



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

May 2, 2016

Mr. Scott L. Batson  
Site Vice President  
Duke Energy Corporation  
Oconee Nuclear Station  
7800 Rochester Highway  
Seneca, SC 29672-0752

**SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000269/2016007, 05000270/2016007, 05000287/2016007**

Dear Mr. Batson:

On March 18, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Oconee Nuclear Station, Units 1, 2, and 3, and 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 one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest the violation or significance of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, U.S Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at the Oconee Nuclear Station. If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, RII, and the NRC Resident Inspector at the Oconee Nuclear Station.

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

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Sincerely,

*/RA/*

Scott M. Shaeffer, Chief  
Engineering Branch 2  
Division of Reactor Safety

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

Enclosure:  
Inspection Reports 05000269/2016007, 05000270/2016007, 05000287/2016007  
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Letter to Scott L. Batson from Scott M. Shaeffer dated May 2, 2016.

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – NRC TRIENNIAL FIRE  
PROTECTION INSPECTION REPORT 05000269/2016007, 05000270/2016007,  
05000287/2016007

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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.: 05000269/2016007, 05000270/2016007, 05000287/2016007

Licensee: Duke Energy Carolinas, LLC

Facility: Oconee Nuclear Station, Units 1, 2 and 3

Location: Seneca, SC 29672

Dates: February 29 – March 4, 2016 (Week 1)  
March 14 – 18, 2016 (Week 2)

Inspectors: J. Dymek, Reactor Inspector  
D. Jones, Senior Reactor Inspector  
W. Monk, Reactor Inspector  
J. Montgomery, Senior Reactor Inspector (Lead Inspector)  
M. Singletary, Reactor Inspector  
M. Thomas, Senior Reactor Inspector

Approved by: Scott M. Shaeffer, Chief  
Engineering Branch 2  
Division of Reactor Safety

Enclosure

## SUMMARY

IR 05000269/2016007, 05000270/2016007, 05000287/2016007; 02/29/2016 – 03/04/2016 and 03/14/2016 – 03/18/2016; Oconee Nuclear Station Units 1, 2, and 3; Fire Protection - NFPA 805 (Triennial)

This report covers an announced two-week triennial fire protection inspection by a team of six regional inspectors. One Green non-cited violation (NCV) was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Components Within The Cross-Cutting Areas," dated December 4, 2014. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5, dated February 2014.

### Cornerstone: Mitigating Systems

- Green. The NRC identified a Green NCV of 10 CFR 50.48(c) and National Fire Protection Association Standard (NFPA) 805, Section 2.4.2.4 for the licensee's failure to perform an adequate engineering analysis to determine the effects of fire on the ability to achieve the nuclear safety performance criteria, and consequently, did not add an associated variation from deterministic requirements (VFDR) into the Fire probabilistic risk assessment (PRA). Specifically, the licensee's Nuclear Safety Capability Assessment (NSCA) failed to identify cables in the turbine building (TB) that could prevent the operation of the High Pressure Injection (HPI) Pumps. This item was entered into the corrective action program (CAP) as action request (AR) 02011673, and the licensee implemented compensatory measures in the form of hourly fire watches.

The performance deficiency (PD) was more than minor because it was associated with the reactor safety Mitigating Systems cornerstone attribute of protection against external factors (i.e. fire), and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee's failure to analyze the effects of fire damage on the HPI cables in the TB could result in fire damage adversely affecting the ability to achieve and maintain safe and stable conditions. Using the guidance of IMC 0609, App. F, the finding was screened as Green because the finding did not affect the ability to reach and maintain a stable plant condition within the first 24 hours of a fire event (Task 1.4.5-B). A cross cutting aspect in the area of Human Performance, Consistent Process because the licensee did not use a consistent, systematic approach to make decisions, and did not incorporate appropriate risk insights (H.13). (Section 1R05.06)

## REPORT DETAILS

### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R05 Fire Protection

This report documents the results of a Triennial Fire Protection Inspection (TFPI) at the Oconee Nuclear Station (ONS), Units 1, 2, and 3. The inspection was conducted in accordance with NRC Inspection Procedure (IP) 71111.05XT, "Fire Protection - NFPA 805 (Triennial)," issued January 31, 2013. The objective of the inspection was to evaluate the design, operational status, and material condition of the licensee's Fire Protection Program (FPP). An additional objective was to review site specific implementation of one mitigating strategy from Section B.5.b of NRC Order EA-02-026, "Order for Interim Safeguards and Security Compensatory Measures" (commonly referred to as B.5.b); as well as the storage, maintenance, and testing of B.5.b mitigating equipment. Section 71111.05-05 of the IP specifies a minimum sample size of two fire areas/fire zones (FAs/FZs) and one B.5.b mitigating strategy for addressing large fires and explosions. The team selected four FZs based on available risk information as analyzed onsite by a senior reactor analyst from Region II, data obtained from in-plant walkdowns regarding potential ignition sources, location and characteristics of combustibles, and location of equipment needed to achieve and maintain the reactor in a safe and stable condition. Other considerations for selecting the FZs were the relative complexity of the post-fire safe shutdown (SSD) procedures, information contained in FPP documents, and results of prior NRC TFPIs. In selecting the B.5.b mitigating strategy sample, the team reviewed licensee submittal letters, safety evaluation reports (SERs), licensee commitments, B.5.b implementing procedures, and previous NRC inspection reports. This inspection fulfilled the requirements of the procedure by selecting a sample of four FZs and one B.5.b mitigating strategy.

- FZ 33 – Unit 2 6900/4160 Volt Switchgear
- FZ 105 – Unit 2 Cable Room
- FZ 103 – Unit 2 East Penetration Room
- FZ KEO – Keowee Hydro Station

For each of the selected FZs, the team evaluated the licensee's FPP against applicable NRC requirements and licensee design basis documents (DBDs). Documents reviewed by the team are listed in the Attachment. Additionally, inspectors reviewed the status of a sample of implementation items documented in Table 2.9-1 of the Oconee Nuclear Station license amendment, dated December 29, 2010.

#### .01 Protection of Safe Shutdown Capabilities

##### a. Inspection Scope

The team examined ONS fire response Abnormal Procedures (APs) and compared them to the NFPA 805 NSCA and Fire Risk Evaluation (FRE), system flow diagrams, and other DBDs to determine if equipment required to achieve post-fire safe and stable plant conditions was properly identified and adequately protected from fire damage in

accordance with the requirements of 10 CFR 50.48(c) and the ONS approved FPP. Cable routing information was reviewed for a selected sample of SSD components to verify that either the associated cables would not be damaged for the selected FZs fire scenarios or the licensee's analysis determined that the fire damage would not prohibit achieving safe and stable plant conditions. A list of SSD components examined for cable routing is included in the Attachment. The specific fire response APs reviewed are listed in the Attachment.

The team reviewed applicable sections of the APs for the selected FZs and fire scenarios to verify that the shutdown methodology properly identified the components and systems necessary to achieve and maintain safe and stable plant conditions. The team performed in-plant walk-throughs of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team verified the licensee personnel credited for procedure implementation had procedures available, were trained on implementation, and were available in the event a fire occurred. The team reviewed operator actions associated with activation of the standby shutdown facility (SSF) for an auxiliary building fire and the utilization of the protected service water (PSW) system for a turbine building (TB) fire that results in the complete loss of AC power. Additionally, selected defense-in-depth actions were assessed to verify that the operators could reasonably perform the specified actions.

b. Findings

Introduction: An unresolved item was identified regarding the licensee's evaluation of certain motor operated valves (MOVs) in the NSCA. Specifically, based on the conclusions in the licensee's NSCA, as well as subsequent evaluations, MOVs that are subject to a hot short that bypasses the torque or limit switch could result in damage to the valve that causes an unmitigated loss of reactor coolant system (RCS) inventory due to leakage through the damaged valve's pressure boundary or the valve's associated sealing components.

Description: Information Notice 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," stated that fire damage could cause an electrical hot short that bypasses thermal overload protection for MOVs, and that this hot short could result in damage to the valve. As a part of the licensee's transition to NFPA 805, the licensee identified a number of MOVs that could be susceptible to IN 92-18 type damage. These valves were classified as non-compliant components or variances from deterministic requirements (VFDRs). The subsequent evaluation of these valves by the licensee's Fire PRA group determined that these VFDRs met the acceptance criteria of the Fire Risk Evaluation, as documented in OSC-9314, as being acceptable "as-is" and that no further action was required. These VFDRs and their FPRA dispositions were communicated to the NRC in the April 2010 Oconee NFPA 805 license amendment request (LAR). Subsequent to NRC's issuance of the SER, Oconee Valve Engineering determined that, due to the size of the installed motor/gearbox, 10 MOVs could potentially suffer IN 92-18 damage to the extent that the integrity of the valve body or bonnet could be compromised. Loss of valve integrity of the valve pressure boundary was not an assumption used in the FPRA evaluation. The licensee documented this condition in AR 01906086. After further evaluation, the licensee documented in AR 01999309 that 9 of the original 10 valves identified could potentially suffer IN 92-18 damage to the extent that the integrity of the valve body or bonnet could be compromised.



For the 9 affected valves, the licensee has undertaken additional evaluations to determine whether some portion of the valve would fail before the valve's pressure boundary is compromised, or that any possible leakage that may result can be bounded by the credited RCS make-up source—in this case, the reactor coolant make-up pump. Inspectors determined that no immediate safety concern existed with this item because the licensee had implemented compensatory measures in accordance with the site's approved FPP. This item is unresolved pending inspector receipt and review of the licensee's evaluation. (URI 05000269, 270, 287/2016007-01, Pressure Boundary of Motor Operated Valves Could be Breached Due to Fire-Induced Hot Short)

## .02 Passive Fire Protection

### a. Inspection Scope

The team conducted walkdown inspections and examined the material condition and as-built configuration of accessible passive barriers both surrounding and within the FZs selected for review to evaluate the adequacy of their fire resistance in accordance with NFPA 805 calculations. Fire barriers inspected included masonry walls, poured concrete ceilings, floors and walls and installed mechanical and electrical penetration seals, fire doors and fire dampers. The team compared the as-built installed barrier configurations to the approved construction details and supporting fire endurance test data, which established the rating of the fire barriers. Fire doors and dampers were examined for attributes such as their material condition, clearances, and proper operation, Underwriters Laboratory (UL) labels on the door and frame, and the method of attachment to the rated barrier. Doors were examined to verify that no modifications had been performed to void their UL listing. The team reviewed licensing bases documentation such as 10CFR 50.48(a), 10CFR50.48(c) and the NRC NFPA 805 SER to verify that passive fire protection features met licensing commitments. In addition, a sample of completed surveillances and maintenance procedures for selected fire doors, fire dampers and penetration seals were reviewed to ensure that these passive barriers were being properly inspected and maintained. The passive barriers reviewed are listed in the Attachment.

### b. Findings

No findings were identified.

## .03 Active Fire Protection

### a. Inspection Scope

The team reviewed the licensee's fire detection systems, manual and automatic water-based fire suppression systems and firefighting standpipe and hose systems protecting the selected FZs. Fire brigade pre-plans, training documents and fire response procedures for these areas were also reviewed. The team reviewed the adequacy of the design, installation and operation of the fire detection and alarm systems to promptly detect fires in the selected fire areas and to annunciate in the control room. The review included walkdowns of as-built configurations and an examination of the type of detectors, detector spacing, and the detectors' location relative to ignition sources, room geometry and fixed obstructions to assess whether the areas were protected in accordance with code of record requirements. Evaluations for VFDRs for non-standard

detector installation were reviewed. Where the variances were identified, the team reviewed planned Engineering Changes (EC's) intended to enhance existing fire detection system performance. The team also reviewed the licensee's fire alarm response procedures, fire protection DBD, NFPA 805 License Amendment Request (LAR) submittals and associated NRC NFPA 805 SER to verify that the fire detection and alarm systems for the selected FZs were installed in accordance with the design and licensing bases for the plant.

The team inspected the material condition, operational configuration and testing of the manual sprinkler system in the cable spreading room (FZ 105); and sprinkler, water spray and CO2 suppression installed to protect hazards at Keowee Hydro Station. The team also reviewed code compliance evaluations to determine if there were any outstanding code deviations for these systems.

The team reviewed the firefighting pre-plans and fire response procedures for the selected FZs to determine if appropriate information was provided to fire brigade members to facilitate suppression activities. These plans were reviewed and confirmed by field walkdowns to verify that they accurately reflected current plant configurations and firefighting equipment locations. These walkdowns also confirmed that fire hose and extinguisher access was properly maintained throughout the plant. The team evaluated whether the fire response procedures and pre-plans could be implemented as intended and that they addressed equipment important to safety, ventilation of heat and smoke from a fire and drainage/runoff from installed fixed fire suppression systems and manual hose streams. Additionally, fire brigade drill records for recently run drills in each area were reviewed to confirm drill scenarios addressed specific hazards to likely be encountered in the areas and to verify actual fire brigade response times supported the fire brigade response time performance basis criteria. A walkdown of staged fire brigade personal protective equipment (PPE) was performed, with gear selected to ascertain its physical condition. An operating shift fire brigade was randomly selected to confirm that all members were currently qualified with regard to their medical and fire brigade training records. Current mutual aid agreements with local outside fire departments response to the plant in a fire emergency were reviewed as well as drill records for outside department participation for a postulated fire event.

b. Findings

No findings were identified.

.04 Protection from Damage from Fire Suppression Activities

a. Inspection Scope

The team inspected the selected FZs to evaluate whether the ability to achieve the nuclear safety performance criteria could be adversely affected due to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. The team addressed the possibility that a fire in one FZ could lead to the migration of smoke or hot gasses to other plant areas, which included a limited use of Consolidated Model of Fire Growth and Smoke Transport (CFAST) and Fire Dynamics Simulation (FDS) fire models. The team also evaluated whether the manual firefighting activities could adversely affect the credited nuclear safety equipment and/or adversely affect local operator recovery actions for the selected fire areas. Additionally, the team

checked that the firefighting water would either be contained in the fire affected area or be safely drained off through floor drains or stairwells. A review of potential flooding through unsealed floor cracks and absorption of water through penetration seals to areas beneath the selected FZs was conducted. This portion of the inspection was carried out through a combination of walkdowns, and reviews of drawings, calculations and installation records. Documents reviewed by the team are listed in the Attachment.

b. Findings

No findings were identified.

.05 Shutdown from a Primary Control Station

a. Inspection Scope

For postulated fire scenarios in FZs 103 and 105, which may impair main control room (MCR) functions, the licensee credited shutdown from a primary control station to achieve hot standby conditions. For the limiting fire, this would involve the partial or full transfer of plant control from the MCR to the SSF.

The team reviewed the licensee's FPP, system flow drawings, electrical drawings, electrical schematics, and other supporting documents to verify that control circuits and power for the credited SSF equipment would be free of fire damage when isolated by disconnect switches. The team reviewed the SSF transfer switch testing methodology and completed surveillances to assess the capability and functionality of the isolation. The reviews ensured that the required functions to achieve post-fire safe and stable conditions were included in the fire response procedures. The review included assessing the adequacy of procedural guidance for establishing and maintaining hot standby conditions from the SSF. This review verified that hot standby conditions could be achieved and maintained with and without offsite power.

b. Findings

No findings were identified.

.06 Circuit Analysis

a. Inspection Scope

The inspectors reviewed the licensee's UFSAR, the NSCA licensee circuit analysis documents, post-fire procedures, electrical schematics and system flow diagrams to gain an understanding of the licensee's SSD strategy in order to verify that the licensee had properly identified required and associated circuits that could impact the ability to achieve and maintain safe and stable conditions for the selected FZs. The inspectors assessed whether the licensee identified structures, systems and components (SSCs) important to meeting the 10 CFR 50.48 requirements were consistent with the established licensing basis. The team performed walk-downs of the selected FZs to independently verify the assumptions and results of the licensee's fire scenario development analysis. The team verified, on a sample basis, that the licensee properly identified cables and equipment required to achieve and maintain safe and stable conditions for the selected fire scenarios in the selected FZs. The inspectors also

reviewed cable routing drawings, electrical one-line diagrams, component block diagrams, penetration and conduit plan drawings, and electrical control wiring diagrams for the selected SSD components to determine if these cables had either been adequately protected from the potential adverse effects of fire damage or analyzed to show that fire induced faults (single and/or multiple) would not prevent shutdown to safe and stable conditions.

The team also reviewed, on a sample basis, breaker/fuse coordination study documents and several EC packages to ensure proper coordination existed between load and incoming supply breakers. The inspectors reviewed the licensee's electrical breaker coordination study calculation to determine if power supplies were susceptible to fire damage, which would potentially affect the credited components for the FZs chosen for review. The specific components and references reviewed are listed in the Attachment.

b. Findings

Introduction: The NRC identified a Green NCV of 10 CFR 50.48(c) and NFPA 805, Section 2.4.2.4 for the licensee's failure to perform an adequate engineering analysis to determine the effects of fire on the ability to achieve the nuclear safety performance criteria, and consequently, did not add an associated VFDR into the Fire PRA. Specifically, the licensee's NSCA failed to identify cables in the TB that could prevent the operation of the High Pressure Injection (HPI) Pumps.

Description: During the walk-down of the Unit 2 6.9KV/4.16KV Switchgear fire zone (FZ 33) and after conducting the circuit analysis review, inspectors determined that the effects of a TB fire had the potential to damage the HPI pump motors, and was not identified as a VFDR in the Fire PRA. For a fire in the TB, PSW was the credited SSD methodology and was credited with powering a HPI pump. Inspectors determined that fire damage could cause a loss of all control power to the TC and TE 4.16KV buses, which powers the "A" and "B" HPI pumps on each unit. Fire damage could also cause a single phase or phase-to-phase cable fault; and without DC power, the breakers for the HPI pump would not trip under fault conditions. This could cause the HPI pump motor to experience single phasing and potentially overheat the pump motor and render it inoperable. This condition represents a VFDR since the power cables and both control power circuits are routed in the same fire zone within the associated fire area.

Analysis: The licensee's failure to perform an adequate engineering analysis for the TB fire area to determine the effects of fire on the ability to achieve the nuclear safety performance criteria was a PD. This PD was determined to be more than minor because it impacted the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to external events (i.e. fire) to prevent undesirable consequences. Specifically, the licensee's failure to analyze the effects of fire damage on the HPI cables in the TB could result in fire damage adversely affecting the ability to achieve and maintain safe and stable conditions. The finding was screened in accordance with NRC IMC 0609, "Significance Determination Process", Attachment 4, "Initial Characterization of Findings," dated June 19, 2012, which determined that, an IMC 0609, Appendix F, "Fire Protection Significance Determination Process," dated September 20, 2013, review was required because it potentially affected the ability to reach and maintain safe and stable conditions in case of a fire. The team evaluated the finding using the guidance in IMC 0609, Appendix F. Using the Phase 1 "Qualitative Screening Approach", the finding was assigned a category of Post-fire Safe

Shutdown (SSD). The team utilized step 1.4, task 1.4.5 “Post-fire Safe Shutdown” to determine the finding to be of very low safety significance (Green) because Question 1.4.5.B, “Does the fire finding affect the ability to reach and maintain a stable plant condition within the first 24 hours of a fire event?” was answered “No”. This determination was based on the fact that, for a TB fire, the SSF and the associated Reactor Coolant Make-up Pump is available and not affected by this issue. Therefore, the SSF SSD path could have been used to ensure a safe and stable shutdown condition could have been achieved. A cross cutting aspect in the area of Human Performance, Consistent Process because the licensee did not use a consistent, systematic approach to make decisions, and did not incorporate appropriate risk insights (H.13)

Enforcement: Oconee Nuclear Station Units 1, 2 and 3 Renewed Facility Operating License Condition 3.D required the licensee to implement and maintain in effect all provisions of the approved FPP that complied with 10 CFR 50.48 (c), “National Fire Protection Association Standard NFPA 805,” as specified in the NRC safety evaluation report (SER) dated December 29, 2010. NFPA 805 Section 2.4.2.4 stated that an engineering analysis shall be performed for each fire area to determine the effects of fire on the ability to achieve the nuclear safety performance criteria.

Contrary to the above, since April 2012 the licensee failed to perform an adequate engineering analysis for the TB fire area to determine the effects of fire on the ability to achieve the nuclear safety performance criteria. The licensee initiated corrective action document AR 02011673 to update the Fire PRA scenarios to explicitly revise the fire analysis by adding the appropriate VFDRs to the Fire PRA. In addition, compensatory measures have been taken to conduct hourly fire watches in the TB until the Fire PRA analysis is complete. This violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy. (NCV 05000269, 270, 287/2016007-02, Postulated Fire Affecting High Pressure Injection Pump Did Not Receive a VFDR Evaluation).

.07 Communications

a. Inspection Scope

The inspectors reviewed plant communication capabilities to evaluate the capability of their telephone/page and portable radio system to support plant personnel in the performance of recovery actions to achieve and maintain SSD, as credited in the ONS UFSAR, Section 9.5.1, Fire Protection. The team performed interviews and plant walk-downs with the licensee’s operations staff to assess the credited method of communications used to complete recovery actions as specified in post-fire SSD procedures for the selected FZs. The team also reviewed the adequacy of the communication system to support plant personnel in the performance of fire brigade duties. The inspectors reviewed the communication systems available at different locations within the plant that would be relied upon to support fire event notification and fire brigade firefighting activities to verify their availability at those locations.

Additionally, a walk-down of the Fire Brigade Storage Room was conducted to verify the material condition status of the Fire Brigade’s and SSD team’s communication equipment. The inspectors reviewed preventive maintenance and surveillance test records to verify that the communication equipment was being properly maintained and tested. The team also verified that the design and location of communications

equipment would not cause a loss of communications during a fire. Specific documents reviewed by the team are listed in the Attachment.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The inspectors verified the adequacy of the plant's emergency lighting systems through review of design and maintenance aspects and inspection walk-downs of the fixed 8-hour battery pack emergency lighting units (ELUs) and MCR Emergency Lighting, as described in the ONS FSAR. Specifically, the team reviewed the adequacy of the ELUs used to support plant personnel during post-fire safe shutdown for the selected FZs. The team performed plant walk-downs and observed the placement and coverage area of fixed 8-hour battery pack emergency lights credited for SSD, to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation and/or instrumentation monitoring for post-fire SSD. The inspectors also reviewed completed test records of ELU battery 8-hr discharge tests, completed surveillances, and preventive maintenance procedures to ensure that they were sized, tested, rated for at least an 8-hour capacity and maintained consistent with vendor guidance, license requirements, and licensee commitments. The inspectors reviewed the vendor manual to ensure that the ELUs were being maintained consistent with the manufacturer's recommendations, and verified the battery storage conditions and maintenance practices were also being followed in accordance with the vendor guidance. Specific documents reviewed by the team are listed in the Attachment.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The licensee does not require transitioning to cold shutdown to achieve the safe and stable condition, and therefore does not require cold shutdown repairs to be implemented. However, the team assessed the availability of repair parts and the adequacy of associated repair procedures that were required to transition the plant from hot standby (Mode 3) to hot shutdown (Mode 4) as stipulated in the NFPA 805 license amendment (dated December 29, 2010). The license amendment included an implementation item (Table 2.9-1, Item 39) for the "Development and documentation of a long term safe shutdown program including analysis, equipment reviews, recovery actions, modifications, and procedural guidance." The team reviewed the NSCA and the FRE to identify components that were both susceptible to fire damage and credited for achieving hot shutdown conditions.

b. Findings

No findings were identified. However, inspectors documented a minor violation associated with long term safe shutdown in Section 4OA5.b of this inspection report.

.10 Compensatory Measures

a. Inspection Scope

The team reviewed the Fire Brigade Leader Turnover Sheet which included out-of-service, degraded, and/or inoperable fire protection features (e.g., detection and suppression systems and passive fire barriers); and NFPA 805 implementation deficiencies. The Fire Brigade Leader Turnover Sheet was assessed to determine the adequacy of the assigned compensatory measures. Additionally, the team verified that the risk associated with removing the fire protection feature from service was properly assessed and the compensatory measures were implemented in accordance with the approved FPP.

The team reviewed impairment and compensatory measures forms for fire watch tours for selected FZs and confirmed by direct observation that fire watch rounds were conducted in the required plant areas at their scheduled intervals. Hourly and roving watch personnel were interviewed to ascertain that their duties and responsibilities were properly understood.

b. Findings

No findings were identified.

.11 Radiological Release

a. Inspection Scope

The team reviewed possible radiological release paths to any unrestricted area due to the direct effects of fire suppression activities for each of the selected FZs. Appendix I of the DBD, Radioactive Release Summary, was reviewed for each FZ. FZs 33, 105, and FA KEO were outside the Radiological Control Area and were concluded to not have any possible release path. Fire Zone 103 had floor drains routed to the radwaste processing system. Fire pre-plans addressed ventilation paths and specified monitoring of contamination levels of smoke. Fire brigade training and pre-plans were reviewed to verify the performance requirements of NFPA 805 for radioactive release were being met.

b. Findings

No findings were identified.

.12 Non Power Operations

a. Inspection Scope

One of the requirements in NFPA 805 was for licensees to implement FPP controls during non-power operational modes. The team verified that plant calculations, procedures, and analyses had adequately identified key safety functions for maintaining the plant in a safe and stable condition during non-power operational modes. Unit 1 entered an unplanned outage during the inspection that was caused by a main transformer fire. The site did not enter any high risk evolutions such as mid-loop operations and maintained adequate FPP controls during the time period that the team was on-site.

b. Findings

No findings were identified.

.13 Monitoring Program

a. Inspection Scope

The team reviewed procedure AD-EG-ALL-1503, "NFPA 805 Monitoring", as well as procedure EDM-253 "NFPA 805 Monitoring Program," to verify that a monitoring program was established to ensure that the availability and reliability of the fire protection systems and features credited in the performance-based analyses are maintained and to assess the performance of the FPP in meeting the performance criteria in accordance with NFPA 805. The licensee established performance monitoring groups that provide a link between components and functions that are monitored together. The items in scope were being monitored for performance based on the established criteria as part of the normal engineering health reporting process. The team reviewed several fire protection system health reports to verify that the monitoring program ensures that the assumptions in the engineering analysis remain valid. The team also verified that the monitoring program instituted appropriate corrective actions to return availability, reliability, and performance of systems that fall outside of established levels.

b. Findings

No findings were identified.

.14 Plant Change Evaluation

a. Inspection Scope

Due to the need for ONS to have an industry full-scope peer review of its Fire PRA and to resolve the findings of that peer review, in accordance with license amendment dated December 29, 2010, ONS is not allowed to self-approve quantitative risk-informed fire protection program changes, except those implementation items needing a plant change evaluation as part of the Transition License Condition.



The NRC safety evaluation does allow ONS to make changes to the plant during transition as long as those changes do not result in an increase in plant risk and do not impact mandatory fire protection requirements contained in NFPA 805 Chapter 3. The team reviewed AD-EG-ALL-1501, Fire Protection Change Process, Rev. 1 to verify that the licensee had a program to determine if a change to the approved FPP could be made without prior NRC approval. The team also interviewed the licensee personnel responsible for evaluating the risk associated with fire protection program changes to verify that their process is followed. The team reviewed a sample of engineering changes to verify the adequacy of the Fire Protection Program Impact Screening Criteria forms.

b. Findings

No findings were identified.

.15 Control of Combustibles and Ignition Sources

a. Inspection Scope

The team reviewed the administrative control of combustible materials and ignition sources to verify that the FPP performance requirements of NFPA 805 Chapter 3 were satisfied. Plant administrative procedures were reviewed to determine if adequate controls were in place to control the potential ignition sources of welding and grinding and the handling of transient combustibles in the plant. The team walked down numerous areas in the plant, including the selected FZs, for control of combustible materials, storage of in-plant materials, transient combustibles, and general housekeeping. The team verified that containers with combustibles were UL or Factory Mutual listed. No specific hot work activity was observed during the course of the inspection

b. Findings

No findings were identified.

.16 B.5.b Mitigating Strategy

a. Inspection Scope

The team reviewed on a sample basis, the licensee's preparedness to handle large fires or explosions by reviewing the mitigating strategy of providing water to the steam generators with a portable pump. To verify that the licensee continued to meet the requirements of their B.5.b related license conditions and 10 CFR 50.54 (hh)(2), the team reviewed procedures to ensure that they were being maintained and were adequate; and performed walkdowns with licensee staff to ensure that the actions were feasible. Inspectors also verified that the required equipment was properly staged and maintained, and that the staff was properly trained.

b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### 4OA2 Problem Identification and Resolution

###### a. Inspection Scope

The team reviewed a sample of recent independent licensee audits, condition reports, self-assessments, and system/program health reports for thoroughness, completeness and conformance to FPP requirements. Guidance for the independent audits are contained in Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," and Generic Letter 82-21, "Technical Specifications for Fire Protection Audits."

The team also reviewed other CAP documents, including completed corrective actions documented in selected ARs and operating experience program documents, to ascertain whether industry identified fire protection issues (actual or potential) affecting ONS were appropriately entered into the CAP for resolution. Items included in the operating experience program effectiveness review were NRC information notices, regulatory guides, regulatory issues summary, industry or vendor generated reports of defects and non-compliances submitted pursuant to 10 CFR Part 21, and vendor information letters. The team evaluated the effectiveness of the corrective actions for the identified issues. The documents reviewed are listed in the Attachment.

###### b. Findings

No findings were identified.

##### 4OA5 Other Activities

###### Verification of Completion of Oconee Operating License Condition 3.D, Transition License Condition #1, Implementation Items

###### a. Inspection Scope

Oconee Transition License Condition #1 stated that the licensee shall complete the items described in Section 2.9, Table 2.9-1, "Implementation Items," of the NRC Safety Evaluation (SE) dated December 29, 2010, prior to January 1, 2013. The inspectors reviewed Oconee Operating License Condition 3.D and associated Transition License Conditions; NRC Safety Evaluation dated December 29, 2010; Oconee Design Basis Document for Fire Protection; licensee correspondence ONS-2014-047, dated May 5, 2014, various calculations and procedures to verify the licensee's actions to adequately complete selected implementation items were as described in Table 2.9-1 of the SE. The inspectors reviewed the following Table 2.9-1 Implementation Items.

Table 2.9-1 Implementation Item 1: *"The Design Basis Specification for Fire Protection will be updated to include the statement that the NRC is the AHJ for fire protection changes requiring approval."* This item was implemented as written.

Table 2.9-1 Implementation Item 2: *"Fleet Directive NSD-313, "Control of Flammable and Combustible Materials," will be updated to include the statement that plastic-sheeting materials shall conform to the requirements of NFPA 701 or equivalent."* This item was implemented as written.

Table 2.9-1 Implementation Item 3: *“Appropriate station procedure(s) for leak or air flow testing will be updated to preclude the use of open flames or combustion generated smoke.”* This item was implemented as written.

Table 2.9-1 Implementation Item 4: *“Fleet Directive NSD-318, “Coatings Program,” will be updated to include the specifications for Class A walls/ceilings and Class I floor finishes.”* This item was implemented as written.

Table 2.9-1 Implementation Item 5: *“Appropriate station electrical specifications will be updated to specify only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables.”* This item was implemented with clarifications described in licensee correspondence to the NRC dated May 5, 2014 (ML14126A688). The NRC is reviewing this item to determine if the clarifications are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 6: *“Transformer deluge flow test procedures will be updated to include drainage inspections as part of the annual flow tests.”* This item was implemented as written.

Table 2.9-1 Implementation Item 7: *“Station Fire Brigade Training documentation will be updated to include guidance to ensure fire drills are conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards.”* This item was implemented as written.

Table 2.9-1 Implementation Item 8: *“Implement the monitoring program described in SE Section 3.7.”* This item was implemented as written in procedure AD-EG-ALL-1503.

Table 2.9-1 Implementation Item 10: *“Standard Operating Guidelines (SOGs) will be updated to include a SOG with the location of the Pre-Fire Plans.”* This item was implemented as written in procedure O-0-SOG-9000-018.

Table 2.9-1 Implementation Item 11: *“ONS code compliance calculation will be updated to ensure required fire detection devices are installed in accordance with NFPA 72, 2007 Edition.”* This item was implemented as written.

Table 2.9-1 Implementation Item 13: *“The SSD procedure and analysis will be updated to incorporate the monitoring and/or adjustment of the following parameters required during operation of the SSF diesel generator (DG): generator current, voltage, power, and frequency. The controls and indications required to monitor and adjust these parameters are currently not included in the SSD analysis.”* This item was implemented as written.

Table 2.9-1 Implementation Item 14: *“Recovery Actions – Station procedures will be updated to reflect new NSCA strategies (including supporting communication coverage) and perform training as necessary. The following actions will be performed: 1) An evaluation to ensure that the hand-held radios operate in the locations of the recovery actions when needed, either with or without repeaters. 2) Development of SSD procedures for Fire Areas RB1, RB2, and RB3 (reactor building). 3) Provide training to*

*the operators on the new SSD procedures for Fire Areas RB1, RB2, and RB3. 4) Conduct drills to ensure viability on the new RB safe shutdown procedures.” This item was implemented as written.*

Table 2.9-1 Implementation Item 15: *“Revise Fleet Directive NSD-403 and Site Directive (SD) 1.3.5 with the definition of high(er) risk evolution (HRE) to address non-power operation (NPO) criteria, e.g., Plant Operating State (POS) 1B. Also, reconcile NSD-403 and SD 1.3.5 Thermal Margin Criteria with the criteria in FAQ 07-0040 as needed.”* This item was implemented with clarifications described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the clarifications are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 16: *“Develop a process to evaluate the potential effects of a fire upon habitability and the impact of increased DID fire protection actions that can be added to the establishment of high confidence in timely closure of the containment equipment hatch per Fleet Directive NSD-403.”* This item was implemented as written.

Table 2.9-1 Implementation Item 17: *“Implement procedural guidance to monitor borated water storage tank (BWST) temperature before freezing occurs.”* This item was implemented as written in procedures NSD-403 and SD 1.3.5.

Table 2.9-1 Implementation Item 18: *“Develop procedural controls to monitor lake levels and availability of the reverse gravity condenser circulating water (CCW) flow path during higher risk evolutions (HREs) for the outage risk management procedures.”* This item was implemented with clarifications described in procedure NSD-403. The NRC determined that the clarifications were acceptable.

Table 2.9-1 Implementation Item 19: *“Develop procedural controls for use of reactor coolant system (RCS) wide range pressure instruments (in lieu of RC Low Range Pressure) during HREs for the outage risk management procedures applicable to NPO key safety function (KSF).”* This item was implemented via alternate methods described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the alternate methods are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 20: *“Develop procedural controls on the Train A Bleed Holdup Tank (BHUT) tank level monitoring for the outage risk management procedures.”* This item was implemented via alternate methods described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the alternate methods are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 21: *“Ensure capability to access (i.e., an operator can be dispatched to manually throttle) motor-operated valves (MOVs) 1, 2, 3LP-21 where 1, 2, 3DHR-GF1&2 success paths are credited.”* This item was implemented via alternate methods described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the alternate methods are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 22: *“Ensure capability to access (i.e., an operator can be dispatched to manually open and close, respectively) manual valves 1, 2, 3HP-363 and 1, 2, 3HP-78 where 1, 2, 3INVCTL3c success paths are credited.”* This item was implemented via alternate methods described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the alternate methods are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 24: *“Develop procedure guidance for pre-emptive realignment of and the removal of power from the MOVs in the Unit specific gravity feed flow paths.”* This item was implemented via alternate methods described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the alternate methods are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

Table 2.9-1 Implementation Item 25: *“Revise NSD-403, SD1.3.5, and ONS technical procedures to implement the recommendations in OSC-9313, Attachment 1, subject to resolution of open Items (i.e., Items 15 through 24).”* The NRC is reviewing this item in conjunction with the resolution of Items 15 through 24 to determine if it acceptable.

Table 2.9-1 Implementation Item 26: *“Revise FPP Design Basis Specification for the Keowee fire hydrants.”* This item was implemented as written.

Table 2.9-1 Implementation Item 27: *“Configuration control procedures which govern the various ONS documents and databases will be revised to reflect the new RI/PB FPP licensing bases.”* This item was implemented as written.

Table 2.9-1 Implementation Item 28: *“Training Position Specific Guides will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per NFPA 805, Section 2.7.3.4.”* This item was implemented with clarifications described in procedure NSD-403. The NRC determined that the clarifications were acceptable.

Table 2.9-1 Implementation Item 29: *“Post-transition quality requirements from NFPA 805 that are not currently part of the ONS processes will be revised to include any additional requirements.”* This item was implemented as written.

Table 2.9-1 Implementation Item 30: *“Operator Guidance – ONS procedures will be updated to include the following: 1) Guidance for maintaining the plant safe and stable following loss of all pressurizer heaters. 2) Guidance for operation of reactor coolant (RC) high point vent valves for RC letdown in the event head vent valve flow path becomes inoperable.”* This item was implemented as written.

Table 2.9-1 Implementation Item 31: *“Resolve the physical location issue of the Unit 1 Pressurizer Level Instrument transmitter separation requirements by revising the fire evaluation to denote the physical separation aspects of the pressurizer level.”* This item was implemented as written.

Table 2.9-1 Implementation Item 33: *“Incorporating all related non-coordinated information in the NSCA and NPO Pinch Point Analysis, and updating the Fire PRA model, to include the results of the breaker coordination study.”* This item was implemented as written.

Table 2.9-1 Implementation Item 39: *“Development and documentation of a long term SSD program including analysis, equipment reviews, recovery actions, modifications, and procedural guidance.”* The inspectors reviewed this item and determined that the licensee had not completed implementation of this item as written in the SE and the ONS Fire Protection DBD. The inspectors identified this issue as a minor violation and documented it in Section 4OA5.b of this inspection report.

Table 2.9-1 Implementation Item 44: *“The breaker coordination study will be updated to include all new NFPA 805 SSD equipment list (SSEL)-related power supplies (i.e., PSW) for power and non-power operations, and additional plant modification will be defined if necessary to ensure that the assumptions of the Fire PRA and NSCA remain valid.”* This item was implemented with clarifications described in licensee correspondence to the NRC dated May 5, 2014. The NRC is reviewing this item to determine if the clarifications are acceptable, and if the May 5, 2014 letter was the appropriate mechanism (in lieu of a LAR) to request the changes to the License Condition.

b. Findings

No findings were identified. However, the team identified the following minor PD not subject to enforcement action in accordance with the NRC's Enforcement Policy:

- Calculation OSC-9314, “NFPA 805 Transition Risk-Informed, Performance-Based Fire Risk Evaluation, Rev. 3,” stated that some credited valves “may suffer IN 92-18 damage” during a fire event. Information Notice 92-18, “Potential for Loss of Remote Shutdown Capability During a Control Room Fire,” stated that fire damage could cause an electrical hot short that bypasses torque and/or limit switches for motor operated valves (MOVs); and that this damage could prevent the MOVs from being repositioned. Inspectors noted that the FPP included 8 valves that were susceptible to IN 92-18 damage. These valves were credited to meet long term safe shutdown requirements when transitioning Unit 2 from hot standby to hot shutdown. Oconee NFPA 805 Amendment/SE (dated 12/29/2010), Table 2.9-1, included Implementation Item #39, which stated that the site would develop and document a long term safe shutdown program, including analysis, equipment reviews, recovery actions, modifications, and procedural guidance. The team determined that Implementation Item #39 was inadequately implemented because the site failed to perform a qualitative analysis and failed to develop alternative mitigation strategies for flow paths adversely impacted by IN 92-18 damage to MOVs. The site entered this issue into the corrective program as AR 02012060.

**4OA6 Meetings, Including Exit**

On March 18, 2016, the inspection team leader presented the preliminary inspection results to Mr. S. Batson and other members of the licensee's staff. The licensee acknowledged the results. Following additional reviews in the Region II office, another exit meeting was held by telephone with Mr. Batson and other members of the licensee's staff on April 27, 2016, to provide an update on changes to the preliminary inspection findings. The licensee acknowledged the findings. Proprietary information is not included in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

## **SUPPLEMENTARY INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee Personnel**

S. Batson, Site Vice President  
J. Brady, Regulatory Consultant  
E. Burchfield, Engineering Manager  
B. Carroll, PRA Supervisor  
C. Eflin, Operations Safe Shutdown Engineer  
J. Ertman, Fleet Fire Protection Manager  
B. Fetterly, Fire Protection Program Manager  
J. Kemp, Fire Protection Program Manager  
R. Price, Electrical Design Basis Manager  
R. Rishel, PRA Group Manager  
E. Simbles, Erin Fire PRA Manager  
J. Smith, Regulatory Affairs  
C. Sweely, Senior Specialist, Areva Fire Protection  
C. Wasik, Regulatory Affairs Manager  
B. Weaver, PRA Engineer  
A. Wells, Fire Protection Engineering Manager  
C. Wilson, Regulatory Affairs Engineer

#### **NRC Personnel**

H. Barrett, Senior Fire Protection Engineer, Fire Protection Branch, NRR  
N. Childs, Resident Inspector  
E. Crowe, Senior Resident Inspector  
A. Gody, Director, Division of Reactor Safety, Region II  
G. Ottenberg, Senior Reactor Inspector, Region II  
R. Patterson, Reactor Inspector, Region II  
S. Shaeffer, Chief, Engineering Branch 2, Division of Reactor Safety, Region II



## LIST OF REPORT ITEMS

### Opened

05000269, 270, 287/2016007-01	URI	Pressure Boundary of Motor Operated Valves Could be Breached Due to Fire-Induced Hot Short (Section 1R05.01)
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### Opened and Closed

05000269, 270, 287/2016007-02	NCV	Postulated Fire Affecting High Pressure Injection Pump Did Not Receive a VFDR Evaluation (Section 1R05.06)
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## SUPPLEMENTAL INFORMATION

### LIST OF FIRE BARRIERS INSPECTED

(Refer to Report Section 1R05.02 - Passive Fire Barriers)

#### Fire Barriers Floors/Walls/Ceiling Identification

Fire Rated Wall	Turbine Building 809+3 from Column Lines 27B to 27N
Fire Rated Wall	U2 East Penetration Room / U2 Cable Spreading Room
Fire Rated Floor	East Penetration Room
Fire Rated Floor	Unit 2 Cable Spreading Room
Fire Rated Ceiling	Unit 2 Cable Spreading Room

#### Description

#### Fire Door Identification

AB22	Double Fire Door U1 to U2 Cable Spreading Room
410D	Unit 2 West Penetration Room to East Penetration Room

#### Description

#### Fire Damper Identification

0VSDAFD01	Between Unit 1 and Unit 2 CSR
0VSDAFD02	Between Unit 1 and Unit 2 CRS
0VSDAFD03	Between Unit 1 and Unit 2 Equip. Rooms
0VSDAFD04	Between Unit 1 and Unit 2 Equip. Rooms

#### Description

#### Fire Barrier Penetration Seal

2CF-39	Unit 2 Cable Spreading Room Ceiling
2CF-65	Unit 2 Cable Spreading Room Ceiling
2CF-86, 87 & 88	Unit 2 Cable Spreading Room Ceiling
2M-N-1	Unit 2 Cable Spreading Room Wall
2M-N-15	Unit 2 Cable Spreading Room Wall

#### Description

#### Section 1R05.06: List of Safe Shutdown Components Inspected

#### Component Identification

2EL MX2XH	600 V Motor Control Center
2HPIPU0001	U2 High Pressure Injection Pump "2A"
2HPIPU0002	U2 High Pressure Injection Pump "2B"
2HPIPU0003	U2 High Pressure Injection Pump "2C"
2RC VA0066	U2 Power Operated Relief Valve
2RC VA0004	U2 PORV Block Valve
2RC HE0002	U2 Pressurizer Heater Bank #2
2RC PU0003	2B1 Reactor Coolant Pump
2RC PU0004	2B2 Reactor Coolant Pump
2CRD-BK-000A	Control Rod Drive Breaker Cabinet
2CRD-BK-000B	Control Rod Drive Breaker Cabinet
2CRD-BK-000C	Control Rod Drive Breaker Cabinet
2CRD-BK-000D	Control Rod Drive Breaker Cabinet
87L	230KV Pilot Wire Differential Relay

#### Description

## LIST OF DOCUMENTS REVIEWED

### Procedures

IP/O/B/3000/020, Maintenance And Testing Of Self-Contained Battery Packs On Emergency Lights, Rev. 43

IP/O/A/0050/002, Site Damage Control Procedure, Rev. 33

MD 4.4.12, Methods For The Replacement Of Fuses, Rev. 1

PT/O/B/0610/009, Emergency Lighting, Rev. 27

AD-EG-ALL-1520, Fleet Transient Combustible Control procedure, Rev. 3

AD-EG-ALL-1503, NFPA 805 Monitoring, Rev. 1

EDM-253, NFPA 805 Monitoring Program, Rev. 2

IP/O/A/3011/013, Molded Case Circuit Breaker Test and Inspection, Rev. 34

IP/O/A4980/050F, ONS 50B and 50H Relay Test, Rev. 15

PT/1/A/0600/024, SSF Valve Control Transfer Verification, Rev. 15

PT/2/A/0600/024, SSF Valve Control Transfer Verification, Rev. 14

PT/3/A/0600/024, SSF Valve Control Transfer Verification, Rev. 14

EP/2/A/1800/001, Unit 2 EOP Blackout, Rev. 2

AP/O/A/1700/025, Standby Shutdown Facility Emergency Operating Procedure, Rev. 61

AP/O/A/1700/043, Fire Brigade Response Procedure, Rev. 6

AP/O/A/1700/044, Abnormal Pressurizer Pressure Control, Rev. 3

AP/2/A/1700/020, Loss of Component Cooling, Rev. 13

AP/2/A/1700/050, Challenging Plant Fire, Rev. 1

AP/2/A/1700/014, Loss of Normal HPI Makeup and/or RCP Seal Injection, Rev. 14

AP/2/A/1700/032, Loss of Letdown, Rev. 7

EP/2/A/1800/001 00, Unit 2 EOP, Immediate Manual Actions and Subsequent Actions, Rev. 0

E.M. 5.2 – Extensive Damage Mitigation (B5b) Strategies Evaluations by Station Management in the TSC, Rev. 8

OP/1/A/6101/003, Alarm Response Guide 1SA-03, Rev. 61

AD-LS-ALL-0006, Notification/Reportability Evaluation, Rev. 0

IP/O/A/3010/006, Station Routed Cables, Enclosure 9.3

OP/OA/1600/010, NFPA-805 Commitments for Planned SSF Unavailability, Enclosure 4.21

OP/OA/1600/010, NFPA-805 Commitments for Unplanned SSF Unavailability, Enclosure 4.18

AD-EG-ALL-1132, Preparation and Control of Design Change Engineering Changes, Rev. 3

AD-EG-ALL-1501, Fire Protection Change Process, Rev. 1

AD-LS-ALL-0007, Applicability Determination Process, Rev. 2

EDM 601, Engineering Change Manual, Rev. 29

IP/O/B/0101/003, Temporary Power Installation and Removal, Rev. 7

NSD 228, Applicability Determination, Rev. 10

NSD 320, Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program, Rev. 4

AD-EG-ALL-1117, Design Analyses and Calculations, Rev. 2

AD-EG-ALL-1502, Fire Protection Impact Screening for Plant Design Changes, Rev. 0

AD-EG-ALL-1520, Transient Combustible Control, Rev. 3

AD-EG-ALL-1521, Hot Work Permits, Rev. 3

AD-EG-ALL-1530, Fire Brigade Training, Rev. 0

AD-EG-ALL-1532, NFPA 805 Pre-Fire Plans, Rev. 0

IP/O/A/0250/005 J, Cable Room and Electrical Room Ventilation System Fire and Control Damper Tests, Rev. 6

IP/O/B/0250/005 F, Fire Detection System Fire Detector Visual Inspection and Sensitivity Test, Rev. 045

MP/O/A/1210/010B, Valve Stem Lubrication for Manual Operated Valves, Rev. 7

MP/0/A/1765/032A, Fire Extinguisher Auxiliary Building-Monthly Inspection, Rev. 000  
 MP/0/A/1705/032, Fire Hose Stations-Common Areas-SLC Related Inspections, Rev 41  
 MP/2/A/1705/018, Fire Protection-Penetration-Fire and Flood Barrier-Inspection and Minor  
 Repair, Rev. 45  
 NSD 316, Fire Protection Impairment and Surveillance, Rev. 17  
 NSD 403, Shutdown Risk Management (Modes 4, 5, 6 AND NO MODE) per CFR 50.65 (A)(4),  
 Rev. 16  
 PT/0/A/1210/010B, Fire Protection System Three Year Flow Test, Rev. 34  
 AM/0/A/1400/002B, Equipment Hatch – Reactor Building - Emergency Closing, Rev. 7  
 NSD-403, Shutdown Risk Management (Modes 4, 5, 6, and No-Mode) per 10 CFR 50.65 (a)(4),  
 Rev. 34  
 OP/0/A/2000/043, KHS Shift Turnover and Rounds, Rev. 42  
 OP/2/A/1102/020D, SSF and Outside Rounds  
 OP/2/A/1103/001, Draining and Nitrogen Purging RCS, Rev. 95  
 PD-EG-ALL-1640, Nuclear Coatings Program, Rev. 0  
 PT/0/A/0250/010E, CT4 Transformer Mulsifyre Wet Test, Rev. 9  
 PT/1/A/0250/010D, Fire Protective Systems Transformer Mulsifyre Wet Test, Rev. 27  
 PT/2/A/0250/010D, Fire Protective Systems Transformer Mulsifyre Wet Test, Rev. 32  
 PT/2/A/0600/001, Periodic Instrument Surveillance, Rev. 309  
 PT/3/A/0250/010D, Fire Protective Systems Transformer Mulsifyre Wet Test, Rev. 29  
 O-0-SOG-9000-018, Standard Operating Guideline, Rev. 0  
 SD 1.3.5, Shutdown Protection Plan, Rev. 34

### **Drawings**

OFD-121D-2.1, Flow Diagram of Emergency Feedwater System, Rev. 39  
 O-0310-FZ-013, Aux & Reactor Building – U2 Fire Protection Plan Fire Zone Boundaries, Rev. 2  
 O-0310-FZ-029, Turbine Building – U2 Fire Protection Plan Fire Zone Boundaries, Rev. 1  
 O-1930, Electrical Equipment Layout Turbine Building EL 822', Rev. 52  
 O-1930-A, Electrical Equipment Layout Below Operation Floor, Rev. 24  
 O-17A, Auxiliary Building Units 1 & 2 EL 771', Rev. 29  
 OC-EAP-PSW-6, PSW to HPIP Power, Rev. 0  
 OEE-250-07, Elementary Diagram Pressurizer Relief Valve, Rev. 18  
 OEE-250, Elementary Diagram Pressure Relief Block Valve SSF 2RC-4, Rev. 12  
 OEE-217-4A, Elementary Diagram 6900 Volt Switchgear #2TA RCP Motor No. 2A1, Rev. 8  
 OEE-217-5, Elementary Diagram 6900 Volt Switchgear #2TA RCP Motor No. 2B1, Rev. 8  
 OEE-217-05-B, Elementary Diagram RCP Power Monitor 2B1, Rev. 0  
 OEE-217-10A, Elementary Diagram 6900 Volt Switchgear #2TB RCP Motor No. 2B2, Rev. 8  
 OEE-249-10, Elementary Diagram SSF Pressure HTR Bank 2 Group B, Rev. 27  
 OEE-249-1, Pressurizer Heaters Arrangement, Rev. 28  
 OEE-249-15, Elementary Diagram SSF Pressurizer HTR Group C Bank 2, Rev. 5  
 K-700, One Line Diagram Relay & Meters 13.8-230 KV, Rev. 39  
 K-707, Elementary Diagram A.C. Circuits Generators No. 1 & No. 2 Transformer No. 1, Rev. 30  
 OFD-101A-02-05, Flow Dia. of High Pressure Injection System (SSF Portion), Rev. 21  
 OFD-101A-2.1, Flow Dia. of High Pressure Injection System, Rev. 45  
 OFD-101A-2.4, Flow Dia. of High Pressure Injection System, Rev. 46  
 OFD-104A-1.1, Flow Dia. of Spent Fuel Cooling System, Rev. 59  
 OFD-121D-1.2, Flow Dia. of Emergency Feedwater System, Rev. 24  
 OFD-121D-2.1, Flow Dia. of Emergency Feedwater System, Rev. 39  
 OFD-131A-1.1, Flow Dia. of Protected Service Water System, Rev. 2  
 OFD-131A-1.2, Flow Dia. of Protected Service Water System, Rev. 1  
 OFD-131A-2.2, Flow Dia. of Protected Service Water System, Rev. 1

OFD-131A-3.2, Flow Dia. of Protected Service Water System, Rev. 2  
 OFD-133A-2.5, Flow Dia. of Condenser Circulating Water System, Rev. 55  
 OSFD-100A-3, Summary Flow Diagram of Emergency Core Cooling and RB Spray Systems, Rev. 5  
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 WO 020026177-01, Bi-Monthly Fire Door Inspection (All Units), 11/30/2015  
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 OSC-9375, Oconee Fire PRA, Fire Scenario Report, Rev. 5  
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 KC-2135, Hydraulic Calculation for Keowee Hydro Station 250 KVA Transformer Water Spray Suppression System, Rev. 0  
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 O-FS-2-AB-9809-001, Pre-Fire Plan for FZ 103 East Penetration Room, Rev. 1  
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 OCFIRE/Fire Brigade Training Program, Fire Brigade Training Records (All Members-Day Shift 3-02/2016)  
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### **Applicable Codes and Standards**

NFPA 13, Standard for the Installation of Sprinkler Systems, 1999 Edition  
 NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 2007 Edition  
 NFPA 15, Standard for the Installation of Water Spray Fixed Systems for Fire Protection, 2001 Edition  
 NFPA 20, Standard for the Installation of Centrifugal Fire Pumps, 2007 Edition  
 NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2007 Edition  
 NFPA 58, Liquefied Petroleum Gas Code, 2011 Edition  
 NFPA 72, National Fire Alarm Code, 2007 Edition  
 NFPA 80, Standard for Fire Doors and Fire Windows, 2007 Edition  
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 NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition  
 ASTM E-0136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, 2009 Edition

### **Technical Manuals and Vendor Information**

MAN-4710, INSTRUCTION MANUAL BIRNS EMERGENCY LIGHTING FIXTURE Model 4710, 4710-230 ELF LED, 7/24/2015  
 Ruskin Air and Sound Control, Incorporated Fire and Smoke Dampers Selection and Application Manual, RFSDM 6/06  
 OM 280-0015.001, Vendor Manual Approval Sheet, Ruskin Fire Damper Operating and Maintenance Instructions  
 Underwriters Laboratory Building Materials Directory, effective 12/16/1994  
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 High Pressure Service Water System Health Report, 3<sup>rd</sup> Quarter 2015  
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 Daily Operational Focus Report – Safety and Peer Observations, 3/10/2016  
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 Oconee Nuclear Station UFSAR 9.5.1, Fire Protection, 31Dec2014  
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 06/05/2015  
 Fire Brigade Leader Turnover Sheet (Listing of SLC Impairments), dated 2/29/2016  
 Fire Brigade Completed Learning Activity Report (ST2117), dated 3/16/2016  
 OPS Hourly Fire Watch-Turbine Building SLC Impairments, dated 3/16/2016  
 Letter of Agreement (LOA), Six Mile Volunteer Fire Department, June 10, 2014  
 Letter of Agreement (LOA), Keowee-Ebenezer Volunteer Fire Department  
 Letter of Agreement (LOA,) Corinth-Shiloh Volunteer Fire Department  
 NFPA 805 FAQ 07-0040, Non-Power Operations Clarifications, Rev. 40  
 NRC Closeout of National Fire Protection Association 805 Frequently Asked Question 07-0040  
 on Non-Power Operations Clarification, dated 08/11/2008  
 Duke Energy Letter ONS-2014-047, License Condition 3.D, Transition License Condition 1,  
 Implementation Clarification and Commitment Change (ML14126A688) dated 05/05/2014

**Action Requests (ARs) Generated as a Result of This Inspection**

02006353, 2016 TFPI: Housekeeping Observation in U2 East Pen Room, 3/1/2016  
 02007057, 2016 TFPI - EOC Work in Response to NCR 2004625, 3/3/2016  
 02011470, 2016 TFPI – NRC Walkdown Safety Questions, 3/16/2016  
 Work Request 20025800, Exposed Wire at Junction Box, 3/16/2016  
 02011673, Postulated HPIP Fire Did Not Receive a VFDR Evaluation, 3/16/2016  
 02012102, 2016 TFPI – Pen 2NF8 Inspection Documentation Incomplete, 3/17/2016  
 02011492, Fire Door Inspection for Lube Oil Storage Room, 3/16/2016  
 02001881, Need to clarify a statement in section 7.7.5, Nuclear Safety Compliance  
 Assessment Results for Fire Area Keowee.  
 02006347, 2016 TFPI – Review top fire scenarios for risk reductions  
 02007102, 2016 TFPI Four ES monitor relays not found in EDB  
 02007168, Radio Communication  
 02007298, 2016 TFPI: Wrong PRA treatment statement used for VFDR  
 02010619, Correction to OSS-0254.OO-OO-4008. NFPA 90A should reference the 2009  
 edition, not 2007  
 02011311, PT/0/A/0120/033, Time Critical Action Verification....  
 02011334, Revise RP/0/A/1000/035, Severe Weather Preparation, Enclosure 4.13 (Site  
 Services Actions), item 3, to specifically include the ramp to the B5b pump building  
 02011664, IP/0/A/0050/002  
 02012060, OSC-9314 does not contain sufficient details on the qualitative risk assessment  
 rationale nor non-credited alternative success paths...  
 02012106, 2016 TFPI NRC observations/comments related to B5b program  
 02012108, 2016 TFPI – ONS B5b response to PWROG document for SGMU

**Other Corrective Action Documents (ARs/NCRs) Reviewed During This Inspection**

NCR 01857385, Egress Emergency Light May Not Be Aligned Correctly, 2/24/2015  
 NCR 01907880, Emergency Light Not Provided by SSF Electrical Equipment Room, 3/10/2015  
 NCR 01999309, Results of IN 92-18 (Hot Short) Review for NFPA 805, 2/9/2016  
 NCR 01932229, Discovery of Thermoplastic Cable at ONS - Affects Fire PRA, 6/17/2015  
 NCR 01909405, Documentation of the October 23rd 2014 NFPA 805 Expert Panel, 11/4/2014  
 NCR 01910240, April 20th 2015 NFPA 805 Expert Panel Meeting Minutes, 4/23/2015  
 NCR 01946412, NFPA 805 Expert Panel Meeting Minutes for 8-10-15 Meeting, 8/24/2015

NCR 02004625, Unplugged Holes in U2 Cable and East Pen Room Cabinets, 2/24/2016  
 AR 01906086, There are 10 MOVs that are postulated to fail their pressure boundary due to stall torque of the actuator, 2/17/2014  
 AR 01999309, Results of IN 92-18 (Hot Short) review for NFPA 805, 2/9/2016  
 AR 01796701, Fire Drill-Unit 2 4160V Equipment Area, Alpha Shift, 1/20/2010  
 AR 01857692, Radio Communication in Control room Questionable, 3/09/2015  
 AR 01851011, Communication Difficulties due to Radio Challenges  
 AR 01905275, Fire Damper Visual Inspections Installed HVAC Duct Penetrations, 10/09/2012  
 AR 01905294, NFPA 805 Code 90A OSC-9684 Fire Damper Acceptance Testing, 10/26/2012  
 AR 02003607, HDPE Temporary Cooling Pipe Apparently Insulated With Armaflex, 2/22/2016  
 AR 02003719, Remove HDPE Pipe Above 1X2 and 2X2 600V Load Centers, 2/23/2016  
 AR 02004052, HDPE Zone of Influence Further Evaluation Needed, 2/23/2016  
 AR 02005093, Armaflex and Suspect Urethane Foam Insulation in TB, 2/25/2016  
 AR 02007353, Fire Drill-Unit 2 East Penetration Room. Alpha Shift, 3/03/2016  
 AR 02009558, Ponding Observed in U1-2 Transformer Oil Collection System

### **Design Changes**

EC 107362  
 EC 109523  
 EC 107303  
 EC 103199  
 EC 103203  
 EC 112439  
 EC 112282  
 EC0000099627, Add DGA Online Monitoring To Transformer 1T, Rev. 3  
 EC0000107303, Install QA-1 Auto Shutoff for RO Unit in High Room Temperature, Rev. 4  
 EC0000110563, Modify Nitrogen System Supports PIP 12-9757, Rev. 1  
 EC0000111823, External Flood East Slope Erosion Protection – Areas 5, 6, 7, and 11, Rev. 2  
 EC0000113270, Install HPSW Water Supply and Fire Hose Cabinets on the Turbine Building Roof, Rev. 0  
 EC0000109910, ONS New Radiation Protection Building 80131 – Storm Drain And HPSW, Rev. 3  
 EC #0000109817, NFPA 805 New Fire Detectors, Auxiliary Building, Rev. 0

### **Audits and Self Assessment Reports**

O-13-05894, Readiness Assessment for NRC Triennial Fire Protection Audit O-ENG-SA-13-15  
 Nuclear Oversight-Audit 2010 Oconee Fire Protection 10-21 (NOS) (TFP) (ONS)  
 Nuclear Oversight-Audit 2013 Oconee Fire Protection 13-11 (NOS) (FP) (ONS)  
 System Health Report, High Pressure Service Water System, 1/01/13 through 3/31/13  
 Program Health Report, Fire Protection Program, 1/01/13 through 3/31/13

### **Licensing Basis Documents**

ONS UFSAR, Section 8.3.2.1.7, Emergency Lighting System, 12/31/2014  
 ONS UFSAR, Section 9.5.1, Fire Protection, 12/31/2014  
 ONS UFSAR, Section 9.6, Standby Shutdown Facility, 12/31/2014  
 Duke Letter, "Request for Additional Information Regarding the License Amendment Request to Adopt NFPA 805...", dated 11/19/2010  
 Duke Energy Letter, Oconee – Response Providing Information Regarding Implementation Details for the Phase 1, 2, and 3 Mitigation Strategies (Security-Related) – dated February 22, 2007

Duke Energy Letter, Oconee – Request for Additional Information regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition) License Amendment Request (LAR) 2008-01, dated November 19, 2010

NRC Letter, Oconee – Conforming License Amendments to Incorporate the Mitigation Strategies Required by Section B.5.b of Commission Order EA-02-026, dated August 16, 2007

NRC Letter, Oconee, Issuance of Amendments Regarding Transition to a Risk-Informed, Performance Based fire Protection Program in Accordance with 10 CFR 50.48(c), dated December 29, 2010

Oconee Nuclear Station Units 1,2, and 3 License Amendment Request to Adopt NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition), April 14, 2010

Duke Energy Carolinas, LLC, Renewed Facility Operating License Nos. DPR-38, DPR-47 and DPR-55

Selected Licensee Commitment (SLC) 16.9.7, Keowee Lake Level, dated 07/23/2012

SLC 16.9.11, Turbine Building Flood Protection Measures, dated 06/29/2015

## LIST OF ACRONYMS AND ABBREVIATIONS

AV	Apparent Violation
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DBD	Design Bases Document
DC	Direct Current
ELU	Emergency Lighting Unit
FA	Fire Area
FPP	Fire Protection Program
FZ	Fire Zone
IMC	Inspection Manual Chapter
IP	NRC Inspection Procedure
NCV	Non Cited Violation
NFPA	National Fire Protection Association
NRC	United States Nuclear Regulatory Commission
NSCA	Nuclear Safety Capability Assessment
NSD	Nuclear System Directive
OMA	Operator Manual Actions
ONS	Oconee Nuclear Station
P&IDs	Piping and Instrumentation Diagrams
PIP	Problem Investigation Program
Rev	Revision
SDP	Significance Determination Process
SER	Safety Evaluation Report
SLC	Selected Licensee Commitments
SSC	Systems, Structures and Components
SSD	Safe Shutdown
WO	Work Order