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

May 4, 2017

Mr. Thomas D. (Tom) Ray
Site Vice President
Duke Energy Corporation
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION – NRC DESIGN BASES ASSURANCE INSPECTION REPORT 05000269/2017007, 05000270/2017007 AND 05000287/2017007

Dear Mr. Ray:

On March 24, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Oconee Nuclear Station, Units 1, 2, and 3. On March 24, 2017, the NRC inspectors discussed the results of this inspection with you and other members of your staff. Additional inspection results were discussed with Mr. Burchfield and other members of your staff on April 12, 2017. The results of this inspection are documented in the enclosed report.

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

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

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

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

Sincerely,

/RA/

Jonathan H. Bartley, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-269, 50-270 and 50-287
License Nos. DPR-38, DPR-47 and DPR-55

Enclosure:
Inspection Report 05000269/2017007,
05000270/2017007 and 05000287/2017007
w/Attachment: Supplemental Information

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SUBJECT: OCONEE NUCLEAR STATION – NRC DESIGN BASES ASSURANCE INSPECTION REPORT 05000269/2017007, 05000270/2017007 AND 05000287/2017007 DATED May 4, 2017

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UNITED STATES NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	50-269, 50-270, and 50-287
License Nos:	DPR-38, DPR-47, and DPR-55
Report Nos:	05000269/2017007, 05000270/2017007, and 05000287/2017007
Licensee:	Duke Energy Carolinas, LLC
Facility:	Oconee Nuclear Station, Units 1, 2, and 3
Location:	Seneca, SC 29672
Dates:	March 6, 2017, through March 24, 2017
Inspectors:	G. Ottenberg, Senior Reactor Inspector (Team Leader) M. Greenleaf, Reactor Inspector A. Ruh, Resident Inspector, Browns Ferry S. Bussey, Senior Reactor Technology Instructor, Technical Training Center (TTC) C. Baron, NRC Mechanical Contractor S. Kobylarz, NRC Electrical Contractor
Approved By:	Jonathan H. Bartley, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY

IR 05000269/2017007, 0500270/2017007, and 05000287/2017007, March 6, 2017 through March 24, 2017; Oconee Nuclear Station, Units 1, 2, and 3; Design Bases Assurance Inspection

The report covers the Design Basis Assurance Inspection conducted from March 6 to March 24, 2017, by a team of four U.S. Nuclear Regulatory Commission (NRC) inspectors and two contractors. One NRC identified non-cited violation is documented in this report. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. The cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas" dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated November 1, 2016. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," revision 6.

Cornerstone: Mitigating Systems

Green. The NRC identified a non-cited violation of Title 10 of the Code of Federal Regulations (CFR) Part 50, Appendix B, Criterion XVI, "Corrective Actions," for the licensee's failure to assure that a condition adverse to quality associated with a damaged trench cover on the "yellow" trench was identified and corrected. Specifically, the seismic design function of the trench cover was not identified or recognized at the time of the licensee's original identification of the issue and subsequent NCR generation, and, due to this error, appropriate corrective actions were not assigned or completed. In response to the issue, the licensee replaced the broken trench cover on the "yellow" trench with a temporary cover on March 22, 2017, and planned work order 20147282 to replace it with a permanent cover to restore the design configuration.

This performance deficiency was more than minor because it was associated with the Design Control Attribute of the Mitigating Systems Cornerstone, and adversely affected the cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, inadequate identification and correction of this condition adverse to quality adversely impacted the trench cover's reliability and capability to perform its function during and following a seismic event. The team determined the finding to be of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating structure, system, or component (SSC), and the SSC maintained its operability or functionality. The team determined that the finding was indicative of current licensee performance, because the issue was first identified in January 2017. A cross-cutting aspect of Consistent Process [H.13.] in the Human Performance Area was assigned because individuals did not use a consistent, systematic approach to make decisions. (Section 1R21.2.1.5)

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Design Basis Assurance Inspection (IP 71111.21M)

.1 Inspection Sample Selection Process

The team selected risk significant components for review using information contained in the Oconee Nuclear Station (ONS) Probabilistic Risk Assessment (PRA) and the U.S. Nuclear Regulatory Commission’s (NRC’s) Standardized Plant Analysis Risk (SPAR) model for ONS. In general, the selection process focused on components that had a risk achievement worth (RAW) factor greater than 1.3 or a risk reduction worth (RRW) factor greater than 1.005. The components selected were associated with both safety-related and non-safety related systems and included a variety of components such as pumps, inverters, operator actions, electrical busses, and valves.

The team also selected modifications that potentially affect the design bases, licensing bases, and performance capability of the associated structures, systems, and components (SSCs). The team selected modifications completed in the past that had not been previously inspected by an NRC modification team using inspection procedure (IP) 71111.17T. The team selected modifications that were performed on risk significant components that were associated with the initiating event, mitigating system or barrier integrity cornerstones. The team selected a sample of electrical and mechanical modifications. Additionally, the complexity of the modification was also considered in selecting the modifications reviewed.

The team initially compiled a list of components based on the risk factors previously mentioned and risk significant modifications that had been completed. Additionally, the team reviewed the previous *Component Design Bases Inspection* (CDBI) and *Evaluations of Changes, Tests, or Experiments and Permanent Plant Modifications* NRC inspection reports and excluded those components and modifications previously inspected. The team then performed an assessment to narrow the focus of the inspection to five components, five modifications and three operating experience (OE) items. The team selected one sample based on large early release frequency (LERF) implications. The team’s assessment evaluated possible low design margin included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, Maintenance Rule (a)(1) status, operability reviews for degraded conditions, NRC resident inspector insights, and industry OE. Finally, consideration was given to the uniqueness and complexity of the design and the available defense-in-depth margins.

The inspection performed by the team was conducted as outlined in NRC IP 71111.21M. This inspection effort included walkdowns of selected components and modifications; interviews with operators, system engineers, and design engineers; and reviews of associated design documents and calculations to assess the adequacy of the components to meet design basis, licensing basis, and risk-informed beyond design basis requirements.

Additionally, for the modification portion of the inspection, the team determined whether the modifications were adequately implemented; that procedures and design and license basis documentation affected by modification had been adequately updated to reflect any changes to the design or license basis of the facility after the change had been performed. Additionally, the team verified that any changes to the design and/or licensing bases had been performed in accordance with NRC guidance. Summaries of the reviews performed for each component, modification, and OE sample are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

.2 Results of Detailed Reviews

.2.1 Results of Detailed Component Reviews (5 samples)

.2.1.1 High Pressure Injection (HPI) Pumps

a. Inspection Scope

The team reviewed the updated final safety analysis report (UFSAR), flow diagrams, test data, system health reports, pump and motor vendor manuals, as well as operating and surveillance procedures to identify design, maintenance, and operational requirements related to pump flow rate, developed head, achieved system flow rate, net positive suction head, and minimum flow requirements. The inspectors reviewed calculations related to pump line up, pump capacity, motor cooling water supply as well as the correlation between calculated requirements, test acceptance criteria, and test results. The inspectors reviewed the bases for system flowrate throttling limitations and whether idle pump discharge check valve leakage and in-service testing program categorization was appropriate. Maintenance, in-service testing, corrective action documents, and design change histories were reviewed to assess the potential for component degradation and the resulting impact on design margins and performance. The team walked down the pumps and related components to verify that the installed configuration was consistent with design bases information and to visually inspect the material condition of the pumps. The team reviewed the licensee's evaluations of system impacts associated with turbine building fires.

The team observed time critical actions performed during simulator evaluated scenarios in accordance with the station emergency operating procedures with regards to HPI pump operation. The team observed a field simulated performance of atmospheric dump valve operation during a small break loss of coolant accident with only one HPI pump available. The team additionally reviewed validated time critical actions performed in April 2016 related to HPI pump operation.

b. Findings

No findings were identified.

.2.1.2 Protected Service Water (PSW) Flow Control Valves, xPSW-22, -24

a. Inspection Scope

The team inspected the PSW flow control valves, xPSW-22, and xPSW-24 to determine whether they were capable of meeting their design basis requirements. The PSW system is designed to provide cooling water to the steam generators, as well as electrical power to a HPI pump and pressurizer heaters, in the event of a fire. The PSW flow control valves are designed to provide controlled flow to each of the six steam generators (two per unit).

The team reviewed design and licensing documents, including the UFSAR, the technical specifications (TSs), associated design basis documents (DBDs), drawings, and other design documents to determine the specific design functions. The team reviewed PSW test results and operating procedures to ensure that the PSW flow control valves were operating as designed and verified that Duke performed appropriate maintenance on the valves. The team also reviewed the PSW system procedures and vendor manuals to determine if Duke operated the PSW control valves within the vendor design limits. The team reviewed the vendor documentation and worst-case calculated environmental conditions to evaluate whether the PSW control valves were designed for the most limiting operating conditions. The team reviewed the control valve testing procedures to evaluate whether Duke performed appropriate maintenance activities and reviewed past test results to determine if the control valves were capable of controlling flow under the most limiting design conditions. Additionally, the team evaluated the basis for a time critical operator action associated with restoring flow to the steam generators after a fire to verify the reactor level and temperature would remain in an acceptable condition. The team conducted several walkdowns of the PSW pump area, the PSW control valves, and associated components and cables to assess the observable material condition, configuration control, and operating environment. The team reviewed Duke’s response to past valve test failures to verify that the equipment was maintained in an operable condition. The team additionally reviewed the time critical actions related to PSW during a high energy line break with the standby shutdown facility (SSF) makeup pump unavailable, and mitigating a tornado event causing SSF failures validated in June 2016. Finally, the team reviewed corrective action documents and available trend data to evaluate whether there were adverse operating trends and to assess Duke’s ability to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.3 CT-4 Blockhouse Ventilation

a. Inspection Scope

The team inspected the CT-4 Blockhouse ventilation system to determine whether it was capable of meeting its design basis requirements. The CT-4 Blockhouse contains equipment required to provide emergency power to the units under postulated accident and loss of offsite power events. The ventilation system includes exhaust fans, fan temperature controls, and a water spray header to provide additional cooling under limiting design conditions.

The team reviewed the UFSAR, calculations, drawings, associated DBDs, and procedures to identify the most limiting requirements for the CT-4 Blockhouse ventilation system. The team also reviewed a sample of test results to verify that CT-4 Blockhouse ventilation system performance met the acceptance criteria and that the fans and associated controls were adequately tested. The team conducted walkdowns of the ventilation system, including piping associated with the water spray header modification and fan power supplies associated with a design modification to increase reliability. Finally, the team reviewed corrective action documents and available trend data to evaluate whether there were adverse operating trends and to assess Duke's performance to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.4 Vital Inverters

a. Inspection Scope

The team inspected the Units 1, 2, and 3, 120 volt (V) alternating current (AC) vital inverters to determine whether they could fulfill their design basis requirements of providing power to 120 V AC instrumentation in the event of a postulated accident. The team interviewed the system engineer and reviewed analyses concerning the capability of the vital inverters to supply the necessary power to the instrumentation under limiting accident conditions. The 10 CFR 50.59 evaluation for the replacement of the original plant inverters with the current inverters was reviewed to evaluate the adequacy of the licensee's evaluation that determined there was no need for a license amendment. The team reviewed design bases documentation and calculations to assess the capability of the inverters to withstand faults of non-safety related equipment tied to the 120 V AC panelboard, and reviewed the breaker coordination designed to protect the upstream inverters from faults. The team also reviewed the licensing basis of the 120 V AC vital inverters with respect to their seismic capability to evaluate the effect of any seismically-induced common-cause failures. The team conducted walkdowns of all 120 V AC vital inverters and associated support systems to assess Duke's configuration control, the material condition, and the operating environment. The team also was able to observe maintenance activities performed on the 2DIC inverter during a subsequent walkdown. The team observed a field simulated performance of removing non-essential loads from control batteries during a station blackout (SBO). The team additionally reviewed the time critical actions related to the inverters during an SBO validated in May 2016. Finally, the team reviewed corrective action documents and system health reports to determine if there were any adverse trends associated with the vital inverters and to assess Duke's performance to evaluate and correct problems.

b. Findings

No findings were identified.

.2.1.5 230 kilovolt (kV) Switchyard Yellow Bus

a. Inspection Scope

The team inspected the safety-related 230 kV switchyard "yellow" bus and the automatic controls for the Keowee Hydro Overhead Unit that connects the 230 kV overhead line to the bus to determine whether the electrical system was capable of performing its design basis requirements. The team reviewed one-line diagrams, electrical schematics, and protective relay diagrams associated with the power system to evaluate the adequacy of the electrical protection system, and the switchyard breaker and Keowee breaker controls to respond to initiating events, such as a Keowee Emergency Start on a Loss-of-Coolant-Accident and Loss-or-Offsite Power and a Switchyard Isolation Signal. The team interviewed plant staff engineers and reviewed the maintenance and operating history of the circuits to evaluate the adequacy of maintenance and configuration control. The team also walked down the 230 kV "yellow" bus circuit breakers, the breaker and bus structures and breaker control panels, the Keowee overhead line circuit breakers and structures, the switchyard circuit breaker 125 V direct current control power batteries and circuit breaker panels, the switchyard loss-of-voltage trip relays, the "yellow" bus protective relaying, including modification EC 112284 that added new primary "yellow" bus differential overcurrent trip relays, the environmental support systems in the 230 kV Switchyard Relay House, and the cable trenches for the control cables from the 230 kV Switchyard Relay House to the Unit 1 and 2 CT4 Blockhouse, to assess the material condition and operating environment of the equipment. Additionally, the team reviewed completed surveillance tests associated with the 230 kV switchyard loss of voltage relaying to ensure that applicable test acceptance criteria were met. Finally, the team reviewed corrective action documents, the 230 kV system health reports, and applicable periodic inspection and test results, including the periodic inspection of the switchyard circuit breaker and bus support foundations, to determine if there were any adverse maintenance or operating trends and to assess Duke's performance to evaluate and correct problems.

b. Findings

Failure to Identify and Correct Broken Cable Trench Cover

Introduction: The NRC identified a Green, non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," for the licensee's failure to assure that a condition adverse to quality associated with a damaged trench cover was identified and corrected.

Description: During a walk down of the "gray" and "yellow" cable trenches from the 230 kV Switchyard Relay House to the Unit 1 and 2 CT4 Blockhouse on March 9, 2017, the inspectors observed a broken concrete trench cover on the "yellow" trench in a gravel area near the road outside the Unit 1 and 2 CT4 Blockhouse. The cover was broken in approximately the middle of the cover, and was wedged in the trench with the walls of the trench supporting the concrete cover from impacting the cables in the trench. The inspectors found through review of drawings and calculations that the two pieces of the broken cover were most likely being held together by a welded-wire fabric that was embedded in the cover. The inspectors also observed that a single trench cover on the “gray” trench was also missing. The inspectors requested the corrective action documentation for the broken “yellow” trench cover to verify that the licensee performed an adequate evaluation for the seismic adequacy of the degraded condition of the cover.

The licensee provided a copy of nuclear condition report (NCR) 2092434, dated January 17, 2017, which documented the as-found condition of the damaged cover, with an Immediate Action that determined the damaged trench cover had no impact to TS or selected licensee commitment (SLC) equipment. The licensee’s NCR review stated that, “There are no TS/SLC cables in the damaged portion of the trench with degraded trench cover.”

The team questioned the statement that there were “no TS/SLC cables in the damaged portion of the trench” during a meeting with the licensee’s engineering staff on March 20, 2017. During the meeting, the inspectors confirmed that safety-related, TS cabling was, in fact, located in the portion of the trench with the damaged cover. The cabling included control circuitry related to switchyard isolation for a loss-of-offsite-power event and to the Keowee Hydro Unit emergency start circuits. The inspectors identified that Duke calculation OSC-0009, Concrete – 230KV Switching Station Cable Trench, determined the cable trench, as a component of the Keowee overhead emergency path, was Class 1 structure, and that the trench structure on overburden was analyzed to be able to withstand a maximum hypothetical earthquake. The calculation also evaluated the trench as a Class 2 structure, which was analyzed to withstand the effects of a design basis earthquake. Calculation OSC-0009 concluded that the 230 kV switchyard cable trenches met the UFSAR seismic criteria for both Class 1 and Class 2 structures when in their evaluated configuration. The calculation also confirmed that the trench cover design was such that “sliding would not occur” during a postulated seismic occurrence. The team found that the seismic design for the cover was intended to prevent the cover from falling into the trench, thereby eliminating the possibility of the cover impacting the cables in the trench.

During the meeting on March 20, 2017, the team expressed concern that a postulated earthquake event could result in the broken trench cover sliding into the trench, which could impact the safety-related cables in the trench. The team was also concerned that the potential impact of the broken cover on safety-related cables during a seismic event had not been evaluated by the licensee in NCR 2092434. As a result of the team’s concern, the licensee initiated NCR 2109622 on March 20, 2017 to identify the error made in the evaluation of the condition in NCR 2092434, where the evaluation determined that no TS safety-related cables were in the trench section with the broken trench cover. Upon review of NCR 2109622, the team observed that the licensee did not perform any evaluation on the seismic adequacy of the broken trench cover or the potential effects on the safety-related cables in the trench.

The team determined that the licensee failed to meet the requirements of their AD-OP-ALL-0105, “Operability Determinations and Functionality Assessments,” Attachment 4, “ODP Entry Checklist,” during the reviews they completed for NCRs 2092434 and 2109622. The ODP entry checklist required, “If the condition involves an SSC within the scope of Section 2.0, Step 1, and any block is yes then an operability determination (IDO and possible PDO) is required.” AD-OP-ALL-0105, Section 2.0, Step 1, included, “SSCs that are not explicitly required to be Operable in a TS LCO, but that perform necessary and required support functions (as specified by the TS definition of Operability) for SSCs that are required to be Operable by TSs are subject to Functionality Assessments and may impact Operability. (i.e., Support SSCs)." The team found that the Degraded or Non-conforming Condition checklist, item number 1, stated, "A condition of an SSC in which there has been any loss of required quality or any loss functional capability relative to the CLB" and should have been checked "yes."

Because an evaluation of the seismic adequacy of the degraded condition of the broken trench cover was not performed, the team additionally requested that the licensee determine whether the weight of the broken cover could adversely affect safety-related cables in the trench. As a result of the team's request, the licensee performed testing at the station on March 24, 2017, that simulated bounding static weight load conditions from a concrete trench cover on individual spare cables that were similar in construction to the most mechanically-limited safety-related cables in the trench. The licensee's test results and evaluation concluded that the cables had adequate mechanical properties to withstand without damage or degradation the full weight of the broken trench cover resting on the cable while maintaining the required electrical insulation and continuity characteristics of the cabling, both during and after the test. The inspectors reviewed the test results and determined that the testing and evaluation performed by the licensee provided reasonable assurance that safety-related cables in the "yellow" trench would likely continue to perform their function under most circumstances following a postulated seismic event that could cause the broken trench cover to slide into the trench and come to rest on the cabling.

The licensee replaced the missing trench cover on the "gray" trench and the broken trench cover on the "yellow" trench on March 22, 2017, with temporary covers that were not fabricated in full accordance with design drawing O-0359, 230kV Switching Station-Cable Trench Concrete, but were evaluated as an acceptable equivalent from a seismic perspective. Permanent trench covers that conformed to the station drawing were planned to be installed under work order 20147282 to restore the design configuration.

Analysis. The team determined that the licensee's failure to identify and correct a condition adverse to quality associated with a damaged trench cover, which was first identified in NCR 2092434, was a performance deficiency and a failure to meet 10 CFR 50, Appendix B, Criterion XVI. The seismic design function of the trench cover was not identified or recognized at the time of NCR generation, and, due to this error, appropriate corrective actions were not assigned or completed. This performance deficiency was more than minor because it was associated with the Design Control Attribute of the Mitigating Systems Cornerstone, and adversely affected the cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, inadequate identification and correction of this condition adverse to quality adversely impacted the trench cover's reliability and capability to perform its function during and following a seismic event.

The team used Inspection Manual Chapter (IMC) 0609, Att. 4, "Initial Characterization of Findings," issued October 7, 2016, for the Mitigating Systems cornerstone, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012, and determined the finding was of very low safety significance (Green) because the finding was a design or qualification deficiency of a mitigating SSC, and the SSC maintained its operability. Specifically, failure to identify the trench cover's function during a seismic event and repair or replace the broken cover could have impacted its ability to perform its function during a seismic event, however, the ability of the cables in the trench to perform their required functions was not affected in this instance.

The team determined that the finding was indicative of current licensee performance, because the issue was first identified in January 2017. A cross-cutting aspect of Consistent Process [H.13.] in the Human Performance Area was assigned because individuals did not use a consistent, systematic approach to make decisions. Specifically, the licensee did not properly consider guidance in their AD-OP-ALL-0105, "Operability Determinations and Functionality Assessments," procedure when evaluating the issue identified in NCRs 2092434 and 2109622 for its potential impact on operability or qualification of the affected SSCs.

Enforcement. Title 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," required, in part, that, "measures shall be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected." Contrary to the above, between January 17, 2017, upon generation of NCR 2092434, and March 22, 2017, when the damaged trench cover was replaced, the licensee did not assure that a condition adverse to quality was promptly identified and corrected. Specifically, the seismic design function of the trench cover was not identified or recognized at the time of NCR generation, and, due to this error, appropriate corrective actions were not assigned or completed to restore the cover to its evaluated condition. The seismic adequacy of the damaged trench cover was in question until an appropriate replacement could be made. In response to this issue, the licensee replaced the trench cover with a temporary one that they evaluated as being an equivalent replacement, and evaluated the past ability of the cabling inside the trench to perform its function if the damaged trench cover were to have fallen on the cables during a seismic event. The licensee initiated work order 20147282 to restore the design configuration. This violation is being treated as an NCV consistent with section 2.3.2.a. of the Enforcement Policy. The violation was entered into the licensee's corrective action program as NCRs 2092434, 2109622, 2110634. (NCV 05000269, 270, 287/2017007-01, "Failure to Identify and Correct Broken Cable Trench Cover.")

.2.2 Results of Detailed Modification Review (5 samples)

.2.2.1 Reverse Osmosis Modifications (ECs 98777, 98778, 99505, 99506, 109523, 109548)

a. Inspection Scope

The team reviewed design bases, licensing bases, and performance capability of the design features associated with the reverse osmosis unit to ensure that the installation of the unit did not degrade the various safety equipment and systems that interface with the unit during operation. Post-modification tests and recent test results were reviewed to ensure operability of the system isolation valves was established, performance continued to meet the design bases, modification design assumptions were appropriate, modification test acceptance criteria were met, and that there were no detrimental system interactions. The team also verified design basis documentation was updated consistent with the design change, verified other design basis features were not adversely impacted, verified procedures and training plans affected by the modification were updated, and verified that affected test documentation was updated. In-service testing results and program updates were reviewed to ensure system boundary valves were being controlled and tested as described in the license amendment request. Operating procedures were also reviewed to ensure that administrative controls were established as described in the license amendment request. Walk downs and interviews were conducted to verify that the modifications were adequately implemented. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.2.2.2 Modify Unit 1/2 Blockhouse Ventilation Fans to Increase Fan Availability (EC110111)

a. Inspection Scope

The team reviewed modification EC110111 that provided independence of the Unit 1/2 Blockhouse Ventilation Fans power and control circuitry, and moved the fan circuits to non-load shed power sources with each fan in a given room powered from separate Units. The modification was performed to increase the availability of the fans and to remove common mode failures to ensure that the Unit 1/2 Blockhouse Ventilation Fans and Switchgear room fans will remain functional with a postulated single failure applied. In the modified configuration, each fan control has its own dedicated temperature switch. The lead fans in the CT-4 room and switchgear room have a temperature switch setpoint of 60 degrees F when in automatic mode. All of the fans are designed to come on when the setpoint of the temperature switch reaches 90 degrees F.

The team reviewed the calculations and performed interviews with design engineering staff to determine whether Duke had adequately evaluated the design bases, licensing bases, and performance capability of the fans associated with the modification. In addition, the team verified that procedures, design documents, and drawings affected by the modification had been adequately updated. The team conducted walkdowns of the ventilation system, including the fan power supplies associated with the design modification to assess the observable material condition, configuration control, and operating environment.

b. Findings

No findings were identified.

.2.2.3 Replace Existing Governor with Digital Controls (ON-53080)

a. Inspection Scope

The team reviewed modification ON-53080 that replaced the Keowee governor control system with a Teleperm XS digital control system. Duke implemented the modification to increase the reliability of their Keowee Hydro Units (KHUs), which are the onsite emergency AC power sources for ONS. The team reviewed the modification's 10 CFR 50.59 evaluation to determine whether the modification should have been transmitted to the NRC for a license amendment review.

The team specifically reviewed the adequacy of isolation between safety related and non-safety related portions of the governor control system. The team interviewed design and system engineers, and reviewed evaluations, the removal, installation, and post-installation testing work orders, as well as the environmental and seismic qualification test result documentation to evaluate the adequacy of the governor control system to perform its specified safety function during normal, abnormal, and accident conditions. The team also reviewed the governor control system's power supply capability and redundancy to evaluate the susceptibility of the governor control system to single-point vulnerabilities. The team also performed a walkdown of the governor control system cabinets to ensure that the installed configuration was in accordance with design instructions. Finally, the team reviewed corrective action documents related to the governor control system to determine if there were reliability or performance issues that may have resulted from the modification.

b. Findings

No findings were identified.

.2.2.4 Keowee Excitation System Replacement (ON-52965)

a. Inspection Scope

The team reviewed modification NSM ON-52965 which installed a new General Electric EX2100 digitally controlled static excitation system for the KHU generators. The modification was performed to replace the Westinghouse WTA Excitation System. The team assessed whether the excitation system was qualified, installed, and tested to meet design basis requirements and whether the operating history of the new excitation system met reliability expectations. The team interviewed design engineers and reviewed drawings and specifications to evaluate the design of the excitation control equipment. Specifically, the team reviewed the Final Scope Document Phase A for KHU 1 and Phase B for KHU 2, the modification test plan, and the 10 CFR 50.59 evaluation for KHU 1 and KHU 2, to verify conformance with design and licensing basis requirements. The team also reviewed the results of periodic surveillance testing that confirmed the Keowee Hydro Generator Units met TS requirements. The team reviewed the preventive maintenance template and maintenance work order plan, and corrective action documents and system health reports, to determine if there were any adverse maintenance or operating trends and to assess Duke's performance to evaluate and correct problems. Finally, the team performed a walk down of the excitation equipment to assess the overall material condition of the system.

b. Findings

No findings were identified.

.2.2.5 Upper Surge Tank Inventory Protection Modifications (ECs 75264, 72624, 75302, 72655, 72723; ON-13098, 23098, 33098)

a. Inspection Scope

The team reviewed the upper surge tank (UST) inventory protection modifications for each of the three units. Duke implemented the modification in order to eliminate single point vulnerability for maintaining UST level to satisfy TS requirements. This modification installed double automatic isolation valves for the UST riser branch. This modification eliminated the requirements for xC-176, xC-187 and xC-192 to close to maintain inventory, as well as upgraded the piping from the emergency feedwater (EFW) system to the UST and allowed operations more control of hotwell level through an adjustable level setpoint. The single point vulnerability was previously documented in LER 99-001-00, "Emergency Feedwater Outside Design Basis Due to Deficient Documentation" (ML16154A539).

The team reviewed the modification to determine if the design basis, licensing basis, and performance capability of the EFW suction from the UST had been degraded by the modification. The team interviewed modification engineers, and reviewed design drawings to determine whether single failure vulnerability met the design and licensing requirements. The team also performed a walkdown of the accessible portions of the UST inventory protection modification to ensure the installed configuration was in accordance with the design instructions and that the EFW suction piping integrity was maintained. The team reviewed validated time critical actions related to EFW suction alignment to the hotwell. Additionally, the team reviewed the results of post modification testing to determine if the changes were properly implemented including the inservice test surveillances to test operability of the automatic valves closure. Finally the team reviewed corrective actions NCRs and available EFW trend data to determine if there were reliability or performance issues that may have resulted from the modification.

b. Findings

No findings were identified.

.2.3 Results of Review of Industry Operating Experience (OE) (3 samples)

The team reviewed selected OE issues for applicability at ONS. The team performed a detailed review of the OE issues listed below to verify that Oconee had appropriately assessed potential applicability to site equipment and initiated corrective actions when necessary.

.2.3.1 Information Notice (IN) 2010-10: Implementation of a Digital Control System under 10 CFR 50.59

a. Inspection Scope

The team reviewed Duke's response to IN 2010-10, Implementation of a Digital Control System under 10 CFR 50.59. Specifically, the team reviewed action request (AR) 01565082 which documented Duke's fleet-wide review of the issue as described in the IN, as well as Oconee Nuclear Station's actions taken in response to the IN (as documented in AR 01484353) to evaluate the adequacy of Duke's procedures and processes of implementing digital modifications in accordance with 10 CFR 50.59. The team reviewed the 10 CFR 50.59 training package that the licensee implemented in response to the IN to evaluate the adequacy of the training required of qualified individuals performing 10 CFR 50.59 evaluations.

b. Findings

No findings were identified.

.2.3.2 IN 2005-21: Plant Trip and Loss of Preferred AC Power from Inadequate Switchyard Maintenance

b. Inspection Scope

The team reviewed the Duke Fleet Review that was performed on IN 2005-21 to determine if the station's response to the IN was adequate. The team requested that the licensee identify in their switchyard maintenance procedures the incorporation of specific vendor recommendations that would address the issues identified in the IN to determine if the information had been adequately incorporated into station work practices. The team reviewed copies of the maintenance procedures that addressed the issues identified in the IN. Duke also confirmed that prior to the issuance of IN 2005-21 a thorough review was conducted to ensure inclusion of manufacturer recommended maintenance on the switchyard breakers and current transformers in site maintenance procedures.

b. Findings

No findings were identified.

.2.3.3 Generic Letter (GL) 91-15: Operating Experience Feedback Report, Solenoid-Operated Valve Problems at U.S. Reactors

c. Inspection Scope

The team reviewed Oconee's response to GL 91-15, "Operating Experience Feedback Report, Solenoid-Operated Valve Problems at U.S. Reactors". Specifically, the team reviewed ARs 01409314, 01736346, 01571863, 01567199, and 01565430 which documented Oconee's review of the issues described in the generic letter. The team verified that the licensee's review adequately addressed the issues in the generic letter.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that Oconee had previously identified and entered into the corrective action program. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions. In addition, nuclear condition reports (NCRs) written on issues identified during the inspection, were reviewed to verify adequate problem identification and incorporation of the problem into the corrective action system. The specific corrective action documents that were sampled and reviewed by the team are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

On March 24, 2017, the inspectors presented the inspection results to Mr. Tom Ray, Site Vice President, and other members of the ONS staff. Additional inspection results were discussed with Mr. Burchfield and other members of the ONS staff on April 12, 2017. The inspectors verified no proprietary information was retained or documented in this report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel
T. Ray, ONS Site Vice President
E. Burchfield, ONS Plant Manager
R. Price, Electrical Design Basis Engineering Manager
D. Wilson, Mechanical Design Basis Engineering Manager
C. Wasik, Regulatory Affairs Manager
A. Spear, Lead Nuclear Engineer
A. Hathcock, Senior Nuclear Engineering Technologist
D. Keeler, Nuclear Engineer I
C. Brown, Critical Systems SSF Engineering Manager
A. Bingham, Senior Nuclear Engineer
R. Powers, Nuclear Oversight
S. Jarrett, Lead Nuclear Engineer

NRC Personnel
F. Ehrhardt, Chief, Projects Branch 1, Region II
K. Manoly, Senior Level Advisor for Structural Mechanics, Office of Nuclear Reactor Regulation
S. Koenick, Project Manager, Office of Nuclear Reactor Regulation

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000269,270,287/2017007-01	NCV	Failure to Identify and Correct Broken Cable Trench Cover. [Section 1R21.2.1.5]

LIST OF DOCUMENTS REVIEWED

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KC-2151, NSM ON-53080 Governor Replacement Project and NSM ON-52965 Exciter Upgrade: Keowee 125VDC System Load Changes, Rev. 9
OSC -10839, CS Response To Turbine Building Fire-Induced Loss Of All Feedwater and 4160VAC Power With PSW Recovery (NFPA 805 Fire Analysis), Rev. 2
OSC-0009, Concrete – 230KV Switching Station Cable Trench, Rev. 11
OSC-10000, HELB Evaluation of Reverse Osmosis Unit as a New HELB Source, Rev. 0
OSC-10242, AOTC (Allowable Operating Transient Cycles) & Fatigue Pro Operating Transient Count Basis Summaries Volume 1 of 5, Rev 1
OSC-10419, ONS Full-Core Mark-B-HTP, Gadolinia Fuel, & 24 Month Cycle LOCA Summary Report, Rev. D1
OSC-10651, Event Mitigation with Protected Service Water (PSW), Rev. 7
OSC-11379, FMEA/EC-112284 Add Redundant Train of Yellow Bus Differential Relaying,
OSC-1212, Oconee Nuclear Station – Unit 2 Auxiliary Feedwater Discharge System Piping Analysis for Problem 2-03A-11, Rev. 29
OSC-1214, Oconee Nuclear Station – Unit 1 Auxiliary Feedwater Discharge System Piping Analysis for Problem 1-03A-11, Rev. 26
OSC-1579, HPI Pumps NPSH Analysis (Injection from BWST), Rev. 8
OSC-2042, HPI Pump Motor Upper Bearing Cooling Report, Rev. 10
OSC-2533, High Pressure Injection Pump Crossover Flow Instrument Loop Accuracy, Rev. 11
OSC-2820, Oconee Nuclear Station Emergency Procedure Setpoints, Revs. 36 and 39
OSC-3120, Oconee Nuclear Station, Unit 1, 2, &3 Electrical Protective Relay Settings & Breaker Coordination, Rev. 22
OSC-3561, Hydraulic Model of the High Pressure Injection System – NRC Bulletin 88-04 Minimum Flow Evaluation, Rev. 3
OSC-3941, HPI System Passive Failure Applicability, Rev. 0
OSC-4083, HPI Flow Loop Instrument Accuracy, Rev. 12
OSC-4580, Maximum Acceptable HPI Pump Developed Head to Prevent Over pressurization of Discharge Piping, Rev. 5
OSC-4616, Letdown Storage Tank Operating Curve – Maximum Allowable Pressure vs. Indicated Level, Rev. 9
OSC-5649, LPSW Test Acceptance Criteria, Rev. 12
OSC-5656, Design Input Calculation & 10CFR50.49 Analysis for NSM ON-12881 Parts A & B, Rev. 4
OSC-5723, Input for B&W LOCA Analyses, HPI System, Rev. 4
OSC-5745, USQ Evaluation of NSM ON-12881, Replacement of 120VAC Vital I&C and Essential Inverters, and Control and Power Battery Chargers, Rev. 3
OSC-5909, Test Acceptance Criteria for High Pressure Injection Pump Developed Head, Rev. 3
OSC-6111, Small Break Loss of Coolant Accident (SBLOCA) Event Mitigation Requirements, Rev. 21
OSC-6118, Loss of Non-Emergency AC Power: Event Mitigation Requirements, Rev. 15
OSC-7134, 230kV and 525kV Switchyards, 115kV Switching Station, and Transformer Yard, with Associated and Misc. Cable Trenches: 5 year Civil / Structural Inspection, Rev. 3
OSC-7253, Items Committed to the QA-5 Program, Rev. 1
OSC-7480, LPI/HPI Hydraulic Analysis (EOP Basis), Rev. 5
OSC-7734, Maximum Hypothetical Accident (MHA) Dose Analysis, Rev. 14

OSC-7934, Auxiliary Building GOTHIC Heat Up Numerical Applications Analysis - PSW Event Cases, Rev. 10
OSC-8552, Hydraulic Analysis for LDST to RBES Return Line Mod NSM, Rev. 4
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OSC-8798, Oconee Nuclear Station Human Reliability Analysis, Rev. 5
OSC-9012, HPI Test Acceptance Criteria (TAC), Rev. 0
OSC-9314, NFPA 805 Transition Risk-Informed, Performance-Based Fire Risk Evaluation, Rev. 6
OSC-9659, Oconee Nuclear Safety Capability Assessment for Units 1, 2, and 3, Rev. 10
OSC-9842, PSW System Pumps NPSH Analysis, Rev. 4
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NCRs (Nuclear Condition Reports)

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01567199	01787169	01806537	01905280	01999607	02089170
01571863	01788604	01807547	01905855	02003985	02090137
01736346	01792498	01816906	01906540	02031073	02090822
01752158	01793432	01826266	01906550	02035073	02090839
01757968	01797407	01830903	01909327	02056895	02092434
01758062	01801226	01841810	01909956	02066214	02101634
01760025	01801471	01845136	01932636	02078377	02106400
01761261	01802104	01882515	01934949	02080657	02109397

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OSS-0218.00-00-0019, Cable And Wiring Separation Criteria, Rev. 17
OSS-0218.00-00-0025, Specification For The Installation of Field Run Cable Support Systems, Rev. 15
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OSS-0254.00-00-1053, Protected Service Water System, Rev. 2
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OSS-0254.00-00-2005, (Elect) Keowee Emergency Power Design Basis Document, Rev. 28
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OSS-0254.00-00-2015, (ELEC) Design Basis Spec for the 120VAC Vital Instrumentation and Control Power System, Rev.5
OSS-0254.00-00-3000, Design Basis Specification 230KV Switchyard and Emergency Power Overhead Power Path Structures, Rev. 3
OSS-0254.00-00-4005, Design Basis Specification for Design Basis Events, Rev. 28
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Drawings

1-07A-400B-H4403, Piping Support/Restraint, Rev. 0
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O-0359, 230kV Switching Station- Cable Trench Concrete, Rev. 5A
O-0705, One Line Diag. 120VAC & 125 VDC Station Aux Circuits Instrumentation Vital Buses, Rev. 104
O-0753-L, Connection Diagram Keowee Emergency Start Panel EPSLP3, Rev. 22
O-14, Turbine Building Mezzanine Floor Plan – EL 796+6, Rev. 36
O-1705, One Line Diag. 120VAC & 125VDC Stat. Aux. Circuits, Rev. 87
O-2705, One Line Diagram – 120 VAC & 125VDC Station Auxiliary Circuits Instrumentation Vital Buses, Rev. 87
O-398-A1-001, PSW Ductbank and Manhole Location Plan, Rev. 1A
O-806-R, External Grid Trouble Protective System Freq CH No.2 Wiring Diagram Panel No. RB17, Rev. 23
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OFD-101A-1.2, Flow Diagram of High Pressure Injection System (Storage Section), Rev. 43
OFD-101A-1.3, Flow Diagram of High Pressure Injection System (Charging Section), Rev. 32
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OFD-102A-1.2, Flow Diagram of Low Pressure Injection System (LPI Pump Discharge), Rev. 60
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OFD-121A-1.8, Oconee Unit 1 Flow Diagram of Condensate System (Condensate Makeup & Emergency FDW Pump Suction), Rev. 25
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OFD-121A-2.7, Oconee Unit 2 Flow Diagram of Condensate System (Upper Surge Tanks 2A & 2B Upper Surge Tank Dome, & Condensate), Rev. 41
OFD-121A-2.8, Oconee Unit 2 Flow Diagram of Condensate System (Condensate Makeup & Emergency FDW Pump Suction), Rev. 17
OFD-121A-3.3, Oconee Unit 3 Flow Diagram of Condensate System (Main Condenser 3C), Rev. 19
OFD-121A-3.7, Oconee Unit 3 Flow Diagram of Condensate System (Upper Surge Tanks 3A & 3B Upper Surge Tank Dome, & Condensate), Rev. 46

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OFD-131A-1.1, Flow Diagram of PSW System, Rev. 2
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KHS-GOV-F-0064-04, Keowee Hydro Station – Submittal 36 and Certificate of Conformance for Unit-1, July 30, 2004
KM 200.—0173.001, Keowee Hydroelectric Station Governor Replacement Instruction Manual, Volume 1
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AD-EG-ALL-1132, Preparation and Control of Design Change Engineering Changes, Rev. 6
AD-EG-ALL-1133, Preparation and Control of Equivalent Change Engineering Changes, Rev. 2
AD-EG-ALL-1155, Post Modification Testing, Rev. 3
AD-EG-ALL-1206, Equipment Reliability Classification, Rev. 3
AD-EG-ALL-1214, Condition Monitoring of Structures, Rev. 0
AD-EG-ALL-1452, Check Valve Component Program, Rev. 0
AD-EG-ALL-1720, Inservice Testing (IST) Program Implementation, Rev. 2
AD-EG-ONS-1214, Condition Monitoring of Structures, Rev. 0
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AD-PI-ALL-0100, Corrective Action Program, Rev. 7
AP/0/A/1700/025, Standby Shutdown Facility Emergency Operating Procedure, Rev. 63
AP/0/A/1700/043, Fire Brigade Response Procedure, Rev. 8
AP/1/0/1700/043, Fire Brigade Response Procedure, Rev. 8
AP/1/A/1700/002, Excessive RCS Leakage, Rev. 15
AP/1/A/1700/011, Recovery from Loss of Power, Rev. 56
AP/1/A/1700/014, Loss of Normal HPI Makeup and/or RCP Seal Injection, Rev. 18
AP/1/A/1700/050, Challenging Plant Fire, Rev. 3
AP/1/A/1700/050, Challenging Plant Fire, Rev. 3
AP/2/A/1700/050, Challenging Plant Fire, Rev. 3
AP/3/A/1700/050, Challenging Plant Fire, Rev. 3
DUKE-QAPD-001, Quality Assurance Program Description, Amend. 41
EDM-601, Engineering Change Manual, Rev. 9
EP/1/A/1800/001 00, Unit 1 EOP Immediate Manual Actions and Subsequent Actions, Rev. 1
EP/1/A/1800/001 0B, Unit 1 EOP Blackout, Rev. 3
EP/1/A/1800/001 0C, Unit 1 EOP Inadequate Core Cooling, Rev. 1
EP/1/A/1800/001 0D, Unit 1 EOP Loss of Subcooling Margin, Rev. 1
EP/1/A/1800/001 0E, Unit 1 EOP Loss of Heat Transfer, Rev 0
EP/1/A/1800/001 0F, Unit 1 EOP Excessive Heat Transfer, Rev. 0
EP/1/A/1800/001 0G, Unit 1 EOP Steam Generator Tube Rupture, Rev 0
EP/1/A/1800/001 0H, Unit 1 EOP Turbine Building Flood, Rev. 0
EP/1/A/1800/001 0I, Unit 1 EOP LOCA Cooldown, Rev. 0
EP/1/A/1800/001 0J, Unit 1 EOP HPI Cooldown, Rev 0
EP/1/A/1800/001 0L, Unit 1 EOP Rules and Appendix, Rev 1
EP/1/A/1800/001 0M, Unit 1 EOP Enclosures 5.1-5.10, Rev. 1
EP/1/A/1800/001 0M, Unit 1 EOP Enclosures 5.1-5.10, Rev. 1
EP/1/A/1800/001 0N, Unit 1 EOP Enclosures 5.11-5.20, Rev. 0
EP/1/A/1800/001 0O, Unit 1 EOP Enclosures 5.21-5.30, Rev. 1
EP/1/A/1800/001 0P, Unit 1 EOP Enclosures 5.31-5.40, Rev. 0
EP/1/A/1800/001 0Q, Unit 1 EOP Enclosures 5.41-5.46, Rev. 4
EP/2/A/1800/001, Enclosure 5.42, PSW Power and Pump Alignment, Rev. 0Q
IP/0/A/0203/001 A, Low Pressure Injection System Borated Water Storage Tank Level Instrument Calibration, Revs. 43, 45, 46
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IP/0/A/0275/010 L, Upper Surge Tank Level Instrument Calibration, Rev. 45
IP/0/A/0401/001 B, KHU-1 and 2 TXS Governor Control System Cabinet Maintenance and Calibration, Rev. 8

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IP/O/A/2001/005, Cogenel FX-22 Power Circuit Breaker Inspection and Maintenance, Rev. 31
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NSD-301, Engineering Change Program, Rev. 33
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OSS-0218.00-00-0019, Cable and Wiring Separation Criteria, Rev. 17
OSS-0218.00-00-0025, Specification for the Installation of Field Run Cable Support Systems, Rev. 15
PT/0/A/0120/033, Time Critical Action Verification, Rev. 3
PT/0/A/0500/001, Protected Service Water Primary and Booster Pump Test, Rev. 1
PT/0/A/0620/016, Keowee Hydro Emergency Start Test, Rev. 50
PT/1/A/0152/003, Condensate System Valve Stroke Test, Rev. 17
PT/1/A/0152/018, Spent Fuel Cooling System Valve Stroke Test, Rev. 14, performed 11/13/16
PT/1/A/0152/035, 1PSW-22 and 1PSW-24 Valve Stroke Test, Rev. 2
PT/1/A/0202/011, High Pressure Injection Pump Test, Rev. 99, performed 2/29/16, 4/3/16, and 10/1/16
PT/1/A/0251/024, HPI Full Flow Test, Rev. 47, performed 11/26/16
PT/1/A/0610/025, Electrical System Weekly Surveillance (Unit 1), Rev. 23
PT/1-2/A/0150/070, Leak Test of SFP Cooling Purification System Isolation from BWST, Rev. 1, performed 6/2/16
PT/2/A/0152/003, Condensate System Valve Stroke Test, Rev. 18
PT/2/A/0202/011, High Pressure Injection Pump Test, Revs. 87, 88, performed 12/28/15, 4/4/16, and 1/3/17
PT/2/A/0251/024, HPI Full Flow Test, Rev. 40, performed 11/9/15
PT/3/A/0150/070, Leak Test of SFP Cooling Purification System Isolation from BWST, Rev. 0
PT/3/A/0152/003, Condensate System Valve Stroke Test, Rev. 18
PT/3/A/0152/018, Spent Fuel Cooling System Valve Stroke Test, Rev. 18, performed 8/25/16
PT/3/A/0202/011, High Pressure Injection Pump Test, Revs. 88, 89, 90, performed 1/11/16, 2/11/16, and 11/8/16
PT/3/A/0230/015, High Pressure Injection Motor Cooler Performance Test, Rev. 37
PT/3/A/0251/024, HPI Full Flow Test, Rev. 43, performed 5/17/16
PT/O/A/0620/009, Keowee Hydro Operation, Rev. 51, performed 1/26/17
PT/O/A/0620/009, Keowee Hydro Operation, Rev. 51, performed 12/19/16
PT/O/A/0620/009, Keowee Hydro Operation, Rev. 51, performed 2/20/17
PT/O/A/0620/016, Keowee Hydro Emergency Start Test, Rev. 46, performed 10/30/13
PT/O/A/0620/016, Keowee Hydro Emergency Start Test, Rev. 48, performed 1/21/15
PT/O/A/0620/016, Keowee Hydro Emergency Start Test, Rev. 49, performed 2/3/16
PT/O/A/0620/018, KHS Out Of Tolerance Test, Rev. 6, performed 1/8/14
PT/O/A/0620/018, KHS Out Of Tolerance Test, Rev. 6, performed 9/1/11
PT/O/A/0620/018, KHS Out Of Tolerance Test, Rev. 8, performed 6/22/16

Self Assessment Reports
Action Request 02066214, ONS 2017 CDBI Readiness Assessment

Modifications
EC 091877, Protected Service Water, Main Header, Rev. 102
EC 109523, U1&2 BWST Recirc Isolation Valves, Rev. 11

EC 109523, Unit 1/2 BWST AOVs 0SF166 and 167, Rev. 10
EC 109548, U3 BWST Recirc Isolation Valves, Rev. 9
EC 110081, Inst. Class F Evaporative Cooling Piping U1/2 Blockhouse, Rev. 8
EC 110082, Connect U1/2 Block House Evap. Cooling Piping to HPSW, Rev. 7
EC 110111, Modify Unit 1/2 Blockhouse Ventilation Fans, Rev. 16
EC 112284, 230KV Switchyard Yellow Bus Differential Relay Upgrade, Rev. 6
EC 89698-001
EC 89698-002
EC 98777, Reverse Osmosis – Install Two 2”, Class C, Return Check Valve Conns, Rev. 11
EC 98778, Add Piping Connecting the U3 BWST & U3 SFP with the Reverse Osmosis Unit, Rev. 12
EC 99505, Reverse Osmosis: Install U1/U2 BWST Connection to the RO Unit, Rev. 9
EC 99506, Reverse Osmosis: Install U2 Piping for U1/U2 SFP, and Return Line to the New RO Unit, Rev. 17
NSM ON-13098, Upper Surge Tank Inventory Protection
NSM ON-23098, Upper Surge Tank Inventory Protection
NSM ON-23106, ECCS – EOPI Reroute Lines to RB Emergency Sump, Rev. 0
NSM ON-33098, Upper Surge Tank Inventory Protection
NSM ON-52965, (Refurb) Keowee Excitation System Replacement, Rev. 0
NSM ON-52965, 10CFR50.59 Evaluation, Unit 1, 10/23/03
NSM ON-52965, 10CFR50.59 Evaluation, Unit 2, 3/25/04
NSM ON-52965, Final Scope Document Phase A Unit 1 and Phase B Unit 2, Rev 1
NSM ON-52965, Modification Test Plan SSC Installed and Operational, Rev. 1

Work Orders

01610217	02145210-01	20030686	20095617	20135264
01660344	02146377-01	20030974	20095622	20135293
01665243	02147174-01	20030978	20095626	20142103
01716227	02162007	20042749	20095629	20142657
01718922	02186866-03	20055071	20097110-98	20142903
02043113	02191062	20075543-01	20104330	20142913
02051662-01	20003777-01	20091575	20109248	
02056425-01	20025262-01	20092120	20130568	
02077787-01	20028915-01	20094665	20130569	

Corrective Action Program Documents Written Due to this Inspection
02101634, No PM Established for Unit 3 Blockhouse Fans
02106397, 2017 DBAI: Review of EC 109548 & 109523 Found Doc Deficiency
02106400, 2017 DBAI- RO Accumulated Operating Time Needs to be Tracked
02106590, PSW Walkdown Follow-up Items
02106771, 2017 DBAI - Cables from 1, 2C-903, 2C-0904 near piping
02106859, 2017 DBAI – Door of 2DIC panelboard found unsecured
02106867, 2017 DBAI - Clarify guidance on cable/piping separation
02106913, 2017 DBAI – Switchyard Panelboards Found Unsecured
02106958, DBAI 2017 - Metal Buckets in 230kV Switchyard
02108432, 2017 DBAI: Add vendor information to Inverter Manual
02108619, NRC Proposed Minor Performance Deficiency
02109141, NFPA 805 HPI Gas Intrusion Evaluation
02109622, NRC DBAI Inspection Identified Error in NCR 02092434
02110063, 2017 DBAI- Trenches between CT4 Blockhouse and Switchyard

02110405, 2017 DBAI: Improve documentation re: HPIP check-valves closed
02110447, 2017 DBAI – Evaluate need for training
02110469, DBAI 2017- QA Condition of vital panelboard breakers
02110479, PSW Further Evaluations Needed
02110634, 2017 DBAI – unapproved change to the plant
02111063, 2017 DBAI NRC Inspection PSW Cable Routing
02111078, 2017 DBAI: Document NRC IN 2005-21 Resolution
02111091, 2017 DBAI: NRC Comment on ODP Entry sensitivity