and/or verified that the heat exchangers were correctly categorized under the Maintenance Rule and were receiving the required maintenance.

- April 3, 2016, emergency core cooling system room coolers
- June 9, 2016, control room chillers

These activities constituted completion of two heat sink performance annual review samples, as defined in Inspection Procedure 71111.07.

b. Findings

Introduction. The inspectors identified a Green non-cited violation of 10 CFR 50.55a, "Codes and Standards," for the licensee's failure to repair various ASME Code Class 3

components in accordance with ASME Code, Section XI requirements. Specifically, the licensee did not follow the applicable ASME Code requirements when making repairs to various components in the ASME Code Class 3 essential service water system.

Description. The inspectors identified a programmatic issue with the licensee's inservice inspection and repair program because the engineering department personnel lacked adequate training and knowledge of the ASME Code to recognize activities that constituted repair activities per ASME Section XI. Specifically, the licensee had been repairing leaking tubes on various ASME Code Class 3 room coolers (SGL09B – B Safety Injection Pump Room Cooler, SGL10A – A Residual Heat Removal Pump Room Cooler, SGL10B – B Residual Heat Removal Pump Room Cooler, and SGL13B – B Containment Spray Pump Room Cooler) as a simple maintenance evolution, and failed to recognized that this constituted a repair activity per ASME Code, Section XI. The maintenance activities of concern were repairs to plug tube leaks which consisted of cutting a tube in order to remove a defect (pinhole), then mechanically installing (no brazing or welding) a Swagelok cap to plug the tube. Use of Swagelok caps to repair heat exchanger tube leaks is allowed by ASME Code and licensee procedures. These jobs were planned and performed as a maintenance activity in accordance with applicable licensee procedures.

Callaway is currently committed to the 2007 Edition/2008 Addenda of ASME Code, Section XI. ASME Code, Section XI, IWA-4120(b)(7) exempts ASME Class 2 and 3 mechanical tube plugging; however, the repairs to these components are considered an ASME Code, Section XI Repair/Replacement Activity. Per footnote 1 in IWA-4110 alterations are considered a repair/replacement activity per Section XI of ASME Code. This is because the tubes that had the Swagelok fittings installed still see system pressure: flow through the tube was not isolated. Therefore, the pressure boundary was altered and the licensee is required to ensure it meets the requirements for ASME Code Class 3 pressure boundaries.

The physical work that was performed met the requirements of Section XI. Safety-related Swagelok caps were installed and ASME Code, Section III (the construction code) sections ND-3646 and ND-3674.1(e) allow the use of caps, so the repairs met the applicable construction code requirements.

The licensee did not consider the work as a repair activity per ASME Code, Section XI, therefore, requirements were not documented in the work packages and were not completed. These requirements were:

- ANII notification
- Traceability of code pressure retaining parts
- Performance of required pressure test – VT-2

The licensee documented these deficiencies under Callaway Action Request 201603640, verified and documented the use of code pressure retaining parts, and completed the required VT-2 pressure tests to correct these issues.

The repair performed on SGL13A (Containment Spray Pump A Room Cooler) utilized brazing to build up base metal of a pinhole leak. This resulted in a repair that was not an approved method by the ASME Code, Section XI. To correct this condition, the licensee

generated Job 16002356-500, "Repair Tubing that was Improperly Repaired under Job 10506915."

This job was completed in accordance with ASME Code requirements and a successful VT-2 was performed. In addition, the engineering department received training on ASME Code repair recognition and requirements.

Analysis. The inspectors determined that the programmatic failure to repair various ASME Code Class 3 components in the essential service water system in accordance with ASME Code was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the associated objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

Using Inspection Manual Chapter 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety significant for greater than 24 hours in accordance with the licensee’s maintenance rule program. Specifically, the licensee performed a historical system health review and reasonably determined the essential service water system remained operable because periodic system walkdowns by the system owner and shiftly rounds by operations had not identified significant system leaks, and the appropriate repairs and testing were completed on the affected components. This finding has a cross-cutting aspect of training in the human performance area because the organization did not provide training and ensure knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values. Specifically, the licensee failed to ensure training of the personnel was adequate to recognize that the repair of the leaks constituted repairs in accordance with ASME Code, Section XI and thus failed to include the necessary ASME testing requirements in the work performance packages to ensure adequate performance of an activity which affected testing of a safety-related modification/repair to risk-significant systems, and thereby ensure nuclear safety [H.9].

Enforcement. Title 10 CFR 50.55a, “Codes and Standards,” requires, in part, that safety-related pressure vessels, piping, pumps and valves, and their supports must meet the requirements applicable to components that are classified as ASME Code Class 3. Contrary to the above, as of April 18, 2016, the licensee failed to ensure that safety-related pressure vessels, piping, pumps and valves, and their supports must meet the requirements applicable to components that are classified as ASME Code Class 3. Specifically, the licensee failed to complete repairs to various ASME Code Class 3 components in the essential service water system because the engineering department did not recognize that correcting tube leakage constituted a repair activity per ASME Code, Section XI. The licensee has completed the applicable testing requirements for the repairs as part of the planned corrective actions. The licensee implemented

immediate correction actions to enter this issue into the corrective action program for resolution. The licensee also completed the necessary repairs and testing to restore compliance with ASME Code. This violation is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy because it was of very low safety significance, and was entered into the licensee's corrective action program as Callaway Action Requests 201603640 and 201604282: NCV 05000483/2016002-02, "Failure to Meet Applicable ASME Code Requirements for Repairs to Components in the Essential Service Water System."

1R08 Inservice Inspection Activities (71111.08)

The activities described below constitute completion of two inservice inspection samples, as defined in Inspection Procedure 71111.08.

.1 Non-destructive Examination Activities and Welding Activities

a. Inspection Scope

The inspectors directly observed the following nondestructive examinations:

SYSTEM	WELD IDENTIFICATION	EXAMINATION TYPE
Auxiliary Feedwater System	Report Number 5010-16-0057 Condensate Storage Tank to Auxiliary Feedwater Header Isolation Valve, Field Weld-25 (Component ALV0202)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0058 Condensate Storage Tank to Auxiliary Feedwater Header Isolation Valve, Field Weld-26 (Component ALV0202)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0059 Condensate Storage Tank to Auxiliary Feedwater Header Isolation Valve, Field Weld-27 (Component ALV0202)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0060 Condensate Storage Tank to Auxiliary Feedwater Header Isolation Valve, Field Weld-28 (Component ALV0202)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0061 Condensate Storage Tank to Auxiliary Feedwater Header Isolation Valve, Field Weld-29 (Component ALV0202)	Magnetic Particle

SYSTEM	WELD IDENTIFICATION	EXAMINATION TYPE
Safety Injection System	Report Number 5000-16-0010 Safety Injection Accumulator D Outlet, Upstream Check Valve Test Line Isolation Valve, Field Weld-01 (Component EPHV8877D)	Penetrant
Safety Injection System	Report Number 5000-16-0011 Safety Injection Accumulator D Outlet, Upstream Check Valve Test Line Isolation Valve, Field Weld-02 (Component EPHV8877D)	Penetrant
Safety Injection System	Report Number 5000-16-0012 Safety Injection Accumulator D Outlet, Upstream Check Valve Test Line Isolation Valve, Field Weld-03 (Component EPHV8877D)	Penetrant
Reactor Coolant System	Record Number 5030-16-012 Fabricated Pipe Spool Piece Including Valve BBV0007 Reactor Coolant System Loop 1 Hot Leg to Nuclear Sample System Isolation Valve, Job Number 16001742-405 (Weld Joints 16001742-405-FW-05 and 06)	Radiograph
Reactor Coolant System	Record Number 5030-16-014 Reactor Coolant System Pressurizer Chemical and Volume Control System Auxiliary Spray Supply Drain (Component BBV0400)	Radiograph
Reactor Coolant System	Record Number UT-16-024 Reactor Pressure Vessel Stud Number 1 (Component 2-CH-STUD-01)	Ultrasonic
Reactor Coolant System	Record Number UT-16-025 Reactor Pressure Vessel Stud Number 2 (Component 2-CH-STUD-02-R1)	Ultrasonic
Reactor Coolant System	Record Number UT-16-026 Reactor Pressure Vessel Stud Number 3 (Component 2-CH-STUD-03)	Ultrasonic

SYSTEM	WELD IDENTIFICATION	EXAMINATION TYPE
Reactor Coolant System	Record Number UT-16-050 Reactor Pressurizer Safety Nozzle A Inner Radius Area Examination (Component 2-BB03-10A-A-IR, Exam Angle 55° + 38°)	Ultrasonic
Reactor Coolant System	Record Number UT-16-050 Reactor Pressurizer Safety Nozzle A Inner Radius Area Examination (Component 2-BB03-10A-A-IR, Exam Angle 55° – 38°)	Ultrasonic
Reactor Coolant System	Record Number UT-16-052 Reactor Pressurizer Safety Nozzle B Inner Radius Area Examination (Component 2-BB03-10B-B-IR, Exam Angle 55° + 38°)	Ultrasonic
Reactor Coolant System	Record Number UT-16-052 Reactor Pressurizer Safety Nozzle B Inner Radius Area Examination (Component 2-BB03-10B-B-IR, Exam Angle 55° – 38°)	Ultrasonic
Reactor Coolant System	Record Number UT-16-053 Reactor Pressurizer Safety Nozzle B to Top Head Weld (Component 2-TBB03-10B-B-W, Exam Angle 55° – 38°)	Ultrasonic
Reactor Coolant System	Acquisition Log No. DM/Pipe 22-1 Reactor Outlet Nozzle (Hot Leg) 22° (Nozzle to Safe-End Dissimilar Metal Weld 2-RV-301-121-A and Safe-End to Pipe Weld 2-BB-01-F103)	Ultrasonic
Reactor Coolant System	Acquisition Log No. DM/Pipe 158-1 Reactor Outlet Nozzle (Hot Leg) 158° (Nozzle to Safe-End Dissimilar Metal Weld 2-RV-301-121-B and Safe-End to Pipe Weld 2-BB-01-F203)	Ultrasonic

SYSTEM	WELD IDENTIFICATION	EXAMINATION TYPE
Reactor Coolant System	Acquisition Log No. DM/Pipe 202-1 Reactor Outlet Nozzle (Hot Leg) 202° (Nozzle to Safe-End Dissimilar Metal Weld 2-RV-301-121-C and Safe-End to Pipe Weld 2-BB-01-F303)	Ultrasonic
Reactor Coolant System	Acquisition Log No. DM/Pipe 338-1 Reactor Outlet Nozzle (Hot Leg) 338° (Nozzle to Safe-End Dissimilar Metal Weld 2-RV-301-121-D and Safe-End to Pipe Weld 2-BB-01-F403)	Ultrasonic
Safety Injection System	Report Number 5041-16-0020 Safety Injection Pumps – Crosstie to Cold Leg Loops Numbers 1, 2, 3, and 4 (Component Location P049)	Visual
Reactor Coolant System	Report Number 5041-16-0021 Reactor Pressure Vessel Head (Component RBB01)	Visual
Essential Service Water System	Record Number 5042-16-0035 Essential Service Water System Support (Component EF02C003142)	Visual
Essential Service Water System	Record Number 5042-16-0036 Essential Service Water System Support Hanger (Component EF03C034134)	Visual
Essential Service Water System	Record Number 5042-16-0037 Essential Service Water System Support (Component EF01C012311)	Visual
Emergency Diesel Generator	Record Number 5042-16-0038 Diesel Generator A Jacket Water Heat Exchanger Supports (Component EKJ06A)	Visual
Emergency Diesel Generator	Record Number 5042-16-0039 Diesel Generator A Jacket Water Heat Exchanger Supports (Component EJH06A)	Visual

SYSTEM	WELD IDENTIFICATION	EXAMINATION TYPE
Chemical and Volume Control System	Report Number 5042-16-0056 Chemical and Volume Control System Pipe Support (Component BG23H004231)	Visual

The inspectors reviewed records for the following nondestructive examinations:

SYSTEM	IDENTIFICATION	EXAMINATION TYPE
Condensate System	Report Number 5010-16-0040 High Pressure Condensate Main Steam Dump Valve Low Point Drain Steam Trap Bypass Valve (Component ABV0184)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0042 Condensate Storage Tank to Auxiliary Feedwater Pump Suction Check Valve (Component ALV0217)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-16-0048 Auxiliary Feedwater System 3-inch Tee to 3-inch Spool Piece (Job Number 15001243, Field Weld FW-16)	Magnetic Particle
Auxiliary Feedwater System	Report Number 5010-1-0049 Hardened Condensate Storage Tank to Auxiliary Feedwater Pump Header Isolation Valve (Component ALV0202, Job Number 15000069, Field Weld FW-30)	Magnetic Particle
Safety Injection System	Report Number 5000-16-0008 Safety Injection Pump B Loop 4 Hot Leg Test Line Isolation HV (Component EMHV8889D)	Penetrant
Safety Injection System	Report Number 5000-16-0010 Safety Injection Accumulator D Outlet Upstream Check Valve Test Line Isolation (Component EPHV8877D, Downstream Side of Valve)	Penetrant

SYSTEM	IDENTIFICATION	EXAMINATION TYPE
Safety Injection System	Report Number 5000-16-0011 Safety Injection Accumulator Outlet Upstream Check Valve Test Line Isolation (Component EPHV8877D, Upstream Side of Valve)	Penetrant
Chemical and Volume Control System	Report Number 5000-16-0018 Chemical and Volume Control System Letdown Throttle Valve B (Component BGV0002)	Penetrant
Reactor Coolant System	Record Number 5030-16-010 Fabricated Pipe Spool Piece Including Valve BBV0007-Reactor Coolant System Loop 1 Hot Leg to Nuclear Sample System Isolation Valve (Job Number 16001742-400, Field Weld Joint 16001742-400-FW-01)	Radiograph
Reactor Coolant System	Record Number 5030-16-011 Fabricated Pipe Spool Piece Including Valve BBV0007-Reactor Coolant System Loop 1 Hot Leg to Nuclear Sample System Isolation Valve (Job Number 16001742-400, Field Weld Joint 16001742-400-FW-02)	Radiograph
Reactor Coolant System	Report Number 5042-16-028 Reactor Pressure Vessel Head (Component RBB01, Second Inspection)	Visual

During the review and observation of each examination, the inspectors observed whether activities were performed in accordance with the ASME Code requirements and applicable procedures. The inspectors also reviewed the qualifications of all nondestructive examination technicians performing the inspections to determine whether they were current.

The inspectors directly observed a portion of the following welding activities:

SYSTEM	WELD IDENTIFICATION	WELD TYPE
Reactor Coolant System	Valve BBV-0400, Reactor Coolant System Pressurizer Chemical and Volume Control System Auxiliary Spray Supply Drain (Job 15001126-500, ASME Code Class 2, Field Weld FW-03)	Manual Gas Tungsten Arc Welding
Chemical and Volume Control System	Valve BGV-0003, CVCS Letdown Orifice A Outlet Throttle Valve Piping (Job 13005673-510, ASME Code Class 2, Field Weld FW-03, -04 and -05)	Manual Gas Tungsten Arc Welding
Chemical and Volume Control System	Valve BGV-0002, CVCS Letdown Orifice A Outlet Throttle Valve Piping (Job 13005672-510, ASME Code Class 2, Field Weld FW-01, -02, and -03)	Manual Gas Tungsten Arc Welding
Auxiliary Feedwater System	Hardened Condensate Storage Tank Re-Circulation Line And Tie-In to Existing Auxiliary Feedwater System Piping (Job 15001243-500, Field Welds FW-11, -12, -13, -14, -15, and -16)	Manual Gas Tungsten Arc Welding

The inspectors reviewed records of the following welding activities:

SYSTEM	WELD IDENTIFICATION	WELD TYPE
Chemical and Volume Control System	Valve BGV-0001, CVCS Letdown Orifice A Outlet Throttle Valve Piping (Job 13005670-510, ASME Code Class 2, Field Weld FW-03, -04, and -05)	Manual Gas Tungsten Arc Welding
Chemical and Volume Control System	Valve BGV-0001, CVCS Letdown Orifice A Outlet Throttle Valve Piping (Job 13005670-010, ASME Code Class 2, Field Weld FW-01, and -02)	Manual Gas Tungsten Arc Welding

Chemical and Volume Control System	Valve BGV-0002, CVCS Letdown Orifice A Outlet Throttle Valve Piping (Job 13005672-010, ASME Code Class 2, Field Weld FW-04, and -05)	Manual Gas Tungsten Arc Welding

The inspectors reviewed whether the welding procedure specifications and the welders had been properly qualified in accordance with ASME Code, Section IX requirements. The inspectors also determined whether essential variables were identified, recorded in the procedure qualification record, and formed the bases for qualification of the welding procedure specifications.

b. Findings

No findings were identified.

.2 Vessel Upper Head Penetration Inspection Activities

a. Inspection Scope

The inspectors reviewed the results of the licensee's bare metal visual inspection of the reactor vessel upper head penetrations to determine whether the licensee identified any evidence of boric acid challenging the structural integrity of the reactor head components and attachments. The inspectors also verified that the required inspection coverage was achieved and limitations were properly recorded. The inspectors reviewed whether the personnel performing the inspection were certified examiners to their respective nondestructive examination method.

b. Findings

The licensee replaced the reactor head during the last refueling outage, RF-20, during the fall 2014, and elected to do a visual inspection of the reactor head at the completion of the first inservice cycle. Some items of interest were identified requiring further inspection. The licensee concluded that there was no leakage associated with any of the reactor vessel closure head penetrations which was documented in Callaway Action Request 201603166. The inspectors witnessed the inspection, discussed the concern with the individuals that had performed the inspection, reviewed the photographs of the areas of concern, and agreed with the licensee's conclusion.

No findings were identified.

.3 Boric Acid Corrosion Control Inspection Activities

a. Inspection Scope

The inspectors reviewed the licensee's implementation of its boric acid corrosion control program for monitoring degradation of those systems that could be adversely affected by boric acid corrosion. The inspectors reviewed the documentation associated with the licensee's boric acid corrosion control walkdown as specified in Procedure EDP-ZZ-01004, "Boric Acid Corrosion Control Program," Revision 18. The inspectors reviewed whether the visual inspections emphasized locations where boric acid leaks could cause degradation of safety significant components and whether

engineering evaluation used corrosion rates applicable to the affected components and properly assessed the effects of corrosion induced wastage on structural or pressure boundary integrity. The inspectors observed whether corrective actions taken were consistent with the ASME Code and 10 CFR Part 50, Appendix B requirements.

The inspectors reviewed licensee boric acid evaluations where boric acid deposits were found on reactor coolant system piping components and other components:

COMPONENT NUMBER	DESCRIPTION	CALLAWAY ACTION REQUEST
BBHV8002A and BHV8002B	Reactor Head Vent Valve Tailpieces on Top of the Reactor Head	201406993
EEJ01A	Residual Heat Removal (RHR) System Heat Exchanger A – Flange	201406827
EEJ01B	Residual Heat Removal (RHR) System Heat Exchanger B – Flange	201406528
BB10-C503	Hangar BB10-C503 (Adjacent Valve BBHV8141C, RCP C SEAL # 1 SEAL WTR OUT ISO HV Experienced Packing Leakage)	201407170
EMHV8923A	Refueling Water Storage Tank to Safety Injection Pump A Suction Isolation Valve	201407454
EPV0124	Downstream Isolation Valve for Test Header Valve EPHV8879D	201407589
EMV0179	Safety Injection Pump A from Residual Heat Removal Heat Exchanger A Suction Vent Valve	201408130
ENV0123	B Containment Spray Pump Casing and Seal Housing Vent Valve	
EJ8842	Residual Heat Removal Trains A&B Safety Injection System Hot Leg Recirculation Supply Header Pressure Relief Valve	201409218
BBHV8351A	Reactor Coolant Pump A Seal Water Supply Isolation Valve	201500874
BGFCV0110A BGPIS0141	Blending Tee Flow Control Valve and Seal Water Injection Filter B	201503867

BGV0551	Chemical and Volume Control System Seal Water Injection Filter B Outlet Drain Valve (Bolted Blind Flange Assembly Downstream of Valve)	201504450
EPHV8877B	Safety Injection System Upstream Check Test Line Isolation Valve	201505362
EMHV8923A	Refueling Water Storage Tank to Safety Injection Pump A Suction Isolation Valve	201600224

b. Findings

No findings were identified.

.4 Steam Generator Tube Inspection Activities

a. Inspection Scope

The inspectors reviewed the steam generator tube eddy current examination scope and expansion criteria to determine whether these criteria met technical specification requirements, EPRI guidelines, and commitments made to the NRC. The inspectors also reviewed whether the eddy current examination inspection scope included areas of degradations that were known to represent potential eddy current test challenges such as the top of tubesheet, tube support plates, and U-bends. The inspectors confirmed that repairs were required at the time of the inspection.

Steam Generator Inspection

- The inspectors verified that the number and sizes of steam generator tube flaws/degradation identified were consistent with the licensee's previous outage operational assessment predictions.

- The inspectors verified that steam generator eddy current examination scope and expansion criteria met technical specification requirements.

- The inspectors verified that eddy current probes and equipment configurations used to acquire data from the steam generator tubes were qualified to detect the known/expected types of steam generator tube degradation in accordance with Appendix H, "Performance Demonstration for Eddy Current Examination of EPRI Document 1013706."

- Eddy current bobbin probe examinations all four steam generators (100 percent of all inservice tubes, full length tube-end to tube-end) was performed.

- Eddy current array probe examinations (all four steam generators) was performed.

The inspectors reviewed the licensee's identification of the following tube degradation mechanisms:

- All inservice 1R18 tube support plate multi-land wear indications, including the following:
    - Steam Generator C (8 lands)
    - Steam Generator D (4 lands)
- Anti-vibration bar (AVB) wear
- All cold leg tubes having non-nominal tubesheet drill hole diameters
- 20 percent of hot leg tubes with sludge from the 1R18 sludge analysis

Tube Repair

The inspectors verified that the licensee implemented repair methods which were consistent with the repair processes allowed in the plant technical specification requirements and to determine if qualified depth sizing methods were applied to degraded tubes accepted for continued service. The licensee repaired a total of 25 tubes. The following repairs were made.

- Steam Generator A – 9 tubes plugged
- Steam Generator C – 14 tubes plugged
- Steam Generator D – 2 tubes plugged

Secondary Side Inspections

The inspectors observed and reviewed secondary side inspection results and verified the licensee took corrective actions in response to the observed degradation. Inspections performed were:

- Top of tubesheet water lancing on all four steam generators:
    - Prior to water lancing, a pre-look visual inspection was performed to examine the sludge piles in two steam generators.
- Foreign object search and retrieval (FOSAR)
- Visual inspections of steam drums in steam generator A and steam generator D

Visual Examinations

The inspectors observed and reviewed the visual examination inspection results. Inspections performed were:

- As-found and as-left visual examination of primary channel heads (both hot leg and cold leg)

- Nuclear Safety Advisory Letter 12-1 (and Information Notice 2013-20) primary bowl inspections

b. Findings

No findings were identified.

.5 Identification and Resolution of Problems

a. Inspection scope

The inspectors reviewed 22 Callaway action request reports which dealt with inservice inspection activities and found the corrective actions for inservice inspection issues were appropriate. From this review the inspectors concluded that the licensee has an appropriate threshold for entering inservice inspection issues into the corrective action program and has procedures that direct a root cause evaluation when necessary. The licensee also has an effective program for applying industry inservice inspection operating experience.

b. Findings

No findings were identified.

.6 Essential Service Water System Inspection

a. Inspection Scope

Inspectors performed a focused baseline inspection of the essential service water system due to concerns with system reliability as a result of ongoing corrosion and water hammer issues. The scope of the inspection included system walkdowns as well as review of design calculations, Callaway action requests, operability determinations, and testing and surveillances associated with the essential service water system.

b. Findings

A finding of very low safety significance was identified and is discussed in Section 1R07, Heat Sink Performance.

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

.1 Review of Licensed Operator Requalification

a. Inspection Scope

On May 31, 2016, the inspectors observed an evaluated simulator scenario performed by an operating crew. The inspectors assessed the performance of the operators and the evaluators' critique of their performance. The inspectors also assessed the modeling and performance of the simulator during the activities.

These activities constituted completion of one quarterly licensed operator requalification program sample, as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

.2 Review of Licensed Operator Performance

a. Inspection Scope

On April 2, 2016, the inspectors observed the performance of on-shift licensed operators in the plant's main control room. At the time of the observations, the plant was in a period of heightened activity due to shutdown activities for Refueling Outage 21, including the main turbine overspeed trip testing.

In addition, the inspectors assessed the operators' adherence to plant procedures, including Procedure ODP-ZZ-00001, "Operations Department – Code of Conduct," Revision 97, and other operations department policies.

These activities constituted completion of one quarterly licensed operator performance sample, as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

On March 24, 2016, the inspectors reviewed the emergency core cooling system room coolers for instances of degraded performance or condition of safety-related structures, systems, and components.

The inspectors reviewed the extent of condition of possible common cause structure, system, and component failures and evaluated the adequacy of the licensee's corrective actions. The inspectors reviewed the licensee's work practices to evaluate whether these may have played a role in the degradation of the structures, systems, and components. The inspectors assessed the licensee's characterization of the degradation in accordance with 10 CFR 50.65 (the Maintenance Rule), and verified that the licensee was appropriately tracking degraded performance and conditions in accordance with the Maintenance Rule.

These activities constituted completion of one maintenance effectiveness sample, as defined in Inspection Procedure 71111.12.

b. Findings

A finding of very low safety significance was identified and is discussed in Section 1R07, Heat Sink Performance.

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

a. Inspection Scope

The inspectors reviewed three risk assessments performed by the licensee prior to changes in plant configuration and the risk management actions taken by the licensee in response to elevated risk:

- April 4, 2016, yellow risk for reduced reactor coolant system inventory to support reactor vessel head assembly removal for refuel
- April 19, 2016, yellow risk for train B spent fuel cooling system out-of-service and train B electrical switchgear work in progress
- May 6, 2016, risk evaluation in accordance with Technical Specification 3.0.4.b for the atmospheric steam dumps, feedwater regulating valves, and turbine-driven auxiliary feedwater pump inoperable for moving from Mode 4 to Mode 3

The inspectors verified that these risk assessment were performed timely and in accordance with the requirements of 10 CFR 50.65 (the Maintenance Rule) and plant procedures. The inspectors reviewed the accuracy and completeness of the licensee's risk assessments and verified that the licensee implemented appropriate risk management actions based on the result of the assessments.

The inspectors also observed portions of two emergent work activities that had the potential to affect the functional capability of mitigating systems:

- April 12, 2016, train A emergency diesel generator pump seals installed backwards
- June 21, 2016, loose bolts on train B control room air conditioning system

The inspectors verified that the licensee appropriately developed and followed a work plan for these activities. The inspectors verified that the licensee took precautions to minimize the impact of the work activities on unaffected structures, systems, and components.

These activities constituted completion of five maintenance risk assessments and emergent work control inspection samples, as defined in Inspection Procedure 71111.13.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15)

a. Inspection Scope

The inspectors reviewed six operability determinations and functionality assessments that the licensee performed for degraded or nonconforming structures, systems, or components:

- April 11, 2016, operability determination of safety related instrument bus inverters
- April 14, 2016, operability determination of leaks identified during train B engineering safety feature actuation system testing
- April 17, 2016, operability determination of containment electrical penetrations
- May 24, 2016, functionality assessment of the emergency off-site facility with no air conditioning and no off-site power
- May 31, 2016, power-operated relief valve block valve closed
- June 28, 2016, operability determination for train A emergency diesel generator due to jacket water heater not cycling off

The inspectors reviewed the timeliness and technical adequacy of the licensee's evaluations. Where the licensee determined the degraded structures, systems, or components to be operable or functional, the inspectors verified that the licensee's compensatory measures were appropriate to provide reasonable assurance of operability or functionality. The inspectors verified that the licensee had considered the effect of other degraded conditions on the operability or functionality of the degraded structure, system, or component.

These activities constituted completion of six operability and functionality review samples, as defined in Inspection Procedure 71111.15.

b. Findings

Introduction. The inspectors identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," associated with the licensee's failure to perform adequate operability assessments when a degraded or nonconforming condition was identified. Specifically, after the licensee identified that a severe water hammer transient would occur following a loss of off-site power, the licensee generated an operability evaluation that relied on judgement and inaccurate information which failed to establish a reasonable expectation of operability.

Description. On April 4, 2016, the licensee identified that during a loss of off-site power event the essential service water system will experience a column separation that results in a severe water hammer transient that could subject portions of the system to transient pressures and dynamic forces in excess of current station analyses. In response to this, the licensee initiated Callaway Action Request 201603472 to capture the issue in the station's corrective action program. The licensee subsequently documented a prompt operability determination for the essential service water system.

Inspectors subsequently reviewed the licensee's prompt operability determination. During their review, the inspectors noted that the licensee had based their operability determination on the results of a special test conducted on April 27, 2016, to simulate system response to a loss of off-site power event. Specifically, the licensee had collected data during the test associated with the strength of the system pressure wave,

which was used to estimate pipe and support loads, and performed system walkdowns following the test and did not note any system damage.

Inspectors noted the following concerns with the licensee's determination:

- The special test was run with the essential service water system at 68 degrees - the temperature had not been corrected to 95 degrees (design basis temperature of the ultimate heat sink). This resulted in a non-conservative result since water hammer transients are more severe at elevated temperatures.

- Due to the location of monitoring equipment, the measured strength of the system pressure wave was not representative of the peak pressure seen in the system. Therefore, the use of the measured peak pressure was non-conservative.

- The testing lineup did not have all system components in their accident lineup which resulted in a non-conservative damping of the severity of the water hammer transient.

Based on this, the inspectors determined that although the licensee's evaluation provided a reasonable expectation of operability under the current plant conditions, it failed to establish a reasonable expectation of operability for the identified condition at worst case design conditions for the system. Inspectors informed the licensee of their concerns and the licensee initiated Callaway Action Request 201605488. The licensee performed a new operability evaluation, and based on engineering judgement, determined that the leaks that had previously been identified would not prevent the system from providing sufficient cooling to safety-related components or challenge the required essential service water system inventory.

Analysis. The licensee's failure to properly assess and document the basis for operability when a severe water hammer occurred in the essential service water system was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, severe water hammer transients in the essential service water system due to a loss of off-site power result in a condition where structures, systems, and components necessary to mitigate the effects of accidents may not have functioned as required.

Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic event, and (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high

safety-significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of conservative bias in the human performance area because the licensee failed to demonstrate that a proposed action was safe in order to proceed, rather than unsafe in order to stop. Specifically, the licensee's use of unsupported judgement and incorrect data resulted in an evaluation that failed to demonstrate a reasonable expectation of operability [H.14].

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be accomplished in accordance with instructions, procedures, or drawings of a type appropriate to the circumstances. Callaway Procedure ODP-ZZ-00001, Addendum 15, "Operability and Functionality Determinations," an Appendix B quality related procedure, provides instructions for performing operability determinations. Procedure ODP-ZZ-00001, Addendum 15, step 3.2.2 states, in part, "The SM should ENSURE an appropriate level of questioning and challenging of assumptions occurs to ensure that a sound basis for operability exists throughout the OD process." Contrary to the above, on April 14, 2016, the licensee failed to ensure an appropriate level of questioning and challenging of assumptions occurred to ensure that a sound basis for operability existed throughout the operability determination process. Specifically, after the licensee identified that a severe water hammer transient would occur following a loss of off-site power, the licensee generated an operability evaluation that relied on judgement and inaccurate information which failed to establish a reasonable expectation of operability. The licensee implemented immediate correction actions to enter this issue into the corrective action program for resolution. The licensee also performed an operability determination which established a reasonable expectation of operability pending implementation of corrective actions. This violation is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy because it was of very low safety significance, and was entered into the licensee's corrective action program as Callaway Action Requests 201605488: NCV 05000483/2016002-03, "Failure to Adequately Evaluate Operability for a Degraded Condition."

1R18 Plant Modifications (71111.18)

Permanent Modifications

a. Inspection Scope

The inspectors reviewed three permanent plant modifications that affected risk significant structures, systems, and components:

- May 19, 2016, modification that tied in the newly built hardened condensate storage tank to the auxiliary feedwater system (Modification Package 13-0033)
- June 10, 2016, modification that installed new check valves in the service water supply lines to the essential service water system (Modification Package 10-0003)
- June 10, 2016, modification that revised sequencer operation of EFHV0037 and EFHV0038 (Modification Package 10-0004)

The inspectors reviewed the design and implementation of the modifications. The inspectors verified that work activities involved in implementing the modifications did not adversely impact operator actions that may be required in response to an emergency or other unplanned event. The inspectors verified that post-modification testing was adequate to establish the operability and functionality of the structures, systems, or components as modified.

These activities constituted completion of three samples of permanent modifications, as defined in Inspection Procedure 71111.18.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed five post-maintenance testing activities that affected risk-significant structures, systems, or components:

- March 24, 2016, train A residual heat removal room cooler leak
- April 13, 2016, train A emergency diesel generator maintenance window
- April 14, 2016, containment recirculation sump to train A residual heat removal pump suction isolation valve
- June 8, 2016, spring cans supporting the essential service water piping to the component cooling water heat exchanger
- June 20, 2016, letdown heat exchanger outlet pressure control valve repairs

The inspectors reviewed licensing- and design-basis documents for the structures, systems, and components and the maintenance and post-maintenance test procedures. The inspectors observed the performance of the post-maintenance tests to verify that the licensee performed the tests in accordance with approved procedures, satisfied the established acceptance criteria, and restored the operability of the affected structures, systems, and components.

These activities constituted completion of five post-maintenance testing inspection samples, as defined in Inspection Procedure 71111.19.

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20)

a. Inspection Scope

During the station's refueling outage that concluded on May 10, 2016, the inspectors evaluated the licensee's outage activities. The inspectors verified that the licensee considered risk in developing and implementing the outage plan, appropriately managed personnel fatigue, and developed mitigation strategies for losses of key safety functions. This verification included the following:

- Review of the licensee's outage plan prior to the outage
- Review and verification of the licensee's fatigue management activities
- Monitoring of shut-down and cool-down activities
- Verification that the licensee maintained defense-in-depth during outage activities
- Observation and review of reduced-inventory activities
- Observation and review of fuel handling activities
- Monitoring of heat-up and startup activities

These activities constituted completion of one refueling outage sample, as defined in Inspection Procedure 71111.20.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed three risk-significant surveillance tests and reviewed test results to verify that these tests adequately demonstrated that the structures, systems, and components were capable of performing their safety functions:

Inservice tests:

- April 6, 2016, emergency core cooling system full flow test

Other surveillance tests:

- April 14, 2016, train B engineering safety feature actuation system testing
- June 29, 2016, train B emergency diesel generator slow start and 1-hour run

The inspectors verified that these tests met technical specification requirements, that the licensee performed the tests in accordance with their procedures, and that the results of the test satisfied appropriate acceptance criteria. The inspectors verified that the licensee restored the operability of the affected structures, systems, and components following testing.

These activities constituted completion of three surveillance testing inspection samples, as defined in Inspection Procedure 71111.22.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstones: Public Radiation Safety and Occupational Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01)

a. Inspection Scope

The inspectors evaluated the licensee's performance in assessing the radiological hazards in the workplace associated with licensed activities. The inspectors assessed the licensee's implementation of appropriate radiation monitoring and exposure control measures for both individual and collective exposures. The inspectors walked down various portions of the plant and performed independent radiation dose rate measurements. The inspectors interviewed the radiation protection manager, radiation protection supervisors, and radiation workers. The inspectors reviewed licensee performance in the following areas:

- Radiological hazard assessment, including a review of the plant's isotopic mix and isotopic percent abundance, hard-to-detect radionuclides and potential alpha hazards. The inspectors also reviewed the licensee's evaluations of changes in plant operations and radiological surveys to identify and detect dose rates, neutron hazards, hot particle exposures, severe dose gradients, airborne radioactivity monitoring, and surface contamination levels.

- Instructions to workers, including labeling or marking containers of radioactive material, radiation work permits, actions for electronic dosimeter alarms, and changes to radiological conditions.

- Contamination and radioactive material control including release of potentially contaminated material from the radiologically controlled area, radiological survey performance, radiation instrument sensitivities, material control and release criteria, procedural guidance, and control and accountability of sealed radioactive sources.

- Radiological hazards control and work coverage including field observations of job performance and adequacy of radiological controls. During walk downs of the facility and job performance observations, the inspectors evaluated ambient radiological conditions, radiological postings, adequacy of radiological controls, radiation protection job coverage, and contamination controls. The inspectors also evaluated the use of electronic dosimeters in high noise areas, dosimetry selection and placement, implementation of effective dose equivalent for external exposures (EDEX), and the application of dosimetry to effectively monitor exposure for work in areas with significant dose rate gradients. The inspectors examined the licensee's controls for highly activated or contaminated materials (non-fuel) stored within spent fuel and other storage pools and evaluated airborne radioactive controls and monitoring.

- High radiation area and very high radiation area controls including posting and physical controls for high radiation areas and very high radiation areas. During plant walk downs, the inspectors verified the adequacy of posting and physical controls, including for areas of the plan with the potential to become risk-significant high radiation areas.

- Radiation worker performance and radiation protection technician proficiency with respect to radiation protection work requirements. The inspectors determined if workers were aware of the significant radiological conditions in their workplace, radiation work permit controls/limits in place, and were aware of their electronic alarming dosimeter dose and dose rate set points. The inspectors observed radiation protection technician job performance, including the performance of radiation surveys.

- Problem identification and resolution for radiological hazard assessment and exposure controls. The inspectors reviewed audits, self-assessments, and corrective action program documents to verify problems were being identified and properly addressed for resolution.

These activities constituted completion of the seven required samples of radiological hazard assessment and exposure control program, as defined in Inspection Procedure 71124.01.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors evaluated whether the licensee controlled in-plant airborne radioactivity concentrations consistent with as low as reasonably achievable (ALARA) principles and that the use of respiratory protection devices did not pose an undue risk to the wearer. During the inspection, the inspectors interviewed licensee personnel, walked down various areas in the plant, and reviewed licensee performance in the following areas:

- Engineering controls, including the use of permanent and temporary ventilation systems to control airborne radioactivity. The inspectors evaluated installed ventilation systems, including review of procedural guidance, verification the systems were used during high-risk activities, and verification of airflow capacity, flow path, and filter/charcoal unit efficiencies. The inspectors also reviewed the use of temporary ventilation systems used to support work in contaminated areas such as high-efficiency particulate air/charcoal negative pressure units. Additionally, the inspectors evaluated the licensee's airborne monitoring protocols, including verification that alarms and set points were appropriate.

- Use of respiratory protection devices and evaluation of the licensee's respiratory protection program including use, storage, maintenance, and quality assurance of National Institute for Occupational Safety and Health-certified equipment, air quality and quantity for supplied-air devices and self-contained breathing

apparatus (SCBA) bottles, qualification and training of personnel, and user performance.

- Self-contained breathing apparatus for emergency use including the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions, hydrostatic testing of SCBA bottles, status of SCBA staged and ready for use in the plant including vision correction, mask sizes, etc., SCBA surveillance and maintenance records, and personnel qualification, training, and readiness.

- Problem identification and resolution for airborne radioactivity control and mitigation. The inspectors reviewed audits, self-assessments, and corrective action documents to verify problems were being identified and properly addressed for resolution.

These activities constituted completion of the four required samples of in-plant airborne radioactivity control and mitigation program, as defined in Inspection Procedure 71124.03.

b. Findings

No findings were identified

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Security

4OA1 Performance Indicator Verification (71151)

.1 Safety System Functional Failures (MS05) and Mitigating Systems Performance Index: Heat Removal Systems (MS08)

a. Inspection Scope

For the period of second quarter 2015 through first quarter 2016, the inspectors reviewed licensee event reports, maintenance rule evaluations, and other records that could indicate whether safety system functional failures had occurred. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, and NUREG-1022, "Event Reporting Guidelines: 10 CFR 50.72 and 50.73," Revision 3, to determine the accuracy of the data reported.

These activities constituted verification of the safety system functional failures performance indicator and the mitigating system performance index performance indicator, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.2 Reactor Coolant System Identified Leakage (BI02)

a. Inspection Scope

The inspectors reviewed the licensee's records of reactor coolant system identified leakage for the period of second quarter 2015 through first quarter 2016 to verify the accuracy and completeness of the reported data. The inspectors reviewed the performance of Procedure OSP-BB-00009, "RCS Inventory Balance," Revision 37, conducted on May 12, 2016. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the reactor coolant system leakage performance indicator, as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.3 Occupational Exposure Control Effectiveness (OR01)

a. Inspection Scope

The inspectors verified that there were no unplanned exposures or losses of radiological control over locked high radiation areas and very high radiation areas during the period of October 1, 2015, through March 31, 2016. The inspectors reviewed a sample of radiologically controlled area exit transactions showing exposures greater than 100 mrem. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the occupational exposure control effectiveness performance indicator as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

.3 Radiological Effluent Technical Specifications/Off-site Dose Calculation Manual Radiological Effluent Occurrences (PR01)

a. Inspection Scope

The inspectors reviewed corrective action program records for liquid or gaseous effluent releases that occurred between October 1, 2015, and March 31, 2016, and were reported to the NRC to verify the performance indicator data. The inspectors used definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, to determine the accuracy of the reported data.

These activities constituted verification of the radiological effluent technical specifications/off-site dose calculation manual radiological effluent occurrences performance indicator as defined in Inspection Procedure 71151.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Routine Review

a. Inspection Scope

Throughout the inspection period, the inspectors performed daily reviews of items entered into the licensee's corrective action program and periodically attended the licensee's condition report screening meetings. The inspectors verified that licensee personnel were identifying problems at an appropriate threshold and entering these problems into the corrective action program for resolution. The inspectors verified that the licensee developed and implemented corrective actions commensurate with the significance of the problems identified. The inspectors also reviewed the licensee's problem identification and resolution activities during the performance of the other inspection activities documented in this report.

b. Findings

No findings were identified.

.2 Semiannual Trend Review

a. Inspection Scope

To verify that the licensee was taking corrective actions to address identified adverse trends that might indicate the existence of a more significant safety issue, the inspectors reviewed corrective action program documentation associated with the following licensee-identified trends:

- Negative trend on essential service water leaks from safety related room coolers (Callaway Action Request 201602658)

- Negative trend involving leaks on plant equipment as a result of train B engineering safety feature actuation system testing (Callaway Action Request 201603472)

These activities constitute completion of one semiannual trend review sample, as defined in Inspection Procedure 71152.

b. Observations and Assessments

The inspectors' review of the possible trends noted above produced the following observations and assessments:

- During the period of March 23 to May 3, 2016, the licensee had twelve leaks across eight safety-related room coolers serviced by essential service water. The licensee considered this a negative trend and performed a root cause evaluation in Callaway Action Request 201602658 to determine the causes for the negative trend. The licensee determined the equipment reliability process did not adequately address the long-standing equipment issues associated with safety related copper-nickel heat exchangers.

  To address the issue, the licensee replaced several room coolers during the recent refueling outage and has a plan to replace all but the containment coolers during the current online cycle. The containment coolers are planned for replacement during the next refueling outage. The inspectors evaluated the licensee's response to the negative trend and determined the actions were appropriate.

- Since April 2007, the Callaway plant has experienced leaks on plant equipment as a result of engineering safety feature actuation system testing. These leaks did not occur during every test, but several components have had repetitive failures and a leak had occurred on a component every refueling outage since 2013. The licensee considered this a negative trend and performed a root cause evaluation in Callaway Action Request 201603472 to determine the causes for the negative trend. The licensee determined the original design of the system did not appropriately account for water column separation and collapse during functional operation and the corrective action process did not adequately drive the organization to correct the condition.

  To address the issue, the licensee "hardened" several components during the recent refueling outage and has hired an external company to evaluate the pressures expected during a design-based accident. The licensee will address the results of the analysis when it becomes available. The inspectors evaluated the licensee's response to the negative trend and determined the actions were appropriate.

c. Findings

A finding associated with these trends is documented in Section 4OA2.3.

.3 Annual Follow-up of Selected Issues

a. Inspection Scope

The inspectors selected one issue for an in-depth follow-up:

- On June 10, 2016, the inspectors reviewed Callaway Action Request 201010634 associated with Callaway's response to a non-cited violation that was issued in Inspection Report 05000483/2010006 (ML103540576).

  The inspectors assessed the licensee's problem identification threshold, cause analyses, extent of condition reviews and compensatory actions. The inspectors identified that the licensee failed to appropriately prioritize the corrective actions and that these actions were not adequate to correct the condition.

These activities constituted completion of one annual follow-up sample as defined in Inspection Procedure 71152.

b. Findings

Introduction. Inspectors identified a Green cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," associated with the licensee's failure to take timely corrective action for a previously identified condition adverse to quality. Specifically, the licensee failed to adequately resolve water hammer and corrosion issues that were previously identified by the NRC as non-cited violation 05000483/2010006-01 and the failure to resolve these issues resulted in subsequent safety-related equipment failures.

Description. Inspectors reviewed licensee's actions taken to address Non-cited Violation 05000483/2010006-01, "Failure to Correct Degraded Condition in Essential Service Water System in a Timely Manner," which was documented in Callaway Action Request 201010634. This non-cited violation was issued because the licensee had been experiencing water hammer events which had caused leaks in safety-related joints and when coupled with system corrosion issues had resulted in leaks in heat exchanger tubes, fittings, and other components.

Inspectors reviewed the licensee's corrective actions taken in response to Non-cited Violation 05000483/2010006-01. Inspectors noted that the licensee had implemented modifications to the station, Modification Packages 10-0003 and 10-0004, which installed check valves in the service water supply lines to the essential service water system and changed the timing sequence for valve operation in the essential service water system. The purpose of these modifications was to reduce the pressure transient imposed on the essential service water system from water hammer events caused by column separation. Inspectors determined that the licensee had not implemented corrective actions to address the corrosion issues that were also identified in the non-cited violation and Callaway Action Request 201010634 was closed.

Inspectors performed a subsequent review of the licensee's corrective action program documents and noted that water hammer events continued to occur when the essential service water system was operated during simulated accident conditions (engineering safety feature actuation system testing). Inspectors identified 28 instances where water hammer events and corrosion issues had damaged safety-related components since Non-cited Violation 05000483/2010006-01 had been issued. Examples include:

- November 17, 2011, train B component cooling water heat exchanger tube side relief valve and the inlet tube side drain valve were found the be leaking by following engineering safety feature actuation system testing

- December 6, 2011, train A motor driven auxiliary feedwater pump room cooler tube leak

- April 12, 2012, train A centrifugal charging pump room cooler tube leak

- April 29, 2012, train B component cooling water room cooler gasket leak following engineering safety feature actuation system testing

- May 1, 2013, train B motor driven auxiliary feedwater pump room cooler tube leak following engineering safety feature actuation system testing

- October 17, 2014, train A centrifugal charging pump room cooler tube leak, B motor driven auxiliary feedwater pump room cooler tube leak, B control room air conditioning condenser endbell gasket leak, and B emergency diesel generator intercooler expansion joint leak following engineering safety feature actuation system testing

Additionally, from March 23 to May 3, 2016, the licensee had identified twelve leaks across eight safety-related room coolers serviced by essential service water and damaged gaskets on the safety-related control room chiller (Licensee Event Report 2016-001-00).

Based on this, inspectors determined that the modifications, Modifications Packages 10-0003 and 10-0004 that were implemented by the licensee were not adequate to mitigate the effects of a water hammer transient. Specifically, system corrosion issues and column separation/water hammer events continued to occur, and these events continued to cause damage to safety related components.

Based on this, inspectors determined that the licensee had failed to take timely and adequate corrective actions to correct the water hammer and corrosion issues in the essential service water system.

Inspectors informed the licensee of their observations and the licensee initiated Callaway Action Request 201604440 to capture this issue in the station's corrective action program. The licensee also generated an operability determination, and based on engineering judgement, determined that though water hammer transients had caused leaks in the system, the leaks that had previously been identified would not prevent the system from providing sufficient cooling to safety-related components or challenge the required essential service water system inventory.

Analysis. The licensee's failure to take timely and adequate corrective actions to correct a condition adverse to quality was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct water hammer and corrosion issue resulted in the licensee declaring safety-related room coolers and chillers inoperable until an analysis of system operability was completed. This affected their capability to respond to initiating events to prevent undesirable consequences.

Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, inspectors determined that this finding was of very low safety significance (Green) because the finding: (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality, (2) did not represent a loss of system and/or function, (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate

safety systems out-of-service for longer than their technical specification allowed outage time, and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant for greater than 24 hours in accordance with the licensee's maintenance rule program. This finding has a cross-cutting aspect of resources in the human performance area because the licensee did not ensure that personnel, equipment, procedures, and other resources were available and adequate to support nuclear safety. Specifically, by failing to address water hammer and corrosion issues, station management failed to ensure that the essential service water system was available and adequately maintained to respond during a loss of off-site power event [H.1].

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. Contrary to the above, from November 2010 through June 2016, for quality related components associated with the essential service water system, to which 10 CFR Part 50, Appendix B applies, the licensee failed to assure that conditions adverse to quality were promptly identified and corrected. Specifically, the licensee failed to adequately resolve water hammer and corrosion issues which were previously identified by the NRC as Non-cited Violation 05000483/2010006-01 and the failure to resolve these issues resulted in subsequent safety-related equipment failures. The licensee implemented immediate correction actions to enter this issue into the corrective action program for resolution. The licensee also performed an operability determination that established a reasonable expectation of operability pending implementation of corrective actions. The violation was entered into the licensee's corrective action program as Callaway Action Request 201604440. This violation is being treated as a cited violation, consistent with Section 2.3.2.a of the NRC Enforcement Policy, because the licensee did not restore compliance (or demonstrate objective evidence of plans to restore compliance) within a reasonable period of time (i.e., in a time frame commensurate with the significance of the violation) after the violation was identified. A Notice of Violation is documented in Enclosure 1: VIO 05000483/2016002-04, "Failure to Promptly Correct Conditions Adverse to Quality."

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153)

(Closed) Licensee Event Report 2014-006-00, "Main Generator Excitation Transformer Faulted to Ground, Causing Reactor Trip"

a. Inspection Scope

On December 3, 2014, a turbine and reactor trip occurred, when the main generator excitation transformer faulted to ground. The reactor trip was classified as uncomplicated and all safety systems performed as designed at the onset of the plant trip. However, during recovery the valve providing flow from the motor-driven auxiliary feedwater pump B to steam generator D (ALHV0005) failed to throttle closed. The problems with ALHV0005 were the subject of a special inspection and were dispositioned in NRC Inspection Report 05000483/2015009 (ADAMS Accession Number ML16013A021). Repair of the excitation transformer was completed and the plant returned to power operations on December 6, 2014.

The construction of the excitation transformer includes high voltage jumper cables between termination points inside its protective enclosure and the winding taps of the transformer coils. The jumper cables are routed above the iron core of the transformer and are supported by insulating boards and restrained by nylon cable ties. The fault to ground was caused when a jumper cable dropped onto the iron transformer core after failure of the nylon cable ties. The cable ties were an original part of the transformer installed in 2007.

The licensee determined the root cause of the transformer failure was inadequate design (routing cables above the transformer core) and material selection (use of nylon cable ties) during the manufacture of the transformer.

Corrective actions included replacing the nylon cable ties with Tefzel cable ties, which are designed for higher temperatures and longer life expectancy, as well as adding lacing to supplement the Tefzel cable ties. The inspectors reviewed the licensee's submittal along with corrective action documents and determined that the licensee adequately documented the event, including the potential safety consequences and necessary corrective actions. A finding related to a failure to follow the licensee's foreign material exclusion procedure is documented in this section. This licensee event report is closed.

b. Findings

Introduction. Inspectors reviewed a Green, self-revealed finding for the licensee's failure to follow the plant procedure for foreign material exclusion. Specifically, after finding foreign material (broken cable ties) within the main generator excitation transformer, established as a foreign material exclusion Level 2 area, the licensee failed to determine the reason for the foreign material and enter the issue into the corrective action program for resolution as required by Procedure APA-ZZ-00801, "Foreign Material Exclusion," Revision 32.

Description. On December 3, 2014, an unexpected turbine and reactor trip occurred. The licensee's investigation determined the direct cause of the event was nylon cable tie wraps used to restrain a critical vendor cable failed allowing the cable to fall onto the hot transformer core, where the cable insulation degraded quickly resulting in a phase-to-ground short. The nylon cable ties became brittle from the environmental conditions inside the cabinet.

The licensee's root cause of the event was inadequate design and material selection during the manufacture of the transformer. This transformer was installed in April 2007 to update old and obsolete main generator exciters. The transformer was manufactured and installed by the vendor as a single component. The design used low-grade nylon cable ties to restrain high voltage jumper cables on insulating boards located above the transformer core. No preventive maintenance strategy was provided by the transformer manufacturer nor identified by the licensee's engineering personnel.

In July 2013, while the plant was off-line, the licensee performed an inspection inside the excitation cabinet. The cabinet was identified as a foreign material exclusion Level 2 (FME-2) area and was considered a "standard risk" area. These areas require boundaries and cleanliness controls. While inside the cabinet, an engineer identified several cable ties on the floor of the transformer. The cable ties were very brittle and

disintegrated in his hand when he picked them up off of the floor. The engineer was unaware the transformer cabinet was being controlled as a FME-2 area and did not consider the broken cable ties as foreign material. The engineer notified the engineering "war room" of the issue. The licensee took no further action.

Licensee Procedure APA-ZZ-00801, defines foreign material as "Any material that is NOT part of a system or component as designed." Section 4.8 of the procedure also directs individuals that enter an FME-2 area to

> Inspect for the presence of any "As-Found" foreign material WHEN the system or component is initially breached. IF present, retrieve the foreign material in accordance with an approved recovery plan or document the review and approval of system operation with the foreign material in the system. Try to determine the source of, and the reason for, the foreign material. Report the loss of FME integrity in the corrective action request system.

The licensee determined the source of the foreign material, but did not determine the reason for the foreign material nor enter the loss of foreign material exclusion integrity into their corrective action program. As a result, the licensee did not evaluate the condition related to the degradation of nylon cable ties inside the cabinet.

The licensee addressed the issue in Callaway Action Request 201606129. Corrective actions included reminding employees about the importance of foreign material and adherence to the foreign material exclusion procedure.

Analysis. The licensee's failure to follow the plant procedure for foreign material exclusion was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the equipment performance attribute of the Initiating Events Cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, after identifying several broken cable ties on the floor inside a FME-2 area the licensee did not determine the reason for the foreign material nor enter the condition into the corrective action program as required by Procedure APA-ZZ-00801. Because the licensee failed to understand what caused the cable tie degradation, a subsequent cable tie failure resulted in a plant trip.

Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At Power," dated June 19, 2012, the finding was determined to be of very low safety significance because it did not cause a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. This finding has a cross-cutting aspect of training in the human performance area because the organization did not provide training and ensure knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values. Specifically, several groups within the licensee's organization was unaware the excitation transformer cabinet was classified as an FME-2 area nor the requirements if foreign material is found within the foreign material exclusion area [H.9].

Enforcement. Inspectors did not identify a violation of regulatory requirements associated with this finding. Because this finding does not involve a violation and is of very low safety significance, it is identified as: FIN 05000483/2016002-05, "Failure to Follow Plant Foreign Material Exclusion Procedure."

These activities constituted completion of one event follow-up sample, as defined in Inspection Procedure 71153.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On April 15, 2016, regional inspectors presented the radiation safety inspection results to Mr. T. Hermann, Site Vice President, and Mr. B. Cox, Senior Director, Nuclear Operations, and other members of the licensee staff. The licensee acknowledged the issues presented. The licensee confirmed that any proprietary information reviewed by the inspectors had been returned or destroyed.

On April 22, 2016, regional inspectors presented the inservice inspection results to Mr. F. Diya, Senior Vice President and Chief Nuclear Officer, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors acknowledged review of proprietary material during the inspection which had been or will be returned to the licensee.

On July 19, 2016, the resident inspectors presented the inspection results to Mr. F. Diya, Senior Vice President and Chief Nuclear Officer, and other members of the licensee staff. The licensee acknowledged the issues presented. The licensee confirmed that any proprietary information reviewed by the inspectors had been returned or destroyed.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

K. Blair, Engineer, Steam Generators
B. Cox, Senior Director, Nuclear Operations
D. Davis, Non-Destructive Testing, Level III
F. Diya, Senior Vice President and Chief Nuclear Officer
T. Elwood, Supervising Engineer, Regulatory Affairs/Licensing
G. Forster, Non-Destructive Testing Supervisor, Level III
J. Geyer, Manager, Radiation Protection
M. Hoehn II, Engineering Supervisor, Engineering Programs
C. Hendricks, Coordinator, Quality Control
T. Herrmann, Site Vice President
R. Hughey, Manager, Shift Operations
L. Kanuckel, Director, Nuclear Oversight
S. Kovaleski, Director, Engineering Design
S. McLaughlin, Manager, Performance Improvement
J. Nurrenbern, Program Owner, Boric Acid
S. Petzel, Engineer, Regulatory Affairs
D. Purvis, Supervisor, Quality Control
F. Stuckey, Senior Health Physicist
S. Thomure, Training Supervisor, Welding Engineering
T. Trent, Senior Health Physicist, Radiation Protection
M. Vonderhaar, Supervisor, Radiation Protection
R. Wink, Manager, Regulatory Affairs
T. Witt, Engineer, Regulatory Affairs

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000483/2016002-01	NCV	Failure to Account for Water Hammer Stresses in Essential Service Water System Calculations (Section 1R04)
05000483/2016002-02	NCV	Failure to Meet Applicable ASME Code Requirements for Repairs to Components in the Essential Service Water System (Section 1R07)
05000483/2016002-03	NCV	Failure to Adequately Evaluate Operability for a Degraded Condition (Section 1R15)
05000483/2016002-05	FIN	Failure to Follow Plant Foreign Material Exclusion Procedure (Section 4OA3)

Open

05000483/2016002-04	VIO	Failure to Promptly Correct Conditions Adverse to Quality (Section 4OA2.3)

Closed

05000483/2014-006-00	LER	Main Generator Excitation Transformer Faulted to Ground, Causing Reactor Trip (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

Number	Title	Revision
AUE-ADM-2222	Communication and Coordination	0
AUE-ADM-2223	Disturbance Reporting	0
AUE-ADM-2227	Reliability Coordination – Responsibility and Authorities	0
OSP-NE-00001	Class 1E Electrical Source Verification	39
OSP-NE-00003	Technical Specification Actions – A.C. Sources	30
OTO-MA-00008	Rapid Load Reduction	34
OTO-ZZ-00012	Severe Weather	33
PDP-ZZ-00027	Seasonal Readiness Program	6

Callaway Action Requests

201508013 201604020

Jobs

13000681

Miscellaneous

Number	Title	Revision
	2016 Summer Reliability Plan	3
2010009	Health Issue: Given an EDG HVAC equipment failure, operability cannot be restored within the 72 hour allowed outage time	
2015005	Health Issue: Degradation of ESW Piping in Containment	

Section 1R04: Equipment Alignment

Procedures

Number	Title	Revision
OTN-AL-00001	Auxiliary Feedwater System	34
OTN-AL-00001, Checklist 1	Auxiliary Feedwater Valve Alignment	22
OTN-AL-00001 Checklist 2	MD-AFP A and B Switch Alignment	18

Drawings

Number	Title	Revision
E-012.2-00002	Large Induction Motors Outline	4
E-21010(Q)	DC Main Single Line Diagram	14
LP-06	NB/NG/NK/NN-1, Safeguards Power Training Diagram	1
M-22AL01(Q)	Auxiliary Feedwater System Piping and Instrumentation Diagram	46
M-143A-00003	Concentric Restricting Orifice Plates Outline Drawing	19

Miscellaneous

Number	Title	Revision
GEK-72150	General Electric Instructions for Class 1E Auxiliary Feedwater Pump Motors	0

Section 1R05: Fire Protection

Procedures

Number	Title	Revision
APA-ZZ-00703	Fire Protection Operability Criteria and Surveillance Requirements	26
APA-ZZ-00750	Hazard Barrier Program	37
EDP-ZZ-04107	HVAC Pressure Boundary Control	29
OTO-KC-00001 Add A-03	Auxiliary Building 1974' – Boric Acid Tank Rooms	0
OTO-KC-00001 Add A-18	Auxiliary Building 2026' – North Electrical Pen Room	0
OTO-KC-00001 Add C-15	Control Building 2016' Switchboard and Battery Rooms 2 and 4	0

Procedures

Number	Title	Revision
OTO-KC-00001 Add C-16	Control Building 2016' Switchboard and Battery Rooms 1 and 3	0
OSP-KC-00015	Fire Door Inspections	17

Drawings

Number	Title	Revision
A-2804	Architectural Fire Delineation Floor Plan, El 2047'-6"	27

Callaway Action Requests

201605406

Jobs

16003139

Miscellaneous

Number	Title	Revision
	Fire Preplan Manual	38
KC-64	C-15 Detailed Fire Modeling Report	1
KC-65	C-16 Detailed Fire Modeling Report	1
KC-83	Fire Safety Analysis Calculation for Fire Area A-3	1
KC-98	Fire Safety Analysis Calculation for Fire Area A-18	1
KC-126	Fire Safety Analysis for Fire Area C-15	1
KC-102	Fire Safety Analysis Calculation for Fire Area A-22	1
KC-127	Fire Safety Analysis Calculation for Fire Area C-16	1
ME-014	Detailed Fire Modeling	0

Section 1R08: Inservice Inspection Activities

Callaway Action Requests

199800739	199800740	199800741	200207750	200404532
200703197	200703247	200703257	200703491	200810348
200810384	200811050	201003386	201109846	201303346
201303370	201303451	201303502	201303702	201303736

Callaway Action Requests

201406864	201407222	201407245	201407246	201407248
201408130	201500430	201501125	201502944	201503385
201504450	201504861	201504926	201505694	201505757
201506100	201506290	201506544	201507559	201508349
201508887	201600224	201600727	201601320	201601742
201602378	201602824	201603031	201603166	201603256
201603472	201603484	201604058	201604063	201603640
201603661				

Drawings

Number	Title	Revision
BG23-H004/231 (Q)	Pip Supports – CVCS Charging and Excess Letdown Sys. Reactor Building	7
EF01-C012/311 (Q)	Pipe Supports – Essential Service Water Sys. Control Bldg. – Trains A & B	4
EF02-C003/142 (Q)	Pipe Supports – Essential Service Water Sys. Aux. Bldg. A Train Supply	6
EF03-C034/134 (Q)	Pipe Supports – Essential Service Water Sys. Aux. Bldg. A Train Return	6
M-22EM01 (Q)	Piping and Instrumentation Diagram High Pressure Coolant Injection System	36
M-23EF01	Piping Isometric Essential Service Water System Control Building	25
M-23EF02	Piping Isometric Essential Service Water System Auxiliary Building A Train Supply	33
M-23EF03	Piping Isometric Essential Service Water System Auxiliary Building A Train Return	33
M-23EF04	Piping Isometric Essential Service Water System Auxiliary Building B Train Supply	22
M-23EF05	Piping Isometric Essential Service Water System Auxiliary Building B Train Return	22
M-23EF06	Piping Isometric Essential Service Water System Auxiliary Building A and ” Train Supply and Return	26
M-25BG23 (Q)	Hanger Location Drawing – CVCS Charging & Excess Letdown Reactor Building	16

Drawings

Number	Title	Revision
M-25EF01 (Q)	Hanger Location Drawing - Essential Service Water Control Bldg. (A &B Train)	14
M-25EF02 (Q)	Hanger Location Drawing – Essential Service Water Sys. Aux. Bldg. A Train Supply	44
M-25EF03 (Q)	Hanger Location Drawing – Essential Service Water Sys. Aux. Bldg. A Train Return	31

Procedures

Number	Title	Revision
APA-ZZ-00350	Measuring and Test Equipment Program	29
APA-ZZ-00500	Corrective Action Program	63
APA-ZZ-00500, Appendix 1	Operability and Functionality Determinations	25
APA-ZZ-00500, Appendix 2	Non-Conforming Materials Report	17
APA-ZZ-00500, Appendix 3	Past Operability and Reportability Evaluations	18
APA-ZZ-00500, Appendix 4	Transient Evaluation	2
APA-ZZ-00500, Appendix 5	Maintenance Rule	19
APA-ZZ-00500, Appendix 6	Collection and Preservation of Evidence	2
APA-ZZ-00500, Appendix 7	Effectiveness Reviews	10
APA-ZZ-00500, Appendix 8	Corrective Action Program Training Requirements	13
APA-ZZ-00500, Appendix 9	Mitigating Systems Performance Index (MSPI)	7
APA-ZZ-00500, Appendix 10	Trending Program	11
APA-ZZ-00500, Appendix 11	Degraded And Nonconforming Condition Resolution	8
APA-ZZ-00500, Appendix 12	Significant Adverse Condition - Significance Level 1	24

Procedures

Number	Title	Revision
APA-ZZ-00500, Appendix 13	Adverse Condition - Significance Level 2	25
APA-ZZ-00500, Appendix 14	Adverse Condition - Significance Level 3	23
APA-ZZ-00500, Appendix 15	Adverse Condition - Significance Level 4	20
APA-ZZ-00500, Appendix 16	Adverse Condition - Significance Level 5	13
APA-ZZ-00500, Appendix 17	Screening Process Guidelines	27
APA-ZZ-00500, Appendix 18	Equipment Performance Evaluation	8
APA-ZZ-00500, Appendix 19	Common Cause Evaluation (CCE)	5
APA-ZZ-00500, Appendix 20	Prompt Human Performance Evaluation (PHPE)	3
APA-ZZ-00500, Appendix 21	Other Issues	18
APA-ZZ-00500, Appendix 22	Corrective Action Program Definitions	13
APA-ZZ-00661	Administration of Welding	16
APA-ZZ-00661, Appendix 3	Personnel Approved to Perform Weld Inspections/Examinations	3
APA-ZZ-00662	ASME Section XI Repair/Replacement Program	22
APA-ZZ-00662, Appendix A	ASME Section XI Repair/Replacement Program Mandatory Requirements Class 1, 2 And 3 Items and Their NF Supports (Fourth Inspection Interval)	5
APA-ZZ-00662 Appendix B	ASME Section XI Code Cases Applied to the Fourth Inspection Interval	6
APA-ZZ-00662 Appendix E	ASME Section XI Repair/Replacement Matrix Minor	4
APA-ZZ-00662 Appendix G	ASME Section XI Repair/Replacement Program Mandatory Requirements Class MC and CC Items and their NF Supports (Second Inspection Interval)	0
APA-ZZ-00750	Hazard Barrier Program	37
EDP-ZZ-00018	Heat Exchanger Eddy Current Testing Methodology	3

Procedures

Number	Title	Revision
EDP-ZZ-01004	Boric Acid Corrosion Control Program	17
EDP-ZZ-01121	Raw Water Systems Predictive Performance Program	21
ESP-ZZ-01016	ASME Section XI IWE Containment Pressure Boundary Inspection	6
MDP-ZZ-LM001	Fluid Leak Management Program	15
MSM-ZZ-QW005	Mechanical Snubber Functional Test	17
MTW-ZZ-WP001	ASME/ANSI General Welding Requirements	26
MTW-ZZ-WP002	Welder Performance Qualification	27
MTW-ZZ-WP003	Control Of Welding Filler Materials	24
MTW-ZZ-WP004	Post Weld Heat Treatment	11
MTW-ZZ-WP006	Qualification of Welding Procedures	9
MTW-ZZ-WP007	Callaway Plant Maintenance Welding Procedure AWS D1.1 General Welding Requirements	4
MTW-ZZ-WP501	Callaway Plant Maintenance Welding Procedure Welding of P-1 Materials	14
MTW-ZZ-WP502	Callaway Plan Maintenance Welding Procedure Welding of P-1 to P-3 Materials	10
MTW-ZZ-WP503	Callaway Plan Maintenance Welding Procedure Welding of P-1 to P-4 Materials	8
MTW-ZZ-WP504	Callaway Plan Maintenance Welding Procedure Welding of P-1 to P-5 Materials	10
MTW-ZZ-WP505	Callaway Plan Maintenance Welding Procedure Welding of P-1 to P-8 Materials	10
MTW-ZZ-WP506	Callaway Plan Maintenance Welding Procedure Welding of P-4X (Including Welding of P-1 and P-8 to P-4X) Materials	8
MTW-ZZ-WP509	Callaway Plan Maintenance Welding Procedure Welding of P-3 Materials	8
MTW-ZZ-WP510	Callaway Plan Maintenance Welding Procedure Welding of P-4 Materials	9
MTW-ZZ-WP511	Callaway Plan Maintenance Welding Procedure Welding of P-5 Materials	10
MTW-ZZ-WP512	Callaway Plan Maintenance Welding Procedure Welding of P-5 to P-8 Materials	5

Procedures

Number	Title	Revision
MTW-ZZ-WP513	Callaway Plan Maintenance Welding Procedure Welding of P-6 to P-8 Materials	4
MTW-ZZ-WP514	Callaway Plan Maintenance Welding Procedure Welding of P-8 Materials	16
MTW-ZZ-WP524	Callaway Plan Mechanical Technical Procedure Torch Brazing of Copper Alloys	8
MTW-ZZ-WP525	Callaway Plan Maintenance Welding Procedure Welding of P-4 to P-8 Materials	4
MTW-ZZ-WP526	Callaway Plan Maintenance Welding Procedure Welding of P-8 to P-34 Materials	3
MTW-ZZ-WP527	Callaway Plan Maintenance Welding Procedure Welding of P-34 Materials	3
MTW-ZZ-WP560	Callaway Plan Maintenance Welding Procedure Fusing of High Density Polyethylene (HDPE) Materials for Nuclear Service	9
MTW-ZZ-WP561	Callaway Plan Maintenance Welding Procedure Fusing of High Density Polyethylene (HDPE) Materials for Non-Nuclear Service	5
MTW-ZZ-WP701	AWS Welding of P-1 Materials	3
MTW-ZZ-WP702	Callaway Plant Maintenance Technical Procedure AWS Welding of Studs	2
PDI-ISI-254-SE	Remote Inservice Examination of Reactor Vessel Nozzle to Safe End, Nozzle to Pipe and Safe End to Pipe Welds	2
PDI-ISI-254-SE-NB	Remote Inservice Examination of Reactor Vessel Nozzle to Safe End, Nozzle to Pipe and Safe End to Pipe Welds Using the Nozzle Scanner	0
QCP-ZZ-05000	Liquid Penetrant Examination	25
QCP-ZZ-05010	Magnetic Particle Examination	19
QCP-ZZ-05019	Ultrasonic Thickness Measurement	14
QCP-ZZ-05030	Radiographic Procedure for Examination of Weldments and Castings	17
QCP-ZZ-05041	Visual Examination to ASME VT-2	26
QCP-ZZ-05048	Boric Acid Walkdown for Reactor Coolant System Pressure Boundary	8
QCP-ZZ-05049	Reactor Pressure Vessel Head Bare Metal Examination	3

Procedures

Number	Title	Revision
UT-2	Ultrasonic Examination of Vessel Welds and Adjacent Base Metal	30
UT-94	Ultrasonic Examination of Ferritic Piping Welds	9
UT-95	Ultrasonic Examination of Austenitic Piping Welds	8
UT-96	Ultrasonic Through Wall Sizing in Piping Welds	7
UT-103	Ultrasonic Examination of Dissimilar Metal Piping Welds	5
WDI-SSP-1101	Manual Ultrasonic Examination of Reactor Vessel Threads in Flange for Callaway Unit 1	1
WDI-STD-088	Underwater Remote Visual Examination of Reactor Vessel Internals	9
WDI-STD-146	ET Examination of Reactor Vessel Pipe Welds Inside Surface	11

Relief Requests

Number	Title	Date
Letter: Michael T. Markley to Fadi Diya	Callaway Plant, Unit 1 - Request for Relief 14R-01, Alternative to ASME Code Inservice Inspection Requirements for Class 3 Buried Piping (TAC NO. MF4271)	May 12, 2015
ULNRC-06115	NRC Letter, "Relief Request 13R-10 for Third 10-Year Inservice Inspection Interval - Use of Polyethylene Pipe in Lieu of Carbon Steel Pipe in Buried Essential Service Water Piping System (TAC No. MD6792)," dated November 7, 2008 (Accession No. ML083100288)	June 10, 2014
ULNRC-06146	Ameren Missouri Letter ULNRC-06115, "10 CFR 50.55a Request: Proposed Alternative to ASME Section XI Requirements for Class 3 Buried Piping," dated June 10, 2014 (ADAMS Accession No. ML14161A399)	September 30, 2014
UNNRC-06214	Docket Number 50-483 Callaway Plant Unit 1 Union Electric Co. Facility Operating License NPF-30 Revision of 10 CFR 50.55a Request: Proposed Alternative to ASME Section XI Requirements for Class 3 Buried Piping (TAC NO. MF4271)	April 24, 2015

Work Packages

15000069-520	15507345	16001742-405	16503498
15000069-505	15507967	16001742-405	16503745

Work Packages

15001243-500	16001742-550	16001743-400

Jobs

10002667	16001870

Miscellaneous

Number	Title	Revision/Date
	Various Non Destructive Examination Reports for ESW components	
206EZ-FLO	Garlock Sealing Technologies Expansion Joint Test	November 15, 2006
0516-19-F01	Secondary Side Visual Inspection Plan for Ameren UE, Callaway RF 21	February 10, 2016
51-9252420-000	AREVA Engineering Information Record: Callaway 1RF021 SG ECT Inspection Plan	March 21, 2016
51-9253319-000	AREVA Engineering Information Record: Callaway 1R21 Degradation Assessment	April 2016
96225-TR-002	Containment F Cooler Response to a Simultaneous LOCA & LOOP Event	1
0096-020-CALC-01	Callaway Water Hammer Load Calculation	0
A190.0002	Procedure Review Form UT-2 Ultrasonic Examination of Vessel Welds and Adjacent Base Metal, Revision 30	October 8, 2014
A190.0002	Procedure Review Form UT-94 Ultrasonic Examination of Ferritic Piping Welds, Revision 9	October 8, 2014
A190.0002	Procedure Review Form UT-95 Ultrasonic Examination of Austenitic Piping Welds, Revision 8	October 8, 2014
A190.0002	Procedure Review Form UT-96 Ultrasonic Through Wall Sizing in Piping Welds, Revision 7	October 8, 2014
A190.0002	Procedure Review Form UT-103 Ultrasonic Examination of Dissimilar Metal Piping Welds, Revision 5	October 8, 2014
AP14-008	Self-Assessment: Nuclear Oversight ISI – IST Audit	October 8, 2014
EDP-ZZ-00016	Self-Assessment: Checklist for Program Review of Alloy 600 Program	October 8, 2014
EDP-ZZ-00016	Self-Assessment: ISI Program	June 20, 2014

Miscellaneous

Number	Title	Revision/Date
RIS 2016-02 OMB Control No. 3150-0011	NRC Regulatory Issue Summary 2016-02, Design Basis Issues Related to Tube-To-Tubesheet Joints in Pressurized-Water Reactor Steam Generators. (ML15169A543)	March 23, 2016
T65.0212 6	Callaway Fall Protection	February 14, 2014

Section 1R11: Licensed Operator Requalification Program

Procedures

Number	Title	Revision
ODP-ZZ-00001	Operations Department – Code of Conduct	97
OSP-AC-00005	Turbine Actual Overspeed Trip	11
OTG-ZZ-00005	Plant Shutdown 20% Power to Hot Standby	47

Callaway Action Requests

200601332 201600670

Miscellaneous

Title	Date
Dynamic Simulator Exam Scenario, Cycle 16-2 As Found	February 1, 2016

Section 1R12: Maintenance Effectiveness

Procedures

Number	Title	Revision
EDP-ZZ-01128	Maintenance Rule Program	24
EDP-ZZ-01128, Appendix 1	SSCs in Scope of the Maintenance Rule at Callaway	10
EDP-ZZ-01128, Appendix 4	Maintenance Rule System Functions	16

Callaway Action Requests

201602435	201602658	201602738	201602824	201603229
201603471	201603472	201603473	201603484	

Jobs

11504345	16001349

Miscellaneous

Number	Title	Revision/Date
	Procon1, LLC Evaluation of Room Cooler SGL-10A Tube Leak Repair	April 13, 2016
1784	Union Electric Company Laboratory Services – Metallurgical Report – Examination of Failed Room Cooler Tubing	September 22, 1994
04060221	AmerenUE Technical Support Services – Metallurgical Report – Examination of Callaway Room Cooler Tubes	September 30, 2004
13050249	Ameren Missouri Technical Support – Metallurgical Report – Examination of Callaway Room Cooler Tubing	May 23, 2013
GL-137	SGL10A/B Room Cooler Heat Removal Capabilities	0

Section 1R13: Maintenance Risk Assessment and Emergent Work Controls

Procedures

Number	Title	Revision
APA-ZZ-00315	Configuration Risk Management Program	14
ODP-ZZ-00002, Appendix 1	Protected Equipment Program	23
ODP-ZZ-00002, Appendix 1, Checklist 5	Placing Train A Protected Equipment Barriers, Mode 5 & 6	2
ODP-ZZ-00002, Appendix 1, Checklist 7	Placing Train B Protected Equipment Barriers, Mode 5 & 6	2

Procedures

Number	Title	Revision
ODP-ZZ-00002, Appendix 1, Checklist 9	Placing Train A Protected Equipment Barriers, Defueled	2
ODP-ZZ-00002, Appendix 1, Checklist 17	Placing Protected Equipment Barriers for SFP Cooling Outage	1
ODP-ZZ-00002, Appendix 2	Risk Management Actions for Planned Risk Significant Activities	11
ODP-ZZ-00002, Appendix 2, Checklist 9	Postings for Lowered Inventory Operations	2

Callaway Action Requests

201601830	201602875	201603382	201605725	201605766

Jobs

06112970	06116947	10505244	13507816	13507818
14512791	14512792	14512793	14512629	14512630
14512631	14512632	14512774	14512780	14512784
14512873	14513123	14513124	14513125	14512846
14512893	14512923	14513455	14514354	15506373
16003488	16003529	16003530	16003531	

Miscellaneous

Number	Title	Revision
	Shutdown Safety Management Plan	3
PRAER 16-405	PRA Evaluation Request – Mode Change from Mode 4 to Mode 3 with Equipment OOS	0

Section 1R15: Operability Evaluations

Procedures

Number	Title	Revision
KDP-ZZ-00013	Emergency Response Facility and Equipment Evaluation	13
MTE-ZZ-QA013	MOVATS UDS Testing of Torque Controlled Limitorque Motor Operated Rising Stem Valves	19

Procedures

Number	Title	Revision
ODP-ZZ-00002	Equipment Status Control	83
OSP-EJ-V002A	RHR Pump Containment Sump Suction and RWST Suction Inservice Test	31

Drawings

Number	Title	Revision
8600-X-89645	High Pressure & Low Pressure Nitrogen Gas Storage & Transfer System Site Gas Systems (KH2) Piping and Instrumentation Diagram	15
E-23BB12A(Q)	RHR Loop 1 Inlet Isolation Valve Schematic Diagram	12
E-1038-00004	Schematic 7.5kVA Inverter 125VDC, 120VAC, 1PH, 60Hz – Alarms	1
E-1038-00003	Schematic 7.5kVA Inverter 120VAC, 1ø, 60Hz	2
E-1038-00006, S002	Outline 7.5kVA Inverter Front Panel Identification	2
M-22AB02(Q)	Main Steam System Piping and Instrumentation Diagram	17
M-22FA01	Auxiliary Boiler System Piping and Instrumentation Diagram	18
M-22KH01	Service Gas System Piping and Instrumentation Diagram	29
M-622.1-00023	Condensing Unit	19
E-23KJ08A(Q)	Standby Jacket Coolant Heater EKJ01A Schematic Diagram	2
E-23KJ09B(Q)	Standby Jacket Coolant Circ. Pump PKJ01A Schematic Diagram	2
M-22KJ01(Q)	Standby Diesel Generator “A” Cooling Water System Piping and Instrumentation Diagram	24

Callaway Action Requests

201603312	201603353	201603598	201603711	201603739
201603758	201604998	201605016	201605045	201605324
201605917	201105227			

Jobs

10507721	10507762	13505626	14511766	16001888
16002253	16002356	16003607		

Miscellaneous

Number	Title	Revision
BO-05 Addendum 19	Revised Temperatures for 3601, 3605, and 3609 for Station Black Out	1
BO-07	Control Room SBO Heat Load Calculation	11
EF-123	UHS Thermal Performance Analysis using GOTHIC 7.2(b) CAR#201001813	1
RFR 17478	Perform Evaluation for NRC GL96-06 Response	C
RFR 201603756	Request for Resolution: Modify low pressure nitrogen system piping and penetrations	0

Section 1R18: Plant Modifications

Procedures

Number	Title	Revision
APA-ZZ-00600	Design Change Control	57
EDP-ZZ-04015	Evaluating and Processing Requests for Resolution (RFR)	70

Drawings

Number	Title	Revision
M-22AL01(Q)	Auxiliary Feedwater System Piping and Instrumentation Diagram	46
M-22AN01	Demineralized Water Storage and Transfer System Piping and Instrumentation Diagram	42
M-22AP01	Condensate Storage and Transfer System Piping and Instrumentation Diagram	31
M-22AP02	Hardened Condensate Storage Tank Composite Piping and Instrumentation Diagram	0
M-22AQ02	Feedwater Chemical Addition System Piping and Instrumentation Diagram	17
M-22KA09	Instrument Air System Piping and Instrumentation Diagram	25

Miscellaneous

Number	Title	Revision/Date
	50.59 Screen for MP 13-0033 Hardened Condensate Storage Tank Refuel 21 Tie-Ins	4
	Applicability Determination for MP 13-0033 Hardened Condensate Storage Tank Refuel 21 Tie-Ins	4

Miscellaneous

Number	Title	Revision/Date
	Evaluation of Scissor Lift Impact on HCST	May 6, 2016
16-05	50.59 Evaluation for MP 13-0033 Hardened Condensate Storage Tank Refuel 21 Tie-Ins	4
MP 13-0033	Hardened Condensate Storage Tank Refuel 21 Tie-Ins	4

Section 1R19: Post-Maintenance Testing

Procedures

Number	Title	Revision
APA-ZZ-00100	Written Instructions Use and Adherence	33
APA-ZZ-00320	Work Execution	56
APA-ZZ-00322 Appendix C	Job Planning	43
MTE-ZZ-QA013	MOVATS UDS Testing of Torque Controlled Limitorque Motor Operated Rising Stem Valves	19
OSP-JE-00001	Emergency Fuel Oil Transfer Pumps Cross-connection Line Fill Verification Test	13
OSP-NE-0001A	Standby Diesel Generator A Periodic Tests	62
OTN-NB-0001A Addendum 3	NB01 transfer to XNB02 Single Offsite Source Operation and Restoration	8
OTN-NE-0001A	Standby Diesel Generation System –Train A	48

Drawings

Number	Title	Revision
E-23BB12A(Q)	RHR Loop 1 Inlet Isolation Valve Schematic Diagram	12
M22-KH01	Service Gas System Piping and Instrumentation Diagram	29

Callaway Action Requests

201602435	201603496	201603598	201603758	201604092
201605141	201605393			

Jobs

10507721	10507762	16001888	16001887	16001349
14005657	15505373	13505566	14511620	16002253

Jobs

16003027

Section 1R20: Refueling and Other Outage Activities

Procedures

Number	Title	Revision
APA-ZZ-00908	Fitness for Duty Programs	34
APA-ZZ-00911	Fatigue Management	5
ESP-ZZ-00024	Low Power Physics Testing Data Acquisition	9
OSP-SA-00004	Visual Inspection of Containment for Loose Debris	25
OTG-ZZ-00001	Plant Heatup Cold Shutdown to Hot Standby	85
OTG-ZZ-00002	Reactor Startup – IPTE	57
OTG-ZZ-00003	Plant Startup Hot Zero Power to 30 Percent Power – IPTE	60
OTG-ZZ-00005	Plant Shutdown 20 Percent Power to Hot Standby	47
OTG-ZZ-00006	Plant Cooldown Hot Standby to Cold Shutdown	74
OTG-ZZ-00007	Refueling Preparation, Performance and Recovery	38

Callaway Action Requests

201600506	201603464	201603496	201603498	201603531
201603598	201603725	201603729	201603739	201603799
201603889	201603909	201603917	201603931	

Section 1R22: Surveillance Testing

Procedures

Number	Title	Revision
APA-ZZ-00350	Measuring and Test Equipment Program	29
OSP-BN-V0005	BN Suction Header Valves Inservice Test	5
OSP-EJ-0006A	RHR Mini Flow Valve Time Response Test Train A	2
OSP-EJ-0006B	RHR Mini Flow Valve Time Response Test Train B	2
OSP-EJ-PV04A	Train A RHR and RCS Check Valve Inservice Test	10
OSP-EJ-PV04B	Train B RHR and RCS Check Valve Inservice Test	12
OSP-EJ-V002B	RWST to RHR Suction Check Valve Inservice Test	10

Procedures

Number	Title	Revision
OSP-EM-P0002	Train A and Train B Safety Injection Comprehensive Pump Test	9
OSP-EM-V0003	ECCS Check Valve Inservice Test	33
OSP-EM-V003A	CCP A and B Full Flow Test	24
OSP-EM-V0004	RHR Check Valve and SI Pump Recirc Valve Inservice Test	22
OSP-EM-V0005	EM8922A and EM8922B Closure Inservice Test	11
OSP-EP-V0006	SI Accumulator Discharge Check Valve Test	9
OSP-NE-0001B	Standby Diesel Generator B Periodic Tests	64
OSP-SA-2413B	Train B Diesel Generator and Sequencer Testing	26
OTN-NE-0001B	Standby Diesel Generation System – Train B	51
OTS-SB-0002B	SSPS Train B Operation in Modes 5, 6, and No Mode	6

Callaway Action Requests

201604838	201508227	201503020

Jobs

10506673	13504474	13504816	14511319	14511384
14511393	14511394	14511398	14511402	14511437
14511604	14511834	14512880	16507235	15004983

Section 2RS1: Radiological Hazard Assessment and Exposure Controls

Procedures

Number	Title	Revision
APA-ZZ-00014	Conduct of Operations - Radiation Protection	22
APA-ZZ-01000	Callaway Energy Center Radiation Protection Program	41
APA-ZZ-01004	Radiological Work Standards	27
HDP-ZZ-01200	Radiation Work Permits	29
HDP-ZZ-01500	Radiological Postings	44
HDP-ZZ-03000	Radiological Survey Program	43
HDP-ZZ-03000 APPA	Frequency and Location of Routine Radiological Surveys	13
HTP-ZZ-02004	Control of Radioactive Sources	39

Procedures

Number	Title	Revision
HTP-ZZ-06001	High Radiation / Locked High Radiation / Very High Radiation Area Access	50

Callaway Action Requests

201507836	201507921	201508154	201508367	201508546
201508801	201600369	201601938	201602105	201602672

Specific Radiation Work Permits

Number	Title	Revision
13005670	Replace Valves BGV001, BGV002, and BGV003	0
14006281	BB8948D Maintenance, Disassemble, Inspect, Repair leak-by and Reassemble Check Valve BB8948D	1
14006280	BB8949D Disassembly and Repair, Remove/Reinstall Insulation, Disassemble, Repair Leak, Clean Studs, Reassemble, Perform VT-1 and VT-3 Inspection and Engineering Oversight	1
210803625	Motor Change on B Reactor Coolant Pump and Associated Tasks	1
15001126500	Replace BBV0400	0

Radiation Survey Records

Survey Number	Title	Date
01181621	Fuel Building 2047’	December 27, 2012
CA-M-20140715-4	RW7225 Low Level Drum Storage Area	July 15, 2014
CA-M-20150821-4	1106 Moderating Heat Exchanger Room – Deposit from HRA	August 21, 2015
CA-M-20151119-11	1124 Valve Area BACC Walkdown, Job 15505065	November 19, 2015
CA-M-20160104-5	1322 South Piping Pen Monthly Routine	January 4, 2016
CA-M-20160203-1	7225 Low Level Drum Storage Area	February 3, 2016
CA-M-20160402-8	RB2000 Initial Entry General Area for RFO21	April 2, 2016
CA-M-20160404-1	1322 South Piping Penetration Rm – Down Posting	April 4, 2016

Radiation Survey Records

Survey Number	Title	Date
CA-M-20160404-25	1323 North Piping Penetration Room	April 4, 2016
CA-M-20160408-33	RB2026VC Pre-job BGV-001, 002, 003	April 8, 2016
CA-M-20160409-9	1124 Valve Compartment Hold Off, Job 10505104	April 9, 2016
CA-M-20160410-29	RB2026VC 14512081/500 Pre-shielding survey	April 10, 2016
CA-M-20160411-33	RB2000 Routine Daily	April 11, 2016
CA-M-20160412-5	RB2026VC Letdown Valve Cubicle fit-up and welding of new BGV-001 valve and piping	April 12, 2016

Air Sampling

Sample Number	Location	Date
1604101612	Cavity	April 10, 2016
1604111442	RB 2026 Letdown Cubicle	April 11, 2016
1604120400	RB 2026	April 12, 2016
1604121345	BB8948D RB 2000	April 12, 2016
1604121800	D SG Manway	April 13, 2016
1604122215	BB8949D	April 13, 2016

Miscellaneous

Number	Title	Date
	Accountable Source Inventory List	
	Custodial Source Inventory List	
15507830	HSP-ZZ-00001: Sealed Beta-Gamma Source Leak Test	January 19, 2016

Section 2RS3: In-plant Airborne Radioactivity Control and Mitigation

Procedures

Number	Title	Revision
HDP-ZZ-08000	Respiratory Protection Program	23
HDP-ZZ-08002	Respiratory Protection Issue and Use	42
HTP-ZZ-08203-DTI-REGULATORS	Testing Scott Regulators And Respirators Using The Biosystems Posichek3 Tester	8

Procedures

Number	Title	Revision
HTP-ZZ-08208-DTI-FITPRO-TESTING	Quantitative Respirator Fit Testing Using The Tsi Portacount Pro System	2
HTP-ZZ-08208-DTI-FIT-TESTING	Quantitative Respirator Fit Testing Using The Tsi Portacount Plus System	6
HTP-ZZ-08300-DTI-AIRPAK75	Scott Air-Pak 75 SCBA Respirator Inspection and Storage	9
HTP-ZZ-08300-DTI-POST HYDRO	Post Hydrostatic Testing of Breathing Air Cylinders	4
HTP-ZZ-08300-DTI-SKAPAK	SKA-PAK at SCBA Respirator Storage and Inspection	8
HTP-ZZ-08301-DTI-RESPRO CLEAN	Manual Cleaning of Respiratory Protection Equipment	1
HTP-ZZ-08301-DTI-SCOTT-RES-CLEAN	Manual Cleaning of Scott Mask Mounted Regulator	4
HTP-ZZ-08501-DTI-AIR TEST	Testing of Breathing Air	5
HTP-ZZ-08502-DTI-MAC-CAL	Scott Mobile Air Cart Calibration	3
HTP-ZZ-08503-DTI-UNIIICOMPRESSOR	Operation of Bauer UNICUS III, 25 CFM Breathing Air Compressor and Breathing Air Cascade System	4
RP-DTI-RESPRO-STORAGE	Storage of Respirators	3

Callaway Action Requests

201407682	201407882	201408905	201500688	201501023
201502128	201502189	201502356	201503288	201503299
201503490	201600547	201600548		

Title	Date
SCBA and Ska-Pak CBT Records	March 9, 2016
Ska-Pak Proficiency Certification Record	March 9, 2016
Breathing Air Sample Data Sheet	March 26, 2014
Breathing Air Sample Data Sheet	June 26, 2014
Breathing Air Sample Data Sheet	September 12, 2014
Breathing Air Sample Data Sheet	December 29, 2014

Title	Date
Breathing Air Sample Data Sheet	March 17, 2015
Breathing Air Sample Data Sheet	June 19, 2015
Breathing Air Sample Data Sheet	September 22, 2015
Breathing Air Sample Data Sheet	December 15, 2015
Breathing Air Sample Data Sheet	March 7, 2016

Training Certificates

Number	Title	Date
Technician A	Air-Pak 2.2/3.0/4.5/Fifty/75 SCBA Maintenance and Overhaul	September 20, 2016
Technician B	Air-Pak 2.2/3.0/4.5/Fifty/75 SCBA Maintenance and Overhaul	July 13, 2017

Miscellaneous

Title	Date
Respiratory Protection Maintenance Records	2014-2015
Respiratory Protection Equipment Inspection Record	April 2015 – March 2016

Section 4OA1: Performance Indicator Verification

Procedures

Number	Title	Revision
RRA-ZZ-00001	NRC Performance Indicator Program	9
OSP-BB-00009	RCS Inventory Balance	37

Callaway Action Requests

201502229 201505332 201505796

Jobs

16503927

Miscellaneous

Number	Title	Revision Date
	Mitigating Systems Performance Index (MSPI) Basis Document	16

Miscellaneous

Number	Title	Revision Date
	NRC Performance Indicator Transmittal Report, Second Quarter 2015, Mitigating Systems Cornerstone	July 9, 2015
	NRC Performance Indicator Transmittal Report, Third Quarter 2015, Mitigating Systems Cornerstone	October 12, 2015
	NRC Performance Indicator Transmittal Report, Fourth Quarter 2015, Mitigating Systems Cornerstone	January 11, 2016
	NRC Performance Indicator Transmittal Report, First Quarter 2016, Mitigating Systems Cornerstone	April 13, 2016
	MSPI Derivation Report, MSPI Heat Removal System, Unavailability Index (UAI)	June 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unreliability Index (URI)	June 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unavailability Index (UAI)	September 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unreliability Index (URI)	September 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unavailability Index (UAI)	December 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unreliability Index (URI)	December 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unavailability Index (UAI)	March 2015
	MSPI Derivation Report, MSPI Heat Removal System, Unreliability Index (URI)	March 2015
	Reactor Coolant System Identified Leakage Data	April 1, 2015 through March 30, 2016
	NRC Performance Indicator Transmittal Report, Second Quarter 2015, Barrier Integrity Cornerstone	July 6, 2015
	NRC Performance Indicator Transmittal Report, Third Quarter 2015, Barrier Integrity Cornerstone	October 12, 2015
	NRC Performance Indicator Transmittal Report, Fourth Quarter 2015, Barrier Integrity Cornerstone	January 11, 2016
	NRC Performance Indicator Transmittal Report, First Quarter 2016, Barrier Integrity Cornerstone	April 8, 2016
LER 2015-001-00	Licensee Event Report – Completion of a Shutdown Required by the Technical Specifications	0

Miscellaneous

Number	Title	Revision Date
LER 2015-002-00	Licensee Event Report – Manual Auxiliary Feedwater Actuation	0
LER 2015-003-00	Licensee Event Report – Reactor Trip Caused by Transmission Line Fault	0
LER 2015-003-01	Licensee Event Report – Reactor Trip Caused by Transmission Line Fault	1
LER 2015-004-00	Licensee Event Report – Auxiliary Feedwater Flow Control Valve Inoperable due to Faulty Electronic Positioner Card	0

Section 4OA2: Identification and Resolution of Problems

Procedures

Number	Title	Revision
APA-ZZ-00500, Appendix 8	Corrective Action Program Training Requirements	13
APA-ZZ-00500, Appendix 9	Mitigating Systems Performance Index (MSPI)	7
APA-ZZ-00500, Appendix 10	Trending Program	11
APA-ZZ-00500, Appendix 11	Degraded And Nonconforming Condition Resolution	8
APA-ZZ-00500, Appendix 12	Significant Adverse Condition - Significance Level 1	24
APA-ZZ-00500, Appendix 13	Adverse Condition - Significance Level 2	25
APA-ZZ-00500, Appendix 14	Adverse Condition - Significance Level 3	23
APA-ZZ-00500, Appendix 15	Adverse Condition - Significance Level 4	20
APA-ZZ-00500, Appendix 16	Adverse Condition - Significance Level 5	13
APA-ZZ-00500, Appendix 17	Screening Process Guidelines	27
APA-ZZ-00500, Appendix 18	Equipment Performance Evaluation	8

Procedures

Number	Title	Revision
APA-ZZ-00500, Appendix 19	Common Cause Evaluation (CCE)	5
APA-ZZ-00500, Appendix 22	Corrective Action Program Definitions	13
APA-ZZ-00600	Design Change Control	57

Drawings

Number	Title	Revision
M-22AE01	Piping and Instrumentation Diagram Service Water System	22

Callaway Action Requests

201010634	20160440	201602658	201603472	201605488
201109846	201110442	201202852	201303346	201303370
201303451	201303502	201303608	201303702	201303736
201307879	201309041	201309046	201400458	201402778
201406213	2014072222	201407248	201407246	201407245
201503637	201602824	201603119	201603346	201603472
201603471	201603472	201603484	201603526	201604063
201604058	201604092	201604297	201604235	201604378

Jobs

16002133	16002339

Miscellaneous

Number	Title	Revision
MP 10-0003	Install Service Water Check Valves to Minimize ESW Water Hammer During LOOP and ESFAS Testing	1
MP 10-0004	Revise Sequencer Operation of EFHV0037 and EFHV0038	2

Section 4OA3: Event Follow-Up

Procedures

Number	Title	Revision
APA-ZZ-00500	Corrective Action Program	57

Procedures

Number	Title	Revision
APA-ZZ-00801	Foreign Material Exclusion	32

Callaway Action Requests

200603505	201408897	201606129

Jobs

11509869	13004764

Miscellaneous

Number	Title	Revision
E-1051-00104	IM for Dry Type Transformer Installation	0

The following items are requested for the
Occupational Radiation Safety Inspection
at Callaway Plant
(April 11 – 15, 2016)
Integrated Report 2016002

Inspection areas are listed in the attachments below.

Please provide the requested information on or before **March 21, 2016**.

Please submit this information using the same lettering system as below. For example, all contacts and phone numbers for Inspection Procedure 71124.01 should be in a file/folder titled "1- A," applicable organization charts in file/folder "1- B," etc.

If information is placed on *ims.certrec.com*, please ensure the inspection exit date entered is at least 30 days later than the onsite inspection dates, so the inspectors will have access to the information while writing the report.

In addition to the corrective action document lists provided for each inspection procedure listed below, please provide updated lists of corrective action documents at the entrance meeting. The dates for these lists should range from the end dates of the original lists to the day of the entrance meeting.

If more than one inspection procedure is to be conducted and the information requests appear to be redundant, there is no need to provide duplicate copies. Enter a note explaining in which file the information can be found.

If you have any questions or comments, please contact the lead inspector, Pete Hernandez at (817) 200-1168 or Pete.Hernandez@nrc.gov.

PAPERWORK REDUCTION ACT STATEMENT

This letter does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing information collection requirements were approved by the Office of Management and Budget, control number 3150-0011.

1. Radiological Hazard Assessment and Exposure Controls (71124.01)
Date of Last Inspection: **October 26, 2015**

A. List of contacts (with official title) and telephone numbers for the Radiation Protection Organization Staff and Technicians

B. Applicable organization charts

C. Audits, self-assessments, and LERs written since date of last inspection, related to this inspection area

D. Procedure indexes for the radiation protection procedures

E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures may be requested by number after the inspector reviews the procedure indexes.
1. Radiation Protection Program Description
2. Radiation Protection Conduct of Operations
3. Personnel Dosimetry Program
4. Posting of Radiological Areas
5. High Radiation Area Controls
6. RCA Access Controls and Radworker Instructions
7. Conduct of Radiological Surveys
8. Radioactive Source Inventory and Control
9. Declared Pregnant Worker Program

F. List of corrective action documents (including corporate and subtiered systems) since date of last inspection
a. Initiated by the radiation protection organization
b. Assigned to the radiation protection organization
c. Identify any CRs that are potentially related to a performance indicator event

NOTE: The lists should indicate the <u>significance level</u> of each issue and the <u>search criteria</u> used. Please provide documents which are "searchable" so that the inspector can perform word searches.

If not covered above, a summary of corrective action documents since date of last inspection involving unmonitored releases, unplanned releases, or releases in which any dose limit or administrative dose limit was exceeded (for Public Radiation Safety Performance Indicator verification in accordance with IP 71151)

G. List of radiologically significant work activities scheduled to be conducted during the inspection period (If the inspection is scheduled during an outage, please also include a list of work activities greater than 1 rem, scheduled during the outage with the dose estimate for the work activity.)

H. List of active radiation work permits

I. Radioactive source inventory list

3. In-Plant Airborne Radioactivity Control and Mitigation (71124.03)
Date of Last Inspection: **October 27, 2014**

A. List of contacts and telephone numbers for the following areas:
   1. Respiratory Protection Program
   2. Self-contained breathing apparatus

B. Applicable organization charts

C. Copies of audits, self-assessments, vendor or NUPIC audits for contractor support (SCBA), and LERs, written since date of last inspection related to:
   1. Installed air filtration systems
   2. Self-contained breathing apparatuses

D. Procedure index for:
   1. use and operation of continuous air monitors
   2. use and operation of temporary air filtration units
   3. Respiratory protection

E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures may be requested by number after the inspector reviews the procedure indexes.
   1. Respiratory protection program
   2. Use of self-contained breathing apparatuses
   3. Air quality testing for SCBAs

F. A summary list of corrective action documents (including corporate and subtiered systems) written since date of last inspection, related to the Airborne Monitoring program including:
   1. continuous air monitors
   2. Self-contained breathing apparatuses
   3. respiratory protection program

   NOTE: The lists should indicate the <u>significance level</u> of each issue and the <u>search criteria</u> used. Please provide documents which are "searchable."

G. List of SCBA qualified personnel - reactor operators and emergency response personnel

H. Inspection records for SCBAs staged in the plant for use since date of last inspection.

I. SCBA training and qualification records for control room operators, shift supervisors, STAs, and OSC personnel for the last year.

   A selection of personnel may be asked to demonstrate proficiency in donning, doffing, and performance of functionality check for respiratory devices.