UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

August 05, 2015

Mr. Scott Batson
Site Vice President
Duke Energy Carolinas, LLC
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT 05000269/2015002, 05000270/2015002, 05000287/2015002

Dear Mr. Batson:

On June 30, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Oconee Nuclear Station Units 1, 2, and 3. On July 9, 2015, 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 three findings of very low safety significance (Green) in this report. These findings did not involve a violation of NRC requirements.

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 II; and the NRC resident inspector at the Oconee Nuclear Site.

In accordance with Title 10 of the Code of Federal Regulations 2.390, “Public Inspections, Exemptions, Requests for Withholding,” of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC’s Public Document Room or from the Publicly Available Records (PARS) component of 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/

Frank Ehrhardt, Chief
Reactor Projects Branch 1
Division of Reactor Projects

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

Enclosure: NRC Integrated Inspection Report 05000269/2015002, 05000270/2015002, 05000287/2015002 w/Attachment: Supplemental Information

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-269, 50-270, 50-287
License Nos:	DPR-38, DPR-47, DPR-55
Report Nos:	05000269/2015002, 05000270/2015002, 05000287/2015002
Licensee:	Duke Energy Carolinas, LLC
Facility:	Oconee Nuclear Station, Units 1, 2 and 3
Location:	Seneca, SC 29672
Dates:	April 1, 2015, through June 30, 2015
Inspectors:	E. Crowe, Senior Resident Inspector N. Childs, Resident Inspector G. Croon, Resident Inspector J. Eargle, Senior Reactor Inspector (Sections 1R17, 4OA5) N. Coovert, Senior Construction Inspector (Sections 1R17, 4OA5) M. Riley, Reactor Inspector (Sections 1R17, 4OA5) B. Davis, Senior Construction Inspector (Section 1R17)
Approved by:	Frank Ehrhardt, Chief Reactor Projects Branch 1 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000269/2015-002, 05000270/2015-002, 05000287/2015-002; April 1, 2015 through June 30, 2015; Oconee Nuclear Station Units 1, 2 and 3; Evaluations of Changes, Tests, or Experiments and Permanent Plant Modifications

The report covered a three-month period of inspection by the resident inspectors and regional inspectors. Three Green findings (FIN) were identified. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Components Within the Cross-Cutting Areas dated December 4, 2014." All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated February 4, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5."

NRC Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The NRC identified a finding for the licensee's failure to verify the adequacy of design inputs used in protected service water (PSW) testing and engineering evaluations to validate that the PSW system could perform its design function with respect to Milestone 4 of order EA-13-010, in accordance with the Duke Energy Carolinas Topical Report, Quality Assurance Program. The licensee entered this issue into their corrective action program as problem investigation program reports (PIPs) O-15-03630, O-15-03527, O-15-03529, O-15-03631, O-15-03530, NCR 01930521, NCR 01929161, and PIP 0-15-4544.

  The performance deficiency was more than minor because it was associated with the design control attribute and adversely affected the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the errors identified in the hydraulic flow modeling software, Calculation OSC-9595, "Protected Service Water (PSW) Hydraulic Model," Rev. 6, and supporting documentation required significant revision and reanalysis in order to determine that the PSW system was capable of meeting its design flow requirements for short term secondary heat removal capability. The inspectors 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 inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of avoid complacency within the human performance area. Specifically, the licensee failed to utilize standard human error prevention tools to ensure critical reviews were performed for the PSW testing and engineering evaluations supporting the completion of Milestone 4 of order EA-13-010 dated July 1, 2013. [H.12] (Section 1R17)

- Green. The NRC identified a finding for the licensee's failure to ensure that appropriate acceptance criteria was used during testing to verify PSW primary pump functionality in accordance with the Duke Energy Carolinas Topical Report, Quality Assurance Program. The licensee entered this issue into their corrective action program as PIP O-15-03190.

  The performance deficiency was more than minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern. Specifically, PSW pump surveillance PT/0/A/0500/001, "Protected Service Water Primary and Booster Pump Test," Rev. 0, did not incorporate acceptance limits established by design documents, and as a result, the licensee could unknowingly consider the PSW primary pump functional beyond seven percent pump degradation. The inspectors 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 SSC, and the SSC maintained its functionality. The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of avoid complacency within the human performance area. Specifically, the licensee failed to utilize standard human error prevention tools to ensure critical reviews were performed for PSW pump testing. [H.12] (Section 1R17)

- Green. The NRC identified a finding for the licensee's failure to translate the design requirements of the high pressure injection (HPI) pump motor coolers into the procedure used to verify adequate flow from PSW, in accordance with the Duke Energy Carolinas Topical Report, Quality Assurance Program. Specifically, the licensee failed to incorporate the fouling factor assumed in Calculation OSC-2042, "HPI Pump Motor Upper Bearing Cooling Report," Rev. 8, into Procedure TT/1/A/05000/008, "High Pressure Injection Motor Cooler Flow Test from PSW," Rev. 2. The licensee entered this issue into their corrective action program as PIPs O-15-03608 and O-15-04544.

  The performance deficiency was more than minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern. Specifically, the low pressure service water (LPSW) and PSW flow test acceptance criteria could have been met without ensuring adequate heat transfer could be provided from the HPI motor coolers to PSW. The inspectors 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 SSC, and the SSC maintained its operability or functionality. The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of teamwork within the human performance area. Specifically, the licensee failed to demonstrate a strong sense of collaboration and cooperation in connection with projects to ensure critical reviews were performed for the procedures used to test the HPI motor coolers. [H.4] (Section 1R17)

  Licensee-Identified Findings

  No findings were identified.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at approximately 100 percent rated thermal power (RTP) and remained at this power level for the remainder of the inspection period.

Unit 2 began the inspection period at approximately 100 percent RTP and remained at this power level for the remainder of the inspection period.

Unit 3 began the inspection period at approximately 100 percent RTP and remained at this power level for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection

a. Inspection Scope

Evaluation of Summer Readiness of Offsite and Alternate AC Power Systems:

The inspectors reviewed the licensee's procedures for operation and continued availability of offsite and onsite alternate AC power systems. The inspectors also reviewed the communications protocols between the transmission system operator and the licensee to verify that the appropriate information is exchanged when issues arise that could affect the offsite power system.

The licensee did not implement equipment or procedure changes that potentially affect operation or reliability of offsite and alternate AC power systems since the last time the inspectors assessed grid reliability.

The inspectors reviewed the material condition of offsite and onsite alternate AC power systems (including switchyard and transformers) by performing a walkdown of the switchyard. The inspectors reviewed outstanding work orders and assessed corrective actions for degraded conditions that impacted plant risk or required compensatory actions. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial Walkdown

a. Inspection Scope

The inspectors verified that critical portions of the selected systems were correctly aligned by performing partial walkdowns. The inspectors selected systems for assessment because they were a redundant or backup system or train, were important for mitigating risk for the current plant conditions, had been recently realigned, or were a single-train system. The inspectors determined the correct system lineup by reviewing plant procedures and drawings. The inspectors observed whether there was indication of degradation, and if so, verified the degradation was being appropriately managed in accordance with an aging management program and it had been entered into the licensee's corrective action program. Documents reviewed are listed in the attachment.

The inspectors selected the following five systems or trains to inspect:

- Unit 0, Keowee 125vDC electrical system during the service test of Keowee Battery Bank 1 and subsequent equalizing charge while the battery was inoperable
- Unit 0, electrical distribution alignment in Unit 1/2 control room, while Keowee underground path was out of service for planned maintenance and testing
- Unit 0, electrical distribution alignment of Keowee Unit 2 and associated support systems during repairs of oil/water leaks of Keowee Unit 1
- Unit 1, 1B low pressure injection, while 1A train was out of service for planned maintenance
- Unit 2, 2A & B motor driven emergency feedwater pump (MDEFWP), while PSW system power was unavailable to standby shutdown facility (SSF) due to cable pulls

b. Findings

No findings were identified.

.2 Complete System Walkdown

a. Inspection Scope

The inspectors conducted a complete walkdown of accessible components of the Unit 3 vital DC system to verify proper equipment alignment. The inspectors selected this system for assessment because it is a risk-significant mitigating system. The inspectors determined the correct system lineup by reviewing plant procedures, drawings, and other documents. During the walkdown, the inspectors observed whether there was indication of equipment degradation, and if so, verified the degradation had been entered into the licensee's corrective action program.

The inspectors reviewed pending design and equipment issues to determine if identified deficiencies significantly impacted the system's functions. Items included in the review were the engineering change list, system health report, and outstanding maintenance work requests/work orders (WOs). In addition, the inspectors reviewed outstanding

corrective actions to ensure that the licensee was identifying and resolving equipment problems. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Quarterly Inspection

a. Inspection Scope

The inspectors evaluated the adequacy of selected fire plans by comparing the fire plans to the defined hazards and defense-in-depth features specified in the fire protection program. In evaluating the fire plans, the inspectors assessed the following items:

- control of transient combustibles and ignition sources
- fire detection systems
- fire suppression systems
- manual firefighting equipment and capability
- passive fire protection features
- compensatory measures and fire watches
- issues related to fire protection contained in the licensee's corrective action program

The inspectors toured the following four fire areas to assess material condition and operational status of fire protection equipment. Documents reviewed are listed in the attachment.

- Unit 1, 1A and 1C low pressure injection pump room, fire zone 54
- Unit 1, equipment room, fire zone 95
- Unit 3, turbine building, fire zone 01
- Unit 3, 3A low pressure injection pump room, fire zone 48

b. Findings

No findings were identified.

1R06 Flood Protection Measures

a. Inspection Scope

Internal Flood Protection: The inspectors reviewed related flood analysis documents and walked down the two areas listed below containing risk-significant SSCs susceptible to flooding. The inspectors verified that plant design features and plant procedures for flood mitigation were consistent with design requirements and internal flooding analysis assumptions. The inspectors also assessed the condition of flood protection barriers and drain systems. In addition, the inspectors verified the licensee was identifying and properly addressing issues using the corrective action program. Documents reviewed are listed in the attachment.

The inspectors toured the following two distinct areas to assess the material condition of the penetrations, penetration seals, and flood mitigation equipment.

- Unit 1 low pressure injection 1A pump room
- Unit 3 low pressure injection 3A pump room

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification

.1 Resident Inspector Quarterly Review of Licensed Operator Requalification:

a. Inspection Scope

On June 24, 2015, the inspectors observed one active simulator training session to assess the performance of licensed operators as part of requalification training. The scenario involved the sequential loss of one HPI pump, two main feedwater pumps, and one reactor coolant pump, with a concurrent steam generator tube rupture. Events progressed to a point where the crew entered an Alert event emergency declaration. The post-scenario critique conducted by the training instructor and the crew was also observed.

The inspectors assessed the following:

- licensed operator performance
- the ability of the licensee to administer the scenario and evaluate the operators
- the quality of the post-scenario critique
- simulator performance

Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

.2 Resident Inspector Quarterly Review of Licensed Operator Performance in the Actual Plant/Main Control Room:

a. Inspection Scope

The inspectors observed operator performance in the main control room on May 17, 2015 during Unit 3 control rod movement testing.

The inspectors assessed the following:

- use of plant procedures
- control board manipulations
- communications between crew members

- use and interpretation of instruments, indications, and alarms
- use of human error prevention techniques
- documentation of activities
- management and supervision

Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors assessed the licensee's treatment of the two issues listed below to verify the licensee appropriately addressed equipment problems within the scope of the maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"). The inspectors reviewed procedures and records to evaluate the licensee's identification, assessment, and characterization of the problems as well as their corrective actions for returning the equipment to a satisfactory condition. The inspectors also interviewed plant personnel to evaluate the adequacy of the corrective actions and the licensee's treatment of the issue per the requirements of 10CFR50.65. Documents reviewed are listed in the attachment.

- Nuclear condition report (NCR) 1932329, 3RIA-15 alarm storage tank vent header leak
- PIP O-14-13699, Blockhouse cooling fan failures

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors reviewed the four maintenance activities listed below to verify that the licensee assessed and managed plant risk as required by 10 CFR 50.65(a)(4) and licensee procedures. The inspectors assessed the adequacy of the licensee's risk assessments and implementation of risk management actions. The inspectors also verified that the licensee was identifying and resolving problems with assessing and managing maintenance-related risk using the corrective action program. Additionally, for maintenance resulting from unforeseen situations, the inspectors assessed the effectiveness of the licensee's planning and control of emergent work activities. Documents reviewed are listed in the attachment.

- Yellow risk condition during CT-4 relay lockout testing
- Yellow risk condition during pressurizer cable pull modifications
- Yellow risk condition (Unit 0) during PSW primary and booster pump testing

- Yellow risk condition during Unit 3 engineered safeguards (ES) troubleshooting

b. Findings

No findings were identified.

1R15 Operability Evaluations and Functionality Assessments

.1 Operability and Functionality Review

a. Inspection Scope

The inspectors selected the seven operability determinations or functionality evaluations listed below for review based on the risk-significance of the associated components and systems. The inspectors reviewed the technical adequacy of the determinations to ensure that technical specification operability was properly justified and the components or systems remained capable of performing their design functions. To verify whether components or systems were operable, the inspectors compared the operability and design criteria in the appropriate sections of the technical specification and updated final safety analysis report to the licensee's evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the attachment.

- NCR 01933005, Unit 1 and Unit 2, Cable room and equipment room temperatures continue to increase without stabilizing after securing air handling unit (AHU) 2-35 for maintenance
- PIP-O-15-3237, Unit 2, U2 SSF reactor coolant makeup unit (RCMU) pump suction pressure
- PIP-O-15-3446, Unit 1, 125V essential DC cables with torn outer jackets.
- PIP-O-15-3676, Unit 2, 2CA battery declared inoperable
- PIP-O-15-4293, Keowee Unit-1, Multiple alarms at Keowee hydro station and U2 control room
- PIP-O-15-04544, Units 1, 2, & 3, high pressure motor upper bearing oil cooler may have inadequate heat transfer performance to support PSW scenarios
- PIP-O-15-04619, Unit 1, support restraints for armadillo splice enclosures for the backup power cables from Unit 2 DC distribution centers to isolating diode cabinets 1ADA, 1ADB, 1ADC and 1ADD do not match drawings on EC-91851

b. Findings

No findings were identified.

.2 Operator Work-Around Review

a. Inspection Scope

The inspectors performed a detailed review of the licensee's operator work-around, operator burden, and control room deficiency lists for the station in effect on June 24, 2015 to verify that the licensee identified operator workarounds at an appropriate threshold and entered them in the corrective action program. The inspectors verified that the licensee identified the full extent of issues, performed appropriate evaluations, and planned appropriate corrective actions. The inspectors also reviewed compensatory actions and their cumulative effects on plant operation. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R17 Evaluations of Changes, Tests, or Experiments and Permanent Plant Modifications

a. Inspection Scope

Evaluations of Changes, Tests, and Experiments: The inspectors reviewed three safety evaluations performed pursuant to Title 10, *Code of Federal Regulations* (CFR) 50.59, to determine if the evaluations were adequate and that prior NRC approval was obtained as appropriate. The inspectors also reviewed one screening where licensee personnel had determined that a 10 CFR 50.59 evaluation was not necessary. The inspectors reviewed these documents to determine if:

- the changes, tests, or experiments performed were evaluated in accordance with 10 CFR 50.59 and that sufficient documentation existed to confirm that a license amendment was not required;
- the safety issues requiring the changes, tests, or experiments were resolved;
- the licensee conclusions for evaluations of changes, tests, or experiments were correct and consistent with 10 CFR 50.59; and
- the design and licensing basis documentation used to support the change was updated to reflect the change.

The inspectors used, in part, Nuclear Energy Institute (NEI) 96-07, "Guidelines for 10 CFR 50.59 Implementation," Revision 1, to determine acceptability of the completed evaluations and screenings. The NEI document was endorsed by the NRC in Regulatory Guide 1.187, "Guidance for Implementation of 10 CFR 50.59, Changes, Tests, and Experiments," dated November 2000.

Permanent Plant Modifications: The inspectors reviewed two permanent plant modifications that had been installed in the plant during the last three years. The modifications reviewed are listed below:

- EC 91877 - PSW System Header Installation
- EC 91878 - Replace ASW System with PSW System

The inspectors reviewed the modifications selected to determine if:

- the supporting design and licensing basis documentation was updated;
- the changes were in accordance with the specified design requirements;
- the test documentation as required by the applicable test programs had been updated; and
- post-modification testing adequately verified system operability and/or functionality.

The inspectors also used applicable industry standards to evaluate acceptability of the modifications and performed walk-downs of accessible portions of the modifications. Documents reviewed are listed in the attachment.

b. Findings

1. Inadequate Design Inputs for PSW Testing and Engineering Evaluations

Introduction: The inspectors identified a Green finding for the licensee's failure to verify the adequacy of design inputs used in PSW testing and engineering evaluations to validate that the PSW system could perform its design function with respect to Milestone 4 of Order EA-13-010, in accordance with the Duke Energy Carolinas Topical Report, Quality Assurance Program (QAP).

Description: The inspectors identified five examples of deficiencies in design inputs for PSW testing and engineering evaluations, as follows:

- Example 1 - Failure to verify the hydraulic flow model accurately reflected the as-built plant configuration.
  The inspectors performed field walk-downs to verify that the as-built plant configuration of the PSW system was consistent with plant drawings and inputs into the hydraulic flow modeling software, as documented in calculations OSC-9595, "PSW Hydraulic Model," Rev. 6, and OSC-11375, "PSW Hydraulic Model SG Injection Resistance Verification (Unit 1)," Rev. 0. During the inspector walk-downs, the inspectors identified non-conservative discrepancies in the number of elbows, piping lengths, and a valve location in a piping segment. As a result, the hydraulic flow modeling software and the as-built PSW system in the plant were not in the same configuration and did not represent an equal comparison.

- Example 2 - Failure to utilize the correct flow coefficient (C_V) values for check valves PSW-9 and PSW-11 in calculation OSC-9595, Rev. 6.
  The inspectors noted that in calculation OSC-9595 the licensee stated that there were no vendor specified flow coefficient (C_V) values for check valves 1,2,3PSW-9 and 1,2,3PSW-11. The calculation used 879.244, which was a generic value from the hydraulic flow modeling software. Upon further review, the inspectors determined that the vendor did specify a C_V value of 652, which was more restrictive than the generic value of 879.244. Additionally, the inspectors noted that the C_V value specified by the vendor was for a 100 percent open valve, but the system flow during the licensee's as-built test run documented in OSC-11375 would not be sufficient to open the valve to the 100 percent position specified by the vendor. This

indicated that the actual C_V would be lower than 652 and therefore more restrictive. The inspectors determined that this caused the model to predict more flow through these valves than would be actually present during an event requiring PSW, which was non-conservative.

- Example 3 – Failure to verify HPI pump motor bearing cooler temperature control LPSW outlet valves were appropriately modeled in calculations OSC-9595 and OSC-11375.
  The LPSW temperature control outlet valves (1LPSW-154, -159, and -164) to the HPI pump motor bearing coolers were throttled to ensure flowrates to each cooler were greater than or equal to 3.5 gallons per minute (gpm). The inspectors noted that these valves were included in the PSW hydraulic flow model software, but these valves were characterized as 100 percent open instead of being shown in a throttled position. As a result, the hydraulic flow modeling software model did not accurately reflect the actual system resistance provided by throttling these valves, and therefore, did not represent an equal comparison.

- Example #4 - Failure to verify that the system configuration and assumptions input into the hydraulic flow modeling software accurately reflect actual plant configuration during testing.
  The licensee's initial validation test run of the PSW system was documented in calculation OSC-11375. Section 3.3 of OSC-11375 stated, in part, that "In the model, PSW-14 (PSW minimum flow valve) is throttled to achieve the sump flow rate recorded in the field." However, the inspectors noted that PSW-14 was not throttled during the field tests (i.e. full open). During interviews with the licensee and their vendor who created the model, the inspectors identified that PSW-14 had been throttled for each software model run and as a result, the model and the field test run were not in the same configuration and did not represent an equal comparison. In addition, the licensee did not verify why there was a difference in the system resistance between the Unit 1 field test and the hydraulic flow model, and instead chose to account for this error by throttling the PSW-14 valve.

- Example #5 – Failure to verify instrument loop uncertainty was correctly translated into the hydraulic flow model.
  The inspectors noted that section 2.3 of Appendices C and G of calculation OSC-9595 stated, in part, that the total loop uncertainty for solenoid operated valves (SOVs) PSW-22 and PSW-24 (inlet valves to A and B steam generators, respectively), was ±18.6 gpm ±1.38 gpm. The instrument uncertainty used in OSC-9595 was incorporated by reference from OSC-9259, "PSW Flow Instrumentation Loop Uncertainty Calculation," Rev. 1. The inspectors reviewed Section 8.0, "Conclusions/Results," of the licensee's most current revision of OSC-9259, Rev. 2, which stated in part, that the PSW flow indicator total loop uncertainty for normal operation was 19.8 GPM ± 3.66 gpm. The inspectors identified that the licensee did not update calculation OSC-9595, the inputs to the hydraulic flow modeling software, and five additional calculations, when the revision to the uncertainty calculation was made. As a result, the change in instrument uncertainty had a non-conservative impact on the results of the model, specifically with respect to the most limiting steam generator alignment.

The inspectors noted that the licensee had established self-imposed standards that major components of the PSW system would be included in the Quality Assurance Condition 1 (QA-1) program, as documented in Section 3.1.2.2, “Quality Assurance Standards,” of the Safety Evaluation by the Office of Nuclear Reactor Regulation (NRR) related to Amendments Nos. 386, 388, and 387. Duke Energy Carolinas Topical Report, QAP, Amendment 40, stated in part, that the QAP “conforms to the criteria established in Appendix B to Title 10 Code of Federal Regulations (CFR), Part 50, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” and that it applies in its entirety to systems, components, items, and services identified as QA-1.” Appendix B to Title 10 CFR Part 50, Criterion III, “Design Control,” states, in part that “design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program.”

The inspectors identified that since February 25, 2015, the licensee failed to meet Title 10 CFR Part 50, Appendix B, Criterion III, when they failed to verify the adequacy of design through their established engineering processes. The inadequate design inputs in calculations OSC-9595, OSC-11375, and the hydraulic flow modeling software were not identified and corrected by the licensee prior to the completion of Milestone 4 on February 25, 2015, as documented in a Duke letter to the NRC, titled “Completion of Protected Service Water System Milestone 4,” dated March 24, 2015. The inspectors noted that the errors identified in the PSW testing and engineering evaluations indicated a lack of critical review performed by the licensee’s organization for these PSW modifications. In addition, the inspectors noted that standard error reduction tools used by technical workers, such as having a questioning attitude and verifying assumptions were valid, would have assisted in preventing the number and extent of the errors identified.

In response to the inspectors’ concerns, the licensee implemented multiple corrective action reports, including PIPs O-15-03630, O-15-03527, O-15-03529, O-15-03631, O-15-03530, NCR 01930521, NCR 01929161, and PIP 0-15-4544. The licensee also performed functionality assessments; performed a PSW system walk-down; and revised multiple calculations, drawings, and procedures. The licensee worked with the vendor and performed significant revision and reanalysis to the hydraulic flow modeling software and the engineering evaluation in OSC-9595, Rev. 7. The inspectors determined, based upon the new evaluations, that the PSW system was able to meet its design function as required in Milestone 4 of order EA-13-010.

Analysis: The licensee’s failure to verify the adequacy of design inputs used in PSW testing and engineering evaluations to validate that the PSW system could perform its design function was a performance deficiency. The performance deficiency was more than minor because it was associated with the design control attribute and adversely affected the short term secondary heat removal capability of the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the errors identified in the hydraulic flow modeling software, calculation OSC-9595, and supporting documentation required significant revision and reanalysis in order to determine that the PSW system was capable to meet its design flow requirements for short term secondary heat removal capability. The inspectors used IMC 0609, Att. 4,

"Initial Characterization of Findings," issued June 19, 2012, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings At Power," issued June 19, 2012, and 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 inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of avoid complacency within the human performance area. Specifically, the licensee failed to utilize standard human error prevention tools to ensure critical reviews were performed for the PSW testing and engineering evaluations. [H.12]

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. The PSW system does not contain safety-related SSCs and as a result, the PSW system is not required to meet the regulatory requirements set forth in Appendix B of Title 10 CFR Part 50. Because this finding does not involve a violation and is of very low safety significance, it is identified as a FIN. (FIN 05000269, 270, & 287/2015002–01, "Inadequate Design Inputs for PSW Testing and Engineering Evaluations")

2. Inadequate Acceptance Criteria for PSW Pump Surveillance Testing

Introduction: The inspectors identified a Green finding for the licensee's failure to ensure that appropriate acceptance criteria was used during testing to verify PSW primary pump functionality in accordance with the Duke Energy Carolinas Topical Report, Quality Assurance Program.

Description: Selected Licensee Commitment (SLC) 16.9.9, "PSW System," dated January 30, 2015, required the PSW system to be functional in Modes 1 and 2. SLC Surveillance Requirement (SR) 16.9.9.3 required that the developed head of PSW primary and booster pumps at the flow test point be greater than or equal to the required developed head in accordance with the Inservice Testing (IST) Program. For PSW to be considered functional, the SR must be met.

The inspectors reviewed the SLC 16.9.9 requirements, pump surveillances, IST data sheets, and test acceptance criteria (TAC) sheets. The inspectors noted that the flow band given in IST data sheets for quarterly surveillance PT/0/A/0500/001, "Protected Service Water Primary and Booster Pump Test," Rev. 0, were not aligned with the flow rate used during original functional testing in TT/0/A/0500/007, "Protected Service Water Pump Performance Test," Rev. 0, or with the values given in TAC sheets, ONTC-0-131A-0003-001, Rev. D and ONTC-0-131A-0003-002, Rev. C for the PSW booster pump, and ONTC-0-131A-0004-002, Rev. C for the PSW primary pump. Specifically, the flow rate range provided in the TAC sheets were 1400-1450 gpm for the PSW primary pump and 1430-1480 gpm for the PSW booster pump. However, the IST data sheet flow band for both pumps was 1294.8-1582.6 gpm, or +/- 10 percent of the baseline flow rate of 1438.7 gpm.

The inspectors noted that OSC-9595, Rev. 6 documented that seven percent degraded performance, not 10 percent degraded, was the limiting PSW primary pump performance necessary to still ensure PSW system capability. The inspectors also

identified that the licensee used the +/-10 percent IST flow band as the acceptance criteria for the IST requirements and SLC 16.9.9.3 functionality. As a result, if the PSW primary pump was tested at the low end of the flow rate range specified on the IST datasheet of 1294.83 gpm with a minimum differential pressure (d/p) across the pump of 1242.54 pounds per square inch, differential (psid), the results would have been less than the minimum required d/p value of 1250 psid for functionality. The IST limits are established so personnel can monitor pump performance and be able to recognize when pump degradation has occurred that would challenge the pumps ability to perform its function. In this case, the +/-10 percent IST flow band was non-conservative because it was beyond the limits to still ensure PSW system capability. As a result, when the PSW primary pump degradation occurs, the pump will become non-functional beyond seven percent degradation, unknowingly to the licensee, who was monitoring for 10 percent degradation. Therefore, the limits on the IST datasheet were inadequate to ensure the PSW primary pump would remain functional during pump performance degradation.

The inspectors noted that the licensee had established self-imposed standards that major components of the PSW system would be included in the QA-1 program, as documented in Section 3.1.2.2, Quality Assurance Standards, of the Safety Evaluation by the Office of NRR related to Amendments Nos. 386, 388, and 387. Duke Energy Carolinas Topical Report, QAP, Amendment 40, stated in part, that the QAP "conforms to the criteria established in Appendix B to Title 10 CFR, Part 50, and that it applies in its entirety to systems, components, items, and services identified as QA-1." Appendix B to Title 10 CFR, Part 50, Criterion XI, "Test Control," states, in part that "a test program shall be established to assure that all testing required to demonstrate that SSCs will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents."

The inspectors identified that since March 18, 2015, the licensee failed to meet Title 10 CFR Part 50, Appendix B, Criterion XI, when they failed to assure that the quarterly PSW testing to demonstrate functionality was performed in accordance with the acceptance limits of seven percent degraded pump condition. The inspectors noted that the errors identified in the PSW testing criteria indicated a lack of critical review performed by the licensee's organization. In addition, the inspectors noted that standard error reduction tools used by technical workers, such as having a questioning attitude and verifying assumptions were valid, would have assisted in preventing the error identified.

In response to the inspectors' concerns, the licensee entered this issue into their corrective action program as PIP O-15-03190. At the time of discovery, the licensee performed a functionality assessment and verified that both PSW pumps had adequate flow and d/p to ensure functionality per the requirements of SLC SR 16.9.9.3. The licensee also revised their TAC sheets and updated the hydraulic flow modeling software to accurate reflect the PSW primary pump performance limits.

Analysis: The licensee's failure to ensure that appropriate acceptance criteria was used during testing to verify PSW primary pump functionality, in accordance with the Duke Energy Carolinas Topical Report, QAP, was a performance deficiency. The performance deficiency was more than minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern.

Specifically, the PSW pump surveillance PT/0/A/0500/001 did not incorporate acceptance limits established by design documents, and as a result, the licensee could unknowingly consider the PSW primary pump functional beyond 7 percent pump degradation. The inspectors used IMC 0609, Att. 4, "Initial Characterization of Findings," issued June 19, 2012, for Mitigating Systems, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings at Power," issued June 19, 2012, and 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 SSC, and the SSC maintained its functionality.

The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of avoid complacency within the human performance area. Specifically, the licensee failed to utilize standard human error prevention tools to ensure critical reviews were performed for the PSW pump testing. [H.12]

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. The PSW system does not contain safety-related SSCs and as a result, the PSW system is not required to meet the regulatory requirements set forth in Appendix B of Title 10 CFR Part 50. Because this finding does not involve a violation and is of very low safety significance, it is identified as a FIN. (FIN 05000269, 270, & 287/2015002–02, "Inadequate Acceptance Criteria for PSW Pump Surveillance Testing")

3. Failure to Translate Design Requirements of the HPI Motor Cooler into Procedures

Introduction: The inspectors identified a Green finding for the licensee's failure to translate the design requirements of the HPI pump motor coolers into the procedure used to verify adequate flow from PSW, in accordance with the Duke Energy Carolinas Topical Report, QAP. Specifically, the licensee failed to incorporate the fouling factor assumed in calculation OSC-2042, "HPI Pump Motor Upper Bearing Cooling Report," Rev. 8, into procedure TT/1/A/05000/008, "High Pressure Injection Motor Cooler Flow Test from PSW," Rev. 2.

Description: Selected Licensee Commitment (SLC) 16.9.9, "PSW System," dated January 30, 2015, required the PSW system to be functional in Modes 1 and 2. SLC Surveillance Requirement (SR) 16.9.9.8 required the verification that the PSW booster pump and valves be able to provide adequate cooling water flow to 'A' and 'B' HPI pump motor coolers in accordance with the IST program. For PSW to be considered functional, the SR must be met.

Calculation OSC-2042 evaluated the HPI pump motor coolers after a turbine building high energy line break (HELB) event when the PSW system could be used for supplying cooing water. The inspectors noted that the calculation assumed a fouling factor of .0012 hr ft² °F/BTU and a minimum flow of 2.761 gpm to maintain the HPI pump motor bearing at a design maximum temperature of 226.7 °F. Calculation OSC-5649, "LPSW Test Acceptance Criteria (TAC)," Rev. 15, indicated that the acceptable value, including tolerance for PSW flow, was 3.5 gpm.

Procedure TT/1/A/05000/008 was used to verify adequate cooling water supply to the HPI motor coolers from PSW. This procedure incorporated the TAC from OSC-5649 to only verify 3.5 gpm flow without verifying that the fouling factor was within an acceptable range. Additionally, procedure PT/1/A/0230/015, "High Pressure Injection Motor Cooler Flow Test," Rev. 36 was used to verify adequate cooling water supply to the HPI motor coolers from LPSW. The TAC for this procedure provided a range of acceptable fouling factors and corresponding flows. The inspectors noted that the lowest value in the range for acceptable fouling factors on the TAC sheet for the LPSW flow was .002 hr ft² °F/BTU, which did not bound the assumed fouling factor associated with PSW design flows. This scenario could lead to the LPSW acceptance criteria being met, while simultaneously and unknowingly not meeting the PSW acceptance criteria.

The inspectors noted that the licensee had established self-imposed standards that major components of the PSW system would be included in the QA-1 program, as documented in Section 3.1.2.2, Quality Assurance Standards, of the Safety Evaluation by the Office of NRR related to Amendments Nos. 386, 388, and 387. Duke Energy Carolinas Topical Report, QAP, Amendment 40, stated in part, that the QAP "conforms to the criteria established in Appendix B to Title 10 CFR, Part 50, and that it applies in its entirety to systems, components, items, and services identified as QA-1." Appendix B to Title 10 CFR, Part 50, Criterion III, "Design Control," states, in part, that "Measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in Section 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies, are correctly translated into specifications, drawings, procedures, and instructions."

The inspectors determined that since October 8, 2014, the date when procedure TT/1/A/05000/008 was developed, the licensee failed to meet Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," by failing to translate the design requirements of the HPI pump motor coolers into the procedures used to verify adequate flow from PSW. Specifically, the licensee failed to incorporate the fouling factor assumed in calculation OSC-2042 into procedure TT/1/A/05000/008. The inspectors noted that the error identified with failing to translate the HPI design requirements into procedures indicated a lack of communication amongst the various licensee organizations involved with ensuring adequate flow to the HPI pump motor coolers. In addition, the inspectors noted that a strong sense of collaboration and cooperation amongst these organizations would have assisted in preventing the error identified.

In response to the inspectors' concerns, the licensee entered this issue into their corrective action program as PIPs O-15-03608 and O-15-04544, and performed a functionality evaluation that determined that the HPI pumps had adequate flow from PSW to support functionality of the system.

Analysis: The licensee's failure to translate the design requirements of the HPI motor coolers into the procedures used to perform performance testing, in accordance with the Duke Energy Carolinas Topical Report, QAP, was a performance deficiency. The performance deficiency was more than minor because if left uncorrected, the performance deficiency had the potential to lead to a more significant safety concern. Specifically, the LPSW and PSW flow test acceptance criteria could have been met without ensuring adequate heat transfer could be provided from the HPI motor coolers to

PSW. The inspectors used IMC 0609, Att. 4, "Initial Characterization of Findings," issued June 19, 2012, for Mitigating Systems, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings at Power," issued June 19, 2012, and 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 SSC, and the SSC maintained its operability or functionality.

The inspectors determined the finding was indicative of present licensee performance and was associated with the cross-cutting aspect of teamwork within the human performance area. Specifically, the licensee failed to demonstrate a strong sense of collaboration and cooperation in connection with projects to ensure critical reviews were performed for the procedures used to test the HPI motor coolers. [H.4].

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. The PSW system does not contain safety-related SSCs and as a result, the PSW system is not required to meet the regulatory requirements set forth in Appendix B of Title 10 CFR Part 50. Because this finding does not involve a violation and is of very low safety significance, it is identified as a FIN. (FIN 05000269, 270, & 287/2015002–03, "Failure to Translate the Design Basis into Procedures Used To Test the HPI Motor Coolers")

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspectors either observed post-maintenance testing or reviewed the test results for the six maintenance activities listed below to verify the work performed was completed correctly and the test activities were adequate to verify system operability and functional capability.

- PT/0/A/0610/024, Keowee Emergency Start for Troubleshooting and Post Maintenance Checkouts
- PT/1/A/0600/19 turbine driven emergency feedwater (TDEFDW) pump test following routine maintenance
- PT/1/A/0600/13B, 1B MDEFDW Pump Test
- PT/2/A/0152/008, coolant storage (CS) System Valve Stroke Test (2CS-46)
- PT/2/A/2200/003 KHU2 returned to service after unplanned replacement of 4B Relay
- OP/0/A/1106/029 Unit 1/2 control room area cooling after unplanned A chiller low oil level repair and maintenance

The inspectors evaluated these activities for the following:

- acceptance criteria were clear and demonstrated operational readiness
- effects of testing on the plant were adequately addressed
- test instrumentation was appropriate
- tests were performed in accordance with approved procedures
- equipment was returned to its operational status following testing
- test documentation was properly evaluated

Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with post-maintenance testing. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors reviewed the seven surveillance tests listed below and either observed the test or reviewed test results to verify testing adequately demonstrated equipment operability and met technical specification and licensee procedural requirements. The inspectors evaluated the test activities to assess for preconditioning of equipment, procedure adherence, and equipment alignment following completion of the surveillance. Additionally, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with surveillance testing. Documents reviewed are listed in the attachment.

Routine Surveillances

- IP/0/A/3000/003 KB1, Keowee Hydro Station Battery 1 Service Test and Annual Surveillance
- PT/3/A/0204/07 A, 3A RB spray pump test
- PT/3/A/0251/073, LPSW flow
- PT/3/A/0600/15, Control Rod Movement

In-Service Tests

- PT/2/A/0202/11, 2B HPI Pump Test
- PT/2/A/0202/11, 2C HPI Pump Test

Reactor Coolant System Leakage

- PT/2/A/0600/010, Reactor Coolant Leakage

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

1EP6 Drill Evaluation

a. Inspection Scope

The inspectors observed emergency preparedness drills conducted on May 5, 2015 and June 23, 2015. The inspectors observed licensee activities in the simulator (on June 23, 2015) and technical support center (on May 5, 2015 and June 23, 2015) to evaluate implementation of the emergency plan, including event classification, notification, and protective action recommendations. The inspectors evaluated the licensee's

performance against criteria established in the licensee's procedures. The inspectors verified the licensee's identified weaknesses were entered in the corrective action program. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

The inspectors sampled licensee data to confirm the accuracy of reported PI data for the following nine PIs. To determine the accuracy of the report PI elements, the reviewed data was assessed against PI definitions and guidance contained in Nuclear Energy Institute 99-02, Regulatory Assessment Indicator Guideline, Revision 7. Documents reviewed are listed in the attachment.

Cornerstone: Mitigating Systems
- High Pressure Injection (3 units)
- Cooling Water (3 units)

Cornerstone: Barrier Integrity
- Reactor Coolant System Leakage (3 units)

For the period of July 1, 2014, through June 30, 2015, the inspectors reviewed operating logs, train unavailability data, maintenance records, maintenance rule data, PIPs, consolidated derivation entry reports, and system health reports to verify the accuracy of the PI data reported for each PI.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution

.1 Daily Screening of Corrective Action Reports

a. Inspection Scope

In accordance with Inspection Procedure (IP) 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed daily screening of items entered into the licensee's CAP. This review was accomplished by reviewing copies of PIPs, attending daily screening meetings, and accessing the licensee's computerized database.

b. Findings

No findings were identified.

.2 Annual Sample Review: Standby Shutdown Facility (SSF) Fire Impairments

a. Inspection Scope

The inspectors conducted a detailed review of the circumstances surrounding multiple fire impairments at the SSF. As part of the detailed review, the inspectors reviewed site documents and interviewed plant personnel to verify that the SSF fire area was appropriately classified in accordance with NFPA 805, "Performance Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," and that there were plans to resolve the fire impairments in a manner commensurate with safety significance. Documents reviewed are listed in the attachment.

b. Findings and Observations

No findings were identified. The inspectors found that the licensee had appropriate plans in place to repair each fire impairment and that the SSF fire area classification was appropriate. However, the inspectors did identify some minor weaknesses with the manner in which the licensee's plant documents reflected the classification of the SSF fire area and some of its associated fire barriers. The minor issues identified were as follows: (1) Some SSF fire walls depicted on a pre-fire plan drawing did not align with the fire walls depicted on the associated fire protection program drawings; (2) a discrepancy existed between a plant calculation and a plant drawing regarding the classification of two fire doors at the SSF; and (3) a plant calculation contained a misleading description of the SSF fire area. None of these items were more than minor in nature and the licensee has entered them into their corrective action program as PIPs O-15-04230 and O-15-03203.

.3 Semi-annual Trend Review

a. Inspection Scope

As required by IP 71152, "Identification and Resolution of Problems," the inspectors performed a review of the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on open corrective actions greater than five years old, but also considered the results of daily inspector CAP item screenings discussed in section 4OA2.1 above, licensee trending efforts, licensee human performance results and inspector observations made during in-plant inspections and walk-downs. The inspectors' review primarily considered the six-month period of January 2015 through June 2015, although some examples expanded beyond those dates when the scope of the trend warranted. The review also included issues documented outside the normal CAP in major equipment problem lists, plant health reports, independent nuclear oversight reports, self-assessment reports, and maintenance rule reports. The inspectors compared and contrasted their results with the results contained in the licensee's latest quarterly trend reports.

Corrective actions associated with a sample of the issues identified in the licensee's trend report were reviewed for adequacy.

b. Observations and Findings

No findings were identified. In general, the licensee performs adequate monitoring of their programs for adverse trends. The inspectors reviewed corrective actions associated with problem identification reports for potential trends. The inspectors determined that the licensee adequately identified adverse trends and their corrective actions were adequate to address any identified adverse trends.

4OA5 Other Activities

.1 Verification of Completion of Milestone 4 of Protected Service Water Major Plant Modification

a. Inspection Scope

Milestone 4 of Confirmatory Order EA-13-010 dated July 1, 2013, (Accession No. ML 13114A928) states:

"The licensee shall have the PSW pump installed and provide the capability to supply electrical power from the PSW building switchgear to operate the PSW pump and the associated valves to provide water to the steam generators of all three units sufficient to remove decay heat following simultaneous reactor trips from 100 percent power, with the steam generators at the pressure corresponding to the lowest safety valve setting, as an alternate path within the emergency operating procedures. This modification along with approved plant procedures and the completion of operator training necessary to accomplish this lineup, and a combination of testing and engineering evaluation in accordance with station procedures which verifies this capability, will be completed and operational no later than June 3, 2015."

For this inspection, the inspectors reviewed the PSW system's electrical and mechanical capability with respect to design flow to the steam generators for Milestone 4. This inspection was bounded by the following limitations:

First, the inspectors reviewed the PSW system for response during a turbine building fire and as a result, the conclusions stated in this section were made based solely upon that event.

Second, the inspectors were only able to verify that the PSW system could perform its intended design function for up to 3 hours and 20 minutes. The modifications to address the alternate chilled water (AWC) system and the portable pump are required for the PSW system to operate for periods longer than 3 hours and 20 minutes and will be inspected during Milestone 5.

Last, the PSW system was turned over to the operations department on January 30, 2015. At the time of this inspection, the system was declared non-functional due to transformers CT6 and CT7 not being seismically qualified. However, the system was considered to be available since the transformers would be capable of providing power during a turbine building fire. The issue concerning the seismic qualification of the transformers was being tracked under PIP O-15-01607, and the system status was being tracked by SLC 16.9.9, "PSW System," dated January 30, 2015.

The inspectors reviewed PSW engineering change (EC) packages, calculations, procedures, licensing documents, completed tests, drawings, and hydraulic flow modeling software and its associated evaluations. The inspectors also performed as-built system and seismic walk-downs, and performed interviews with the licensee's staff and the vendor who developed the hydraulic flow modeling software. Specifically, the summary of the licensee's analyses performed to support "the combination of testing and engineering evaluation," as stated in the order, were in calculations OSC-9595, "Protected Service Water (PSW) Hydraulic Model," Rev. 6 and OSC-11375, "PSW Hydraulic Model SG Injection Resistance Verification (Unit 1)," Rev. 0.

The inspectors also reviewed the PSW EC packages to assess the effects of the modification on the safe shutdown facility (SSF) and the emergency feedwater (EFW) system. The inspectors reviewed the EC package associated with the installation of the condensate test line to assess the effects of the modification on the EFW system and to verify that the piping was installed in accordance with design drawings to ensure the piping was seismically qualified.

The inspectors reviewed licensee procedures and training activities related to the operation of the permanent PSW primary and booster pumps. The inspectors also observed testing of these plant components to include operation with power from PSW switchgear. The inspectors also monitored limited testing activities of these pumps and their associated valves (electric motor and solenoid operated valves). The inspectors verified the system was properly aligned as required by station procedures following initial test including the verification the condensate test line was isolated. Additionally, the inspectors observed concrete excavation for the old and new foundations pumps including rebar placement. The inspectors performed walk-downs to assess the material condition of the new PSW pump foundation. The inspectors also observed pump installation, coupling and testing related to initial installation. The inspectors observed installation of PSW primary and booster pump area ventilation and associated exhaust fan. The inspectors evaluated the various stages of these installations to assess their effects on operation of the SSF, emergency feedwater and equipment used for the station's B.5.b strategy.

The inspectors determined that the licensee's modification met the intent of Milestone 4.

b. Findings

No findings were identified.

.2 Operation of an Independent Spent Fuel Storage Installation (60855.1)

a. Inspection Scope

The inspectors observed activities associated with the dry fuel storage campaign for dry shielded canister (DSC) 136 during the week of June 15, 2015. The inspectors reviewed applicable procedure changes made since July 2013, including associated 10 CFR 72.48, "Changes, Tests, and Experiments," screens to verify that changes made were consistent with the ISFSI Certificate of Compliance. The inspectors reviewed records to verify that the licensee recorded and maintained the location of each fuel assembly

placed in the ISFSI. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

.3 (Closed) Unresolved Item (URI) 05000270/2014004-01, URI Review of FOD 50.59 Evaluation

a. Inspection Scope

The inspectors continued the review of the flood outlet device (FOD) modification to verify the adequacy of the modification package and the 10 CFR 50.59 screenings and to evaluate the modification for adverse effects on system availability, reliability, and functional capability. Documents reviewed are listed in the attachment.

In November 1998, the licensee identified that a HELB induced flood in the EPR could spread to other components in the Auxiliary Building (AB) and affect the ability of various safe shut down (S/D) equipment to perform its safety-related function as described in the final safety analysis report (FSAR). The licensee developed a modification package in April 2006, to install a FOD which required a 50.59 evaluation. An initial 50.59 screening determined that the FOD modification did not require a detailed 50.59 evaluation. On August 21, 2006, the licensee conducted a review of the 50.59 screening and, as documented in PIP O-06-05726, "…were not able to conclusively determine if the correct conclusion had been made." A corrective action was identified in the corrective action document to perform an in-depth 50.59 screening and evaluation.

The licensee performed a more in-depth 50.59 screening and evaluation in December 2015. This screening arrived at the same conclusion as the previous 2006 screening, specifically, the proposed FOD modification did not require a more detailed 50.59 evaluation, per NSD 209.

b. Observation

The inspectors reviewed the licensee's revised 50.59 screening. Specifically, the inspectors confirmed that the revised 50.59 screening addressed the additional items cited in the August 2006 review needing to be addressed. Based on this review of the revised 50.59 screening results, the inspectors concluded the revised 50.59 screening addressed the additional items and correctly determined there was no need for a more in depth 50.59 evaluation. The inspectors subsequently concluded this item is closed.

.4 Institute of Nuclear Power Operations (INPO) Assessment Report Review

The inspectors reviewed the final report for the INPO Assessment of Oconee Nuclear Station conducted in August 2014. The inspectors reviewed the report to ensure that issues identified were consistent with the NRC perspectives of licensee performance and to verify if any significant safety issues were identified that required further NRC follow-up. The inspectors determined that no additional NRC follow-up was required.

4OA6 Management Meetings (Including Exit Meeting)

Exit Meeting Summary

On July 9, 2015, the resident inspectors presented the inspection results to Mr. Batson and other members of licensee management. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee
K. Alter, Design Basis Manager
E. Anderson, PSW Engineering Director
J. Beckman, PSW Lead Engineer
S. Batson, Site Vice President
S. Boggs, Emergency Services Coordinator
B. Bowers, Operations Instructor
T. Brown, PSW Licensing Manager
E. Burchfield, Engineering Manager
T. Cheslak; Oconee Fire Protection Engineer
T. Doss, LOR Supervisor
C. Dunton, Site Support Director
P. Fisk; Superintendent of Operations
A. Lotfi, Duke - Construction
T. Patterson, Safety Assurance Manager
J. Pottmeyer, Simulator Supervisor
J. Pounds, OMP Tornado/HELB QA Oversight
T. Ray, Station Manager
F. Rickenbaker, OMP Manager
D. Robinson, Radiation Protection Manager
C. Ropp, Operations Training Supervisor
B. Shingleton, Regulatory Affairs
J.R. Steely, Training Manager
J. Smith, Regulatory Compliance
P. Street, Emergency Planning Manager
C. Wasik, Regulatory Compliance Manager

NRC
N. Childs, Resident Inspector
G. Croon, Resident Inspector
E. Crowe, Senior Resident Inspector
R. Hall, Project Manager, NRR

LIST OF ITEMS OPENED, CLOSED, DISCUSSED AND UPDATED

Opened and Closed		
05000269, 270, & 287/2015002–01	FIN	Inadequate Design Inputs for PSW Testing and Engineering Evaluations [Section 1R17]
05000269, 270, & 287/2015002–02	FIN	Inadequate Acceptance Criteria for PSW Pump Surveillance Testing [Section 1R17]
05000269, 270, & 287/2015002–03	FIN	Failure To Translate The Design Basis Into Procedures Used To Test The HPI Motor Coolers [Section 1R17]
Discussed		
None		
Opened		
None		
Closed		
05000270/2014004-01	URI	Review of FOD 50.59 Evaluation (Section 4OA5)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures:

AP/1/A/1700/034, Degraded Grid, Rev 34
COP-NUC-P01, TCC/SOC Response to Nuclear Switchyard Low Voltage, dated November 6, 2013
NSD 417, Generation Risk Management Process, Rev 16
OP/0/A/1107/016, Removal and Restoration of Switchyard Electrical Equipment, Rev 35
PT/0/A/0610/022, Degraded Grid and Switchyard Isolation Test, Rev 35

Other:

System Health Report – 230 kV & 525 kV Switchyard Power System, 1st quarter 2015

Section 1R04: Equipment Alignment

Complex Activity Plans:

Service Test of Keowee Battery Bank 1, approved 3/31/15

Drawings:

K-704, One Line Diagram 125 Volt DC Station Auxiliary Circuits, Rev 41

Procedures:

AD-OP-ALL-0201, Protected Equipment, Rev 1
AP/0/A/2000/002, Keowee Hydro Station – Emergency Start, Rev 16
IP/0/A/3000/003 KB1, Keowee Hydro Station Battery 1 Service Test and Annual Surveillance, Rev 2

Other:

Oconee Nuclear Station Protected Equipment Log for May 12, 2015
Oconee Nuclear Station Protected Equipment Log for June 17, 2015
System Health Report – Vital AC/DC and Essential AC Systems, 3rd quarter 2014

Section 1R05: Fire Protection

Procedures:

O-FS-1-AB-9758-001, Pre-Fire Plan – Unit 1 LPI and RBS Pump Room, Rev 0
O-FS-1-AB-9771-001, Pre-Fire Plan – Unit 1 LPI Hatch Area, Rev 0
O-FS-1-AB-9796-001, Pre-Fire Plan – Unit 1 Equipment Room, Rev 1
O-FS-3-AB-9759-001, Pre-Fire Plan – Unit 3 LPI and RBS Pump Room, Rev 0
O-FS-3-AB-9771-001, Pre-Fire Plan – Unit 3 LPI Hatch Area, Rev 0
O-FS-3-TB-9771-001, Pre-Fire Plan – Unit 3 Turbine Building, Rev 0

Section 1R06: Flood Protection Measures

Documents:

SLC 16.9.11a, Auxiliary Building Flood Protection Measures, Dated 11/15/12
UFSAR 3.4, Water Level (Flood) Design, Section 3.4.1.1, Current Flood Protection Measures for the Turbine and Auxiliary Buildings, Dated Dec. 31, 2013

Section 1R11: Licensed Operator Requalification

Procedures:

AD-TQ-ALL-1000, Conduct of Training, Rev 4
AP/1/A/1700/09, Spent Fuel Damage, Rev. 08

AP/1/A/1700/18, Abnormal Release of Radioactivity, Rev. 23
EP/1/A/1800/01, Emergency Operating Procedure Rev. 40
RP/0/A/1000/01, Emergency Classification Rev. 02
RP/0/A/1000/002, Control Room Emergency Coordinator Procedure, Rev 7

Other
Active Simulator Exam OP-OC-ASE-02A, Rev 0

Section 1R12: Maintenance Effectiveness
Nuclear Condition Reports (NCR) and Problem Identification Program Reports (PIPs):
O-11-12208; O-12-10971; O-14-07438; O-14-13500; O-15-03505; O-15-03697; O-15-04208; 1932329

Procedures:
AD-EG-ALL-1210, Maintenance Rule Program, Rev 0

Other:
Engineering Change (EC) 115096, Provide Replacement Motors for CT4 Blockhouse Ventilation Fans
EC 110111, Rev 3

Section 1R13: Maintenance Risk Assessments and Emergent Work Control
Procedures:
AD-NF-ALL-0501, Electronic Risk Assessment Tool (ERAT), Rev 0
AD-WC-ALL-0410, Work Activity Integrated Risk Management, Rev 1
NSD-415, Operational Risk Management (Modes 1-3) per 10CFR50.65(A)(4), Rev 8
NSD-417, Generation Risk Management Process, Rev 17

Engineering Change:
091826

Work Orders:
01967973; 02189088

Section 1R15: Operability Evaluations
Nuclear Condition Reports (NCR) and Problem Identification Program Reports (PIPs):
15-03237; 15-3446; 15-3676; 15-4293; 15-04544; 15-04619; 01742025; 01800429; 01805359; 01808560; 01814053; 01820759; 01822195; 01832561; 01839899; 01854580; 01869655; 01871057; 01905205; 01905280; 01905287; 01905659; 01906095; 01907095; 01908143; 01908541; 01908719; 01908909; 01908918; 01908927; 01908931; 01908958; 01909393; 01810016; 01933005; 02189701

Procedures:
AD-OP-ALL-0202, Aggregate Operator Impact Assessment, Rev 1

Other:
ONS Operator Challenges Database
Operator Focus Items Database

Section 1R17: Evaluation of Changes, Tests, and Experiments and Permanent Plant Modifications

10 CFR 50.59 Evaluations
EC 91877, PSW System Header, dated 7/11/14
EC 91878, Replace ASW System with PSW System, dated 7/11/14
EC 111881, PSW Pump Room Duct Extension, dated 7/11/14

10 CFR 50.59 Screenings
EC 91860, Installation of Condensate Test Line for PSW, 10/13/11

Permanent Plant Modifications
EC 91877, PSW System Header, dated 7/11/14
EC 91878, Replace ASW System with PSW System, dated 7/11/14

Calculations
OSC 10195, Generic Letter 89-10 Test Acceptance Criteria, Rev. 1
OSC-10493, PSW System Suction Supply Availability and Temperature, Rev. 1
OSC-10651, Event Mitigation with PSW, Rev. 3
OSC-11194, CCW Heatup During PSW and/or SSF-ASW Operation, Rev. 0
OSC-11375, PSW Hydraulic Model SG Injection Resistance Verification (Unit 1)
OSC-11378, Measurement Uncertainty Calculation for an Alternate Minimum Flow Scenario in the PSW System, Rev. 1
OSC-1375, PSW Hydraulic Model SG Injection Resistance Verification (Unit 1), Rev. 0
OSC-2042, HPI Pump Motor Upper Bearing Cooling Report, Rev. 7, Rev. 8, and Rev. 9
OSC-2515, Verification of Emergency Feedwater System Flow Utilizing MFW System Bypass, Rev. 22
OSC-2820, Emergency Procedure Setpoints, Rev. 39
OSC-5649, LPSW Test Acceptance Criteria (TAC), Rev. 15 and Rev. 16
OSC-7934/NAI-1652-002, Oconee Nuclear Station Units 1, 2, and 3 Auxiliary Building GOTHIC Heat Up Analysis – PSW Event Cases, Rev. 6
OSC-8211, Westinghouse Report RPS/PMPS (NS)-02-008 High Pressure Injection Pump Moor in High Temperature Environment, Rev. 3
OSC-9190, PSW System 125 VDC Power System Analysis, Rev. 4
OSC-9206, Protected Service Water Main Header / CCW Min Flow, Rev. 6
OSC-9259, PSW Flow Instrument Loop Uncertainty Calculation, Rev. 1 and Rev. 2
OSC-9370, Unit 1/2/3 PSW AC Power System Voltage and Short Circuit Analysis, Rev. 4
OSC-9536, Electrical Design Input Calculation for EC91878, Rev. 8
OSC-9539, Electrical Design Inputs for Engineering Change EC91877 (OD500932), Rev. 4
OSC-9595, PSW Hydraulic Model, Rev. 5, Rev. 6, and Rev. 7
OSC-9596, Mechanical Design Input Calculation (DIC) and System Calculation for the Protected Service Water System, Rev. 9
OSC-9596, Mechanical Design Input Calculation and System Calculation for the PSW System, Rev. 6, Rev. 7, and Rev. 9
OSC-9831, Protective Relay Settings Associated with PSW Switchgear, Rev. 8
OSC-9847, PSW Primary Pump and Booster Pump Head Curves, Rev. 3
OSC-9901, PSW Primary Pump Discharge Flow Instrument Uncertainty Calculation, Rev. 2
OSC-9941, PSW Primary Pump Suction Pressure Instrument Uncertainty and Setpoint, Rev. 1

Procedures
AD-EG-ALL-1117, Design Analyses and Calculations, Rev. 1
AD-EG-ALL-1206, Equipment Reliability Classification, Rev. 1
AD-EG-ALL-1720, Inservice Testing (IST) Program Implementation, Rev 0
AD-PI-ALL-0100, Corrective Action Program, Rev. 1, Rev. 2, and Rev. 3
AM/0/A/3007/086, Abnormal Procedure for Installation And Removal Of Nitrogen System For Auxiliary Building Air Handling Units And Exhaust Fans Damper Control During AWC Operation, Rev. 1
AM/0/A/3007/087, Abnormal Procedure for Installation And Removal Of AWC - Trane 500-Ton Model RTAC Chiller Make-up Water, Rev. 0
AP/1/A/1700/008, Loss of Control Room, Rev. 16
AP/1/A/1700/013, Dam Failure, Rev. 32
AP/1/A/1700/050, Challenging Plant Fire, Rev. 1
AP/1-2/A/1700/036, Degraded Control Room Area Cooling, Rev. 11
EDM-210, Engineering Responsibilities for the Maintenance Rule, Rev. 28
EP/1/A/1800/001, Emergency Operating Procedure, Blackout, Rev. 40
EP/2/A/1800/001 E, Emergency Operating Procedure, Loss of Heat Transfer, Rev. 41
EP/2/A/1800/001, Emergency Operating Procedure, Rev. 41
EP/2/A/1800/01, Loss of Heat Transfer, Rev. 41
NSD 203, Operability/Functionality, Rev. 26
NSD 310, Requirements for the Maintenance Rule, Rev. 12
ONTC-0-131A-0003-001, Test Acceptance Criteria for PSW Booster Pump, Rev. D
ONTC-0-131A-0003-002, Test Acceptance Criteria for PSW Booster Pump, Rev. C
ONTC-0-131A-0004-001, Test Acceptance Criteria for PSW Primary Pump, Rev. E
ONTC-0-131A-0004-002, Test Acceptance Criteria for PSW Primary Pump, Rev. C
OP/0/A/1650/001, PSW System, Rev. 1
PT/0/A/0500/001, PSW Primary and Booster Pump Test, Rev. 000
PT/1/A/0230/015, High Pressure Injection Motor Cooler Flow Test, Rev. 37
PT/2/A/0230/015, High Pressure Injection Motor Cooler Flow Test, Rev. 35
TT/0/A/0500/007, Protected Service Water Pump Performance Test, Rev. 0

Completed Procedures
IP/0/A/3001/010, Maintenance of Limitorque Valve Operators, Rev. 104, completed 11/25/2014
IP/0/A/3001/011K, Testing of Motor Operated Valves Using VIPER, Rev. 015, completed 11/24/2014
MP/0/A/1840/040A, Pump - Motors - Miscellaneous Components – Lubrication Post Maintenance Testing, Rev. 3, completed 11/25/2014
PT/0/A/0500/001, Protected Service Water Primary and Booster Pump test, Rev. 0, completed 03/18/2015
PT/1/A/0202/011, High Pressure Injection Pump Test, Rev. 98, completed 3/13/2015
PT/1/A/0230/015, High Pressure Injection Motor Cooler Flow Test, Rev. 36, completed 11/23/2014
TT/0/A/0500/007, Protected Service Water Pump Performance Test, Rev. 0, completed 11/15/2014
TT/0/A/0500/007, Protected Service Water Pump Performance Test, Rev. 1, completed 11/23/2014
TT/1/A/0500/003, Protected Service Water Injection to SG 1A & 1B, Rev. 2, completed 11/26/2014
TT/1/A/0500/003, Protected Service Water Injection to SG 1A & 1B, Rev. 4, completed on

12/04/2014 and 1/29/2015
TT/1/A/0500/008, High Pressure Injection Motor Cooler Flow Test From PSW, Rev. 2, completed 11/21/2014
TT/1/A/0500/008, High Pressure Injection Motor Cooler Flow Test From PSW, Rev. 2, completed 11/27/2014

Drawings
0-1436-500932-05, Isometric Piping Layout Protected Service Water CLG to HPI Pump MTR Bearing, Rev. A
0-1436-500932-07, Isometric Piping Layout Protected Service Water Pipe Header, Rev. B
0-1436-500932-08, Isometric Piping Layout Protected Service Water Pipe Header, Rev. B
0-1436-500932-09, Isometric Piping Layout Protected Service Water Pipe Header, Rev. B
0-1436-500932-10, Isometric Piping Layout Protected Service Water Pipe Header, Rev. A
0-1436-500932-11, Isometric Piping Layout Protected Service Water Pipe Header, Rev. B
032612, PSW 14 Control Schematic, Rev. 3
0-PSW-1436C-H5014, Sheet 1, Rev. 0
0-PSW-1436C-H5014, Sheet 2, Rev. 0
0-PSW-1436C-H5014, Sheet 3, Rev. 0
0-PSW-1436C-H5014, Sheet 4, Rev. 0
0-PSW-1436D-H5003, Sheet 1, Rev. J
0-PSW-1436D-H5003, Sheet 2, Rev. J
0-PSW-1436D-H5003, Sheet 3, Rev. J
0-PSW-1436D-H5003, Sheet 4, Rev. J
0-PSW-1436D-H5003, Sheet 5, Rev. J
0-PSW-1436D-H5003, Sheet 6, Rev. J
0-PSW-1436D-H5003, Sheet 7, Rev. J
0-PSW-1436D-H5006, Sheet 1, Rev. 0
0-PSW-1436D-H5006, Sheet 2, Rev. 0
0-PSW-1436D-H5006, Sheet 3, Rev. 0
0-PSW-2436C-H5028, Sheet 1, Rev. D
0-PSW-2436C-H5028, Sheet 2, Rev. D
0-PSW-2436C-H5028, Sheet 3, Rev. D
0-PSW-2436C-H5028, Sheet 4, Rev. D
0-PSW-2436C-H5030, Sheet 1, Rev. C
0-PSW-2436C-H5030, Sheet 2, Rev. C
0-PSW-2436C-H5030, Sheet 3, Rev. C
0-PSW-2436C-H5031, Sheet 1, Rev. D
0-PSW-2436C-H5031, Sheet 2, Rev. D
0-PSW-2436C-H5031, Sheet 3, Rev. D
2-PSW-2436C-H5587, Sheet 1, Rev. A
2-PSW-2436C-H5587, Sheet 2, Rev. A
2-PSW-2436C-H5587, Sheet 3, Rev. A
2-PSW-2436C-H5589, Sheet 1, Rev. 0
2-PSW-2436C-H5589, Sheet 2, Rev. 0
2-PSW-2436C-H5589, Sheet 3, Rev. 0
3-PSW-2436C-H5845, Sheet 1, Rev. 0
3-PSW-2436C-H5845, Sheet 2, Rev. 0
3-PSW-2436C-H5845, Sheet 3, Rev. 0
3-PSW-2436C-H5848, Sheet 1, Rev. 0

3-PSW-2436C-H5848, Sheet 2, Rev. 0
3-PSW-2436C-H5848, Sheet 3, Rev. 0
O-0436-500932-06, Isometric Piping Layout PSW Pipe Header, Rev. D
O-0436-500932-06, Isometric Piping Layout PSW Pipe Header, Rev. D
O-0437-500932-03, Isometric Piping Layout PSW Pipe Header, Rev. B
O-0437-500932-04, Isometric Piping Layout PSW Pipe Header, Rev. C
O-0437-500932-05, Isometric Piping Layout PSW Pipe Header, Rev. F
O-0AB-414B04-07, Pipe Support Isometric Clg to HPI Pump Mtr Bearing, Rev. 1
O-0AB-4PSW01-01, Pipe Support Isometric PSW 4-PSW-01 PSW Pump Room, Rev. 1
O-0AB-4PSW01-07, Pipe Support Isometric PSW 4-PSW-02 Pipe Header, Rev. 0
O-0AB-4PSW02-07, Pipe Support Isometric PSW 4-PSW-02 Pipe Header, Rev. 1
O-1436-500932-08, Isometric Piping Layout PSW Pipe Header, Rev. C
O-1436-500932-09, Isometric Piping Layout PSW Pipe Header, Rev. C
O-1436-500932-10, Isometric Piping Layout PSW Pipe Header, Rev. B
O-1436-500932-11, Isometric Piping Layout PSW Pipe Header, Rev. C
O-1436-500932-12, Isometric Piping Layout PSW Pipe Header, Rev. B
O-1436-500933-07, Isometric Piping Layout PSW Pipe Header, Rev. B
O-2436-500933-01, Isometric Piping Layout PSW Pump Room, Rev. H
O-2436-500933-02, Isometric Piping Layout PSW Pump Room, Rev. D
O-2436-500933-03, Isometric Piping Layout PSW Pump Room, Rev. K
O-2436-500933-04, Isometric Piping Layout PSW Pump Room, Rev. D
O-2436-500933-05, Isometric Piping Layout PSW Pump Room, Rev. E
O-2436-500933-06, Isometric Piping Layout PSW Pump Room, Rev. D
O-2436-500933-07, Isometric Piping Layout PSW Pump Room, Rev. N
O-2436-500933-08, Isometric Piping Layout PSW Pump Room, Rev. E
O-2436-500933-09, Isometric Piping Layout PSW Pump Room, Rev. N
O-2AB-4PSW01-01, Pipe Support Isometric PSW 4-PSW-01 CCW Mini-Flow, Rev. 2
O-3AB-414B04-07, Pipe Support Isometric PSW 4-14B-04 Clg to HPI Pump Mtr Bearing, Rev. 0
O-3AB-4PSW01-16, Pipe Support Isometric PSW 4-PSW-01 Pipe Header, Rev. 1
OEE-265-19, PSW Recirc Valve 0PSW14 Normal Feed, Rev. 2
OEE-265-21, PSW Pump Room Exhaust Fan Normal Feed, Rev. 0
OEE-365-19, PSW Recirc Valve 0PSW14 Alternate Feed, Rev. 2
OFD-121A-1.5, Flow Diagram of Condensate System, Rev. 37
OFD-121A-1.7, Flow Diagram of Condensate System, Rev. 43
OFD-121A-2.7, Flow Diagram of Condensate System, Rev. 41
OFD-121A-3.5, Flow Diagram of Condensate System, Rev. 30
OFD-121A-3.7, Flow Diagram of Condensate System, Rev. 46
OFD-121B-1.3, Flow Diagram of Feedwater System, Rev. 38
OFD-121B-2.3, Flow Diagram of Feedwater System, Rev. 32
OFD-121D-1.1, Flow Diagram of Emergency Feedwater System, Rev. 38
OFD-121D-2.1, Flow Diagram of Emergency Feedwater System, Rev. 39
OFD-121D-3.1, Flow Diagram of Emergency Feedwater System, Rev. 46
OFD-124B-1.1, Flow Diagram of Low Pressure Service Water System, Rev. 65
OFD-124B-1.6, Flow Diagram of Low Pressure Service Water System, Rev. 41
OFD-124B-2.1, Flow Diagram of Low Pressure Service Water System, Rev. 74
OFD-124B-3.1, Flow Diagram of Low Pressure Service Water System, Rev. 60
OFD-124B-3.6, Flow Diagram of Low Pressure Service Water System, Rev. 24
OFD-131A-1.1, Flow Diagram of Protected Service Water System, Rev. 2
OFD-131A-1.2, Flow Diagram of Protected Service Water System, Rev. 1

OFD-131A-2.2, Flow Diagram of Protected Service Water System, Rev. 1
OFD-131A-3.2, Flow Diagram of Protected Service Water System, Rev. 2
OLRD-121B-3.3, License Renewal Boundary Drawing Of Feedwater System, Rev. 1
OM 208.-0366.001, PSW Booster Pump Curve, Rev. D0A
OM 245.-0464.001, W.E. Tilting Disk Check Valves With Flexitallic Gasket, Rev. J
OM 245.-0820.001, 6" – 630 LB Weld Ends Carbon Steel Swing Check Valve With Resilient Seat, Rev. A
OM 245.-1537.001, 6" – 630 LB Weld Ends Carbon Bonnet Lipseal Tilt Disk Check Valve, Rev. A
OM 245.-1537.001, 6"-630 LB Weld Ends Carbon Steel Bolted Bonnet Lipseal Tilt Disk Check Valve, Rev A
OM 245.-1791.001, Wafer Check Valve, Rev. C
OM 245.-2150.001, 1" – 1878 LB Swing Check Valve Socket Ends, Stainless Steel and Non-Cobalt Trim, Rev. D
OM 245.-2185.001, 6" – 1875 LB Swing Check Valve Socket Ends Stainless Steel. Resilient Seat and Non-Cobalt Trim, Rev. A
OM 245.-2461.001, Durabla Check Valve, Rev. D
OM 245.-2592.001, NPS 6" Bolted Bonnet Gate Valve, Rev. DOE
OM 245.-2592.002, NPS 6" Bolted Bonnet Gate Valve, Rev. C
OM 245.-2725.001, 8" Bolted Cover Swing Check Valve, Rev. F
OM 245.-2750.001, Limitorque Motor Operator Survey Sheet, EC 91877, Rev. A
OM 245/-2150.001, 1"-1878 LB Swing Check Valve Socket Ends Stainless Steel and Non-Cobalt Trim, Rev. E
OM 248.-0830.001, Split Body Ball Valve C/W Gear Actuator, Rev. G

Work Orders (WO)

01671029-01	01679999-01	01768380-01	01797969-01
01856142-01	01856181-01	01856212-01	01881223-01
01881247-01	01881275-01	01908166-01	01908209-01
01908210-01	01908350-01	01908387-01	01908568-01
01933000-01	01933067-01	01963308-01	01963410-01
01963432-01	01992669-01	01992816-01	01992818-01
01992818-01	02024171-01	02140513-01	02140529-01
02162891-07	02179712-35		

Specifications

ECV-0601.00-00-0003, Specification for Seismic Qualification of Valves for ASME Section III and Duke Energy Safety Class D (Oconee Only) and F Applications, dated December 5, 2011
OSR-0245.00-00-0041, Technical Requirements for Valve Number DMV-1462, Rev. 2
OSS-0027.00-00-0002, Procedures, Supplemental Requirements and Tolerances for Fabrication and Erection of Pipe Supports and Restraints, Rev. 28
OSS-0251.00-00-0006, Motor Operated Throttle Valves (DMV-1464 and DMV-1471) for the Protected Service Water System, Rev. 2
OSS-0292.00-00-0001, Specification for Design and Implementation Support of the Protected Service Water System, Rev. 2

Miscellaneous
Duke Energy Carolinas Topical Report, Quality Assurance Program (QAP), Amendment 40,

Duke letter to the NRC, titled “Completion of Protected Service Water System Milestone 4,” dated 03/24/2015.
Duke letter to the NRC, titled “Duke Energy Carolinas, LLC; Oconee Nuclear Station, Units 1, 2, and 3; Docket Numbers 50-269, 50-270, and 50-287; Renewed Operating Licenses DPR-38, DPR-47, and DPR-55; Licensing Basis for the PSW System – response to the Request for Additional Information Item Nos. 172 through 189; License Amendment Request 2008-07 – Supplement 7,” dated 12/18/2013
Duke letter to the NRC, titled “Oconee Nuclear Station Docket Nos. 50-269, -270, -287; Special Report per Selected Licensee Commitment 16.9.9 Auxiliary Service Water (ASW) System and Main Steam Atmospheric Dump Valves and Oconee Transition from the Station ASW to the Protected Service Water System – Revision 3,” dated 02/09/2015
EC-91877/OD500932 U1, Large Bore Piping Inspections
EC-91877/OD500932 U1,2,3 Small Bore Piping Inspections
EC-91877/OD500932 U2, Large Bore Piping Inspections
EC-91877/OD500932 U3, Large Bore Piping Inspections
Maintenance Rule: SSC Summary Sheets for PSW System, dated 4/09/2015
NRC letter to Mr. S. Batson, Oconee Nuclear Station, titled “Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendments Regarding Implementation of the PSW System (TAC Nos. ME7737, ME7739, ME7746, ME7747, and ME7748,” dated 08/13/2014
OM 208.-0364.001, PSW Primary Pump-Seismic Qualification Analysis for 6X8X11BXMSD7 Stage, (100022620-0010), Rev. D5
OM 208.-0421.001, Vendor Manual for “Installation Operation and Maintenance Manual – MSD-D Horizontal Multi-stage Pump for PSW Primary,” Rev. 4
OM 208.-0473.001, Seismic Qualification Analysis for 6X8X17BX CAP8 Protected Service Water System Booster Pump, Rev. D06
OM 208.-0493.001, Vendor Manual for “Installation Operation and Maintenance Manual for PSW Booster Pump,” Rev. 5
OM 245.-2143.001, NIB – Design & Seismic Analysis for 09G-2004 (1/2”), 09G-2005 (3/4”), 09G-2006 (1”), 09G-2007 (1 ½”), 09G-2008 (2”), Class 800 Stainless Steel Split Wedge Gate Valves, Rev. DM
OM 245.-2576.001, DMV 1459 & DMV-1488 Design/Seismic/Weak Link Report for 6” Class 900 Forged Stainless Steel Bolted Bonnet Gate Valve, Rev. 1
OM 245.-2582.001, DMV-1459 and DMV-1488 Velan Operability Test Report for Functional Test With Static Side Load of A 6” – 900 Forged Bolted Bonnett Gate Valve Units 1, 2, & 3, Rev. 00A
OM 245.-2660.001, DMV 1462 – Design/Seismic/Weak Link Report, Rev. B
OM 245.-2660.001, DMV-1462-Design/Seismic/Weak Link Report, Rev. B
OM 245.-2748.001, PSW Design and Seismic Report (FMEA) for DMV 1464, 3” Lincoln Log Motorized Valve, Rev. A
OM 251.-0870.001, PSW Weak Link Analysis for DMV 1464, Rev. D
OM 253.-0105.001, DMV 1463 – Design and Seismic Report, Target Rock Valve Model 09L-001, Solenoid Operated Modulating Valve, Rev. 00B
OM 253.-0117.001, Vendor Manual for “DMV 1463 – Technical Manual for 6 Inch Modulating Bolted Bonnet Solenoid Operated Valve Model 09L-001,” Rev. F
OSS-0254.00-00-1000, Design Basis Specification for the Emergency Feedwater and the PSW System, Rev. 51A, 51B, and 54A
Protected Service Water Booster Pump Curve, 11/3/2011
Protected Service Water System Primary Pump Curve, 10/13/2011
Safety Evaluation by the Office of Nuclear Reactor Regulation (NRR) related to Amendments

Nos. 386, 388, and 387.
Safety Evaluation by the Office of Nuclear Reactor Regulation (NRR) related to the Effect of Tornados on Oconee Emergency Feedwater System (TACS 48225, 48226, and 48227)
Selected Licensee Commitment (SLC) 16.9.9, PSW System, dated 01/30/2015

Corrective Action Documents

PIP O-12-02867	PIP O-13-04860	PIP O-13-08099	PIP O-14-07356
PIP O-14-10537	PIP O-14-11906	PIP O-14-12981	PIP O-14-13063
PIP O-14-13143	PIP O-14-13213	PIP O-15-01607	

Corrective Action Documents Written Due To This Inspection

NCR 1929161	NCR 1930521	NCR 1931156	PIP O-14-04589
PIP O-15-01607	PIP O-15-03145	PIP O-15-03159	PIP O-15-03160
PIP O-15-03185	PIP O-15-03190	PIP O-15-03191	PIP O-15-03409
PIP O-15-03473	PIP O-15-03525	PIP O-15-03527	PIP O-15-03528
PIP O-15-03529	PIP O-15-03530	PIP O-15-03534	PIP O-15-03570
PIP O-15-03608	PIP O-15-03624	PIP O-15-03629	PIP O-15-03630
PIP O-15-03631	PIP O-15-04155	PIP O-15-04157	PIP O-15-04158
PIP O-15-04419	PIP O-15-04544	PIP O-15-04557	PIP O-15-04587
PIP O-15-04615	PIP O-15-04626		

Section 1R18: Plant Modifications

Engineering Change:
111311

Work Orders:
02157476

Section 1R19: Post-Maintenance Testing

Procedures:
OP/0/A/1106/029, Control Room, Equipment Room, & Cable Room Chillers, Rev 46
PT/0/A/0610/024, Keowee Emergency Start for Troubleshooting and Post Maintenance Checkouts, Rev 15
PT/1/A/0600/012 Turbine Driven Emergency Feedwater Pump Test, Rev 102
PT/2/A/0152/008, Coolant Storage System Valve Stroke Test, Rev 12
PT/2/A/2200/003, KHU-2 Quarterly Surveillance, Rev 17

Nuclear Condition Reports (NCR) and Problem Identification Program Reports (PIPs):
15-03245; 1931456

Work Request:
01133468; 01931456, 02199492

Work Orders:
02189006

Section 1R22: Surveillance Testing

Procedures

IP/0/A/3000/003 KB1, Keowee Hydro Station Battery 1 Service Test and Annual Surveillance, Rev 2
IP/0/A/3000/026, Battery Cell Connection Resistance Test, Rev 40
PT/1/A/0600/013, Motor Driven Emergency Feedwater Pump Test, Rev 72
PT/2/A/0202/011, High Pressure Injection Pump Test, Rev 87
PT/2/A/0600/010, Reactor Coolant Leakage (Unit 2), completed June 14, 2015
PT/3/A/0204/007, Reactor Building Spray Pump Test, Rev 96
PT/3/A/0251/073, System Flow Data Verification, Rev 13

Work Orders

02175044 02; 02189009; 02188244; 02182642; 02202298

Section 1EP6: Drill Evaluation

Procedures:

RP/0/A/1000/001, Emergency Classification, Rev 3
RP/0/A/1000/001, Emergency Classification, Rev 4

Other:

Oconee Nuclear Station, ERO Quarterly Drill Scenario 15-02, updated April 21, 2015
Oconee Nuclear Station, ERO Quarterly Drill Scenario 15-03, updated June 23, 2015

Section 4OA1: Performance Indicator Verification

Chemistry Desktop - Datasheets for July 1, 2014 – June 30, 2015
CSM 3.10, Primary Lab Sampling Frequencies, Specifications, and Corrective Actions, Rev. 42

Section 4OA2: Problem Identification and Resolution

Calculations:

OSC-8979, Oconee Fire PRA, Plant Partitioning and Ignition Frequencies, Rev 2
OSC-9302, Fire Protection Evaluation for Power Block Building and Fire Area Separation, Rev 2
OSC-10650, Oconee NFPA 805 Power Block, Fire Area, and Fire Zone Definitions, Rev 2

Drawings:

O-310K-22, Miscellaneous Structures – Fire Protection Plan & Fire Barrier, Flood, and Pressure Boundary Plans, Rev 10
O-315F, SSF Architectural Schedules, Details, Notes, Rev 17
O-315-0B-01, SSF Architectural, Rev 6

Problem Identification Program Reports (PIPs):

O-14-14171; O-14-11037; O-14-5350

Work Orders

02007388; 02157317; 02174867

Work Requests

01126648; 01128848

Other:
Fire Impairment IMP-ON-2014-00662, Fire Barrier Found to have Air Flow, initiated October 15, 2014
Fire Impairment IMP ON-2014-00360, Gap in SSF Door is Too Large, initiated May 9, 2014
Fire Impairment IMP ON-2015-00008, SSF Pump Room Basement Level Door has Excess Gaps, initiated January 1, 2015
Pre-Fire Plan O-FS-0-PA-9000-004, Standby Shutdown Facility, Rev 0
Selected Licensee Commitment (SLC) 16.9.5, Fire Barriers, dated December 31, 2012

Section 4OA5: Other Activities

Procedures:
HP/0/B/1000/097, Radiological Protection Requirements for Independent Spent Fuel Storage Installation Phase V, VI, and VII, Rev 16
MP/0/A/1500/023, Independent Spent Fuel Storage Installation Phases V, VI, and VII DSC Loading and Storage, Rev 27

Action Requests (AR)
01338859, 01338890, 01344737, 01345440, 01345653, 01345995, 01345010, 01351264, 01342178, 01351777, 01349709, 01351808, 01351867, 01929812, 03338682

Other:
Calculation OSC-11442, ISFSI Selection of Spent Fuel Assemblies and Non-Fuel Hardware for Storage in the NUHOMS®-24PHB Storage System, Canister 136 (1-89), Rev 0
Certificate of Conformance – Spent Fuel Storage Cask 136, approved August 17, 2010
Certificate of Compliance for Spent Fuel Storage Casks – Certificate #1004, Amendment #13
Completed MP/0/A/1500/023, Enclosure 9.11, Loading Fuel into TSC/DSC, approved June 11, 2015
Engineering Instruction ONEI-0400-441, ISFSI Oconee Nuclear Station DSC 136 (1-89), Rev 0
Final Safety Evaluation Report (SER), TransNuclear Inc. Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel - Docket #72-1004, Amendment #13
Technical Specifications for the Standardized NUHOMS® Horizontal Modular Storage System - Docket 72-1004, Amendment #13 to COC 1004