UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 6, 2015

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

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 - REPORT FOR THE ONSITE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (TAC NOS. MF0782, MF0783, MF0784, MF0785, MF0786, AND MF0787)

Dear Mr. Batson:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A065 - not publicly available, security related information), Duke Energy Carolinas, LLC (Duke, the licensee) submitted its OIP for Oconee Nuclear Station, Units 1, 2, and 3 (Oconee) in response to Order EA-12-049. By letters dated August 29, 2013, February 28, 2014, August 27, 2014, February 27, 2015, and August 26, 2015 (ADAMS Accession Nos. ML13246A009, ML14064A196, ML14245A018, ML15063A027, and ML15247A068, respectively), the licensee submitted its first five six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the Oconee interim staff evaluation (ISE) dated February 10, 2014 (ADAMS Accession No. ML13365A258), and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13086A095), the licensee submitted its OIP for Oconee in response to Order EA-12-051. By letter dated June 21, 2013 (ADAMS Accession No. ML13171A301), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 19, 2013, August 26, 2013, February 28, 2014, August 27, 2014, February 27, 2015, and August 26, 2015 (ADAMS Accession Nos. ML13207A413, ML13242A009, ML14064A197, ML14245A019, ML15063A028, and

ML15247A069, respectively), the licensee submitted its RAI responses and first five six-month updates to the OIP. The NRC staff's review led to the issuance of the Oconee ISE and RAI dated November 1, 2013 (ADAMS Accession No. ML13298A696). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audit process, to include the in-office and onsite portions, allows the staff to assess whether it has enough information to make a safety evaluation of the Integrated Plans. The audit allows the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted information, identifies additional information necessary for the licensee to supplement its plan, and identifies any staff potential concerns. The audit's onsite portion took place prior to declarations of compliance for Oconee.

In support of the ongoing audit of the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Oconee from July 20-23, 2015, per the audit plan dated June 10, 2015 (ADAMS Accession No. ML15160A664). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on a successful path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, review of staging and deployment of offsite equipment, and review of installation details for SFPI equipment.

The enclosed audit report provides a summary of the activities for the onsite audit portion. Additionally, this report contains an attachment listing all open audit items currently under NRC staff review.

If you have any questions, please contact me at 301-415-2901 or by e-mail at John.Boska@nrc.gov.

Sincerely,

John P. Boska

John P. Boska, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-269, 50-270, and 50-287

Enclosure:
Audit report

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ORDERS EA-12-049 AND EA-12-051 MODIFYING LICENSES

WITH REGARD TO REQUIREMENTS FOR

MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

AND RELIABLE SPENT FUEL POOL INSTRUMENTATION

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

BACKGROUND AND AUDIT BASIS

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). Order EA-12-049 directs licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event (BDBEE). Order EA-12-051 requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a BDBEE. The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A065 - not publicly available, security related information), Duke Energy Carolinas, LLC (Duke, the licensee) submitted its OIP for Oconee Nuclear Station, Units 1, 2, and 3 (Oconee) in response to Order EA-12-049. By letters dated August 29, 2013, February 28, 2014, August 27, 2014, February 27, 2015, and August 26, 2015 (ADAMS Accession Nos. ML13246A009, ML14064A196, ML14245A018, ML15063A027, and ML15247A068, respectively), the licensee submitted its first five six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders

that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the Oconee interim staff evaluation (ISE) dated February 10, 2014 (ADAMS Accession No. ML13365A258), and continues with in-office and onsite portions of this audit.

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The ongoing audit process, to include the in-office and onsite portions, allows the staff to assess whether it has enough information to make a safety evaluation of the Integrated Plans. The audit allows the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted information, identifies additional information necessary for the licensee to supplement its plan, and identifies any staff potential concerns.

In support of the ongoing audit of the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Oconee from July 20-23, 2015, per the audit plan dated June 10, 2015 (ADAMS Accession No. ML15160A664). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and gain key insights most easily obtained at the plant as to whether the licensee is on a successful path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, review of staging and deployment of offsite equipment, and review of installation details for SFPI equipment. The audit's onsite portion took place prior to declarations of compliance for Oconee.

Following the licensee's declarations of order compliance, the NRC staff will evaluate the OIPs, as supplemented; the resulting site-specific Overall Program Documents (OPDs) and Final Integrated Plans (FIPs); and, as appropriate, other licensee submittals based on the requirements in the orders. For Order EA-12-049, the staff will make a safety determination using the Nuclear Energy Institute (NEI) developed guidance document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" issued in August 2012 (ADAMS Accession No. ML12242A378), as endorsed, by NRC Japan Lessons-Learned Directorate (JLD) interim staff guidance (ISG) JLD-ISG-2012-01 "Compliance with Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-

Basis External Events'" (ADAMS Accession No. ML12229A174). For Order EA-12-051, the staff will make a safety determination using the NEI developed guidance document NEI 12-02, Revision 1, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation'" (ADAMS Accession No. ML12240A307), as endorsed, with exceptions and clarifications, by NRC ISG JLD-ISG-2012-03 "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," (ADAMS Accession No. ML12221A339) as providing one acceptable means of meeting the order requirements. Should the licensee propose an alternative strategy for compliance, additional staff review will be required to evaluate the alternative strategy in reference to the applicable order.

AUDIT ACTIVITIES

The onsite audit was conducted at the Oconee facility from July 20, 2015, through July 23, 2015. The NRC audit team staff was as follows:

Title	Team Member	Organization
Team Lead/Project Manager	John Boska	NRR/JLD
Technical Support – Electrical	Prem Sahay	NRR/JLD
Technical Support – Reactor Systems	Joshua Miller	NRR/DSS
Technical Support – Reactor Systems	Laura Okruhlik	NRR/JLD
Technical Support – Balance of Plant	On Yee	NRR/JLD
Technical Support - SFPI	Khoi Nguyen	NRR/JLD

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the audit plan, to include conducting a tabletop discussion of the site's integrated mitigating strategies (MS) compliance program, a review of specific technical review items, and discussion of specific program topics. Activities that were planned to support the above included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

AUDIT SUMMARY

1.0 Entrance Meeting (July 20, 2015)

At the audit entrance meeting, the NRC staff audit team introduced itself followed by introductions from the licensee's staff. The NRC audit team provided a brief overview of the audit's objectives and anticipated schedule.

2.0 Integrated Mitigating Strategies Compliance Program Overview

Per the audit plan and as an introduction to the site's program, the licensee provided a presentation to the NRC audit team describing the site's strategies to meet the NRC orders. The licensee reviewed its strategy to maintain core cooling, containment, and SFP cooling in the

event of an ELAP, and the plant modifications being done in order to implement the strategies. Also reviewed was the design and location of the storage facilities for the FLEX equipment, the interface with the National Strategic Alliance for FLEX Emergency Response (SAFER) Response Centers (NSRC) including staging areas, the SFP level indication modification, the modifications planned to enhance emergency communications, and procedural enhancements such as development of FLEX guidelines (FGs).

3.0 Onsite Audit Technical Discussion Topics

Based on the audit plan, and with a particular emphasis on the Part 2 "Specific Technical Review Items," the NRC staff technical reviewers conducted interviews with licensee technical staff, site walk-downs, and detailed document review for the items listed in the plan. Results of these technical reviews and any additional review items needed from the licensee are documented in the audit item status table in Attachment 3, as discussed in the Conclusion section below.

3.1 Reactor Systems Technical Discussions and Walk-Downs

The NRC staff met with licensee staff to discuss the amount of leakage from the reactor coolant pump (RCP) seals, and the use of the Standby Shutdown Facility (SSF) to initially respond to the event. The auxiliary service water (ASW) pump in the SSF will be used to maintain level in all steam generators (SGs) for reactor decay heat removal using a water supply from the ultimate heat sink (UHS). Water will be injected into the RCP seals to cool them and to add water to the reactor coolant system (RCS) using the SSF diesel generator (DG) to power the SSF reactor coolant makeup (RCMU) pumps, which are located in the reactor containment buildings. The RCMU pumps take suction from the spent fuel pools. A portable FLEX SG makeup pump that can add water to all six SGs and three portable FLEX RCS makeup pumps (one per unit) will be stored in the FLEX storage building (FSB), along with one backup (N+1) pump for SG makeup and one backup (N+1) pump for RCS makeup. The NRC staff reviewed the analysis and flow calculations along with applicable procedures. The NRC staff reviewed the licensee's strategy for utilizing raw water sources (such as Lake Keowee), including water filtration and monitoring of core parameters to ensure adequate cooling. The NRC staff also walked down the licensee's strategies and reviewed plant procedures for implementing the core cooling and makeup strategies.

3.2 Electrical Technical Discussions and Walk-Downs

a. The NRC staff walked down the battery rooms and reviewed the proposed strategies for hydrogen control and temperature control. The NRC staff reviewed the licensee response to audit questions and the summary of results and the conclusion in calculation OSC-11253, Attachment E, for hydrogen concentration in the battery rooms. The licensee's calculation determined that hydrogen will be maintained at or below 0.37% by volume in each battery room. When asked by the NRC staff, the licensee provided additional information that the Oconee criteria is below the 4% explosive limit for hydrogen concentration in the battery rooms and that a conservative 2% acceptance criteria is applied. Since the licensee's calculation shows that the hydrogen concentration by volume is much less than the acceptance criteria, no mitigation strategy

will be required. Based on the above, the NRC Staff has no further questions on hydrogen control. This item is closed.

b. The licensee stated that Oconee does not plan to use a dc battery load shed strategy because the SSF system will be used to power the dc loads for the mitigating strategy for Phases 1 and 2 and is expected to power the dc loads for up to 72 hours.

c. The NRC staff reviewed and approved the use of the existing installed SSF diesel generator for Phase 1 and 2 and for up to 72 hours of coping (in the non-flood strategy) as an alternative to NEI 12-06, Rev. 0, in the NRC Interim Staff Evaluation (ISE) Report (ADAMS Accession No. ML13365A258) in February 2014.

d. The NRC staff walked down electrical connection points and locations for the FLEX DGs. Three portable FLEX DGs (one for each unit, 500 kW, 600 Vac) are stored in the FSB, along with one backup (N+1) DG. These FLEX DGs are stored with enough diesel fuel for several hours of operation, and will be refueled after that. The NRC staff also reviewed the licensee's use of smaller portable FLEX DGs, 6 kW, 120/240 Vac, stored in the FSB which will be used to repower important plant equipment. The staff reviewed the summary of results and the conclusion of the licensee's load and sizing calculations for the FLEX generators and did not identify any issues. Subsequent to the audit visit, the licensee reported that a change has been made to use a larger 10 kW 120/240 Vac portable DG for the alternate repower strategy. The increased capacity will allow one 10 kW DG per unit to supply the needed loads, with one additional 10 kW DG for the backup (N+1) equipment. All four 10kW DGs are stored in the FSB. The licensee plans to continue to store several of the 6kW, 120/240 Vac DGs in the FSB. One of the portable 6 kW DGs (one DG for all three Units) will continue to be used as part of the primary repower strategy with one 6 kW DG as the backup (N+1). The other 6 kW DGs will be available to provide power for FLEX support related functions (portable lighting and ventilation).

e. During the site audit, the licensee stated that the temperature ratings on the procurement specifications of the Phase 2 and Phase 3 portable FLEX DGs bound the historical average maximum site temperatures (105 °F) and therefore the licensee concluded that the FLEX DGs are designed for the environment where they will operate.

f. The NRC Staff discussed the qualification of electrical equipment inside containment with the licensee staff. The licensee provided a response stating that the equipment in the containment is qualified for 284 °F for the loss-of-coolant accident (LOCA) and for 32 days post-accident. The ELAP temperature profile in the containment after shutdown showed that it can go up to 284 °F and 59.0 psig in about 60 hours and then will level off. Therefore the equipment will remain qualified for the ELAP peak temperature and will not exceed the equipment qualification temperature for 30 days (refer to calculation OSC-8064). The licensee also provided temperature profiles for both the LOCA and the ELAP event. The licensee confirmed that the qualification of electrical equipment in the containment will remain bounded for the ELAP event out to approximately 30 days, which would envelop a significant recovery phase period also. Based on above, the

NRC staff has no further questions on the qualification of electrical equipment inside containment.

g. The NRC staff reviewed the licensee's response and evaluation of an issue identified by the NRC staff regarding the ability to successfully recharge the station batteries after they reached a fully depleted state and if the batteries would be able to supply power. The licensee's response stated that the battery chargers at Oconee are designed to automatically restart after a loss of power event and will, depending on the amount of battery discharge, go into "current limit" mode until the connected battery has recharged enough to self-limit the amount of current it is drawing from the charger. Going into current limit mode is normal and occurs after every battery discharge test is performed.

Although discharge tests are performed periodically on the batteries and they would be expected to recharge successfully from a depleted state, there is a possibility that a given battery may not be recoverable after an extended period of being fully discharged.

Based on the above, the licensee committed to changing its mitigation strategy. The licensee will add actions to the Blackout Tab in procedure EP/1/A/1800/001 to initiate a procedure to isolate the station batteries until power can be restored to the battery chargers. Subsequent to the audit visit, the licensee reported that this would be accomplished by shedding all loads on the vital dc buses (1DCA and 1DCB for Unit 1). The licensee will also shut down the vital inverters (1DIA, 1DIB, 1DIC, and 1DID for Unit 1) which are powered by the batteries and supply loads such as the instrument panels, by opening the inverter input and output breakers. Analogous steps will be added to the Unit 2 and Unit 3 procedures. The battery chargers' input and output breakers will remain closed so that the chargers will restart automatically when power is restored. These actions will be completed after declaration of an ELAP (approx. T+2 hours) and before T+4 hours (which is the current Station Blackout coping limit).

Based on the above actions to prevent complete discharge of the batteries, FG/X/A/1900/020, "FLEX Electrical Distribution," is being revised to verify proper operation of the battery chargers and to add actions to return specified dc loads and the vital inverters to service when re-energizing the battery chargers from the Phase 2 portable repower system in the T+18 hours to T+24 hours timeframe. The licensee stated that in the meantime, the SSF DG will continue to supply power to the SSF battery charger, SSF inverters and SSF loads starting from T=15 minutes and onward per Oconee procedure AP/0/A/1700/025. The licensee provided a Nuclear Task Management Tracking No. 01938086-01 to revise procedure FG/X/A/1900/020 ('X' is the Unit number) as discussed above. Based on the above, this item is closed.

3.3 SFPI Technical Discussions and Walk-Downs

The NRC staff walked down instrument, transmitter, electronics, and display locations for the SFP level instrumentation, along with the associated cable runs. The NRC staff also reviewed the available calibration, maintenance and test procedures for the SFP level instrumentation.

3.4 Other Technical Discussion Areas and Walk-Downs

a. The NRC staff toured the locations where the FLEX equipment would be located or stored (for portable equipment). The staff walked down equipment haul routes from the storage locations to the designated deployment sites, and walked down haul routes from designated staging areas for equipment that will be delivered from the NSRC.

b. The NRC staff walked down the FLEX strategies for core cooling, reactor coolant system inventory, SFP inventory, and containment cooling functions. This included the usage of the portable FLEX pumps, hose routing and connection points (primary and alternate).

c. The NRC staff reviewed the strategy that will be implemented by the licensee to refuel the portable diesel-powered FLEX equipment. The NRC staff reviewed the instructions for refueling the equipment, as well as the equipment needed to perform the refueling. Additionally, the staff reviewed the licensee's procedures for ensuring adequate fuel quality.

d. The licensee's cooldown strategy relies on operation of the SG atmospheric dump valves (ADVs). The NRC staff reviewed the capability to operate the ADVs during an extended loss of alternating current (ac) power (ELAP).

e. The NRC staff reviewed the licensee's plans to ensure adequate communications, lighting, personnel access, and equipment access, to successfully implement the strategies. The staff interviewed plant personnel responsible for these areas, and observed lighting and communication needs during plant walkdowns.

4.0 Exit Meeting (July 23, 2015)

The NRC staff audit team conducted an exit meeting with licensee staff following the closure of onsite audit activities. The NRC staff highlighted items reviewed and noted that the results of the onsite audit trip will be documented in this report. There were eight FLEX issues and one SFPI issue open at the conclusion of the audit and they were discussed at the exit meeting.

After returning to the office, the NRC audit team added one additional item for further review. This is item 20-E, on the qualification of the SSF RCMU pumps. See Attachment 3 for additional information.

CONCLUSION

The NRC staff completed all three parts of the onsite audit plan. Each audit item listed in Part 2 of the plan was reviewed by NRC staff members while on site. In addition to the list of NRC and licensee onsite audit staff participants in Attachment 1, Attachment 2 provides a list of documents reviewed during the onsite audit portion.

In support of the continuing audit process, as the licensee proceeds towards orders compliance for this site, Attachment 3 provides the status of all open audit review items that the NRC staff is evaluating in anticipation of issuance of a combined safety evaluation (SE) for both the MS and SFPI orders. The five sources for the audit items referenced below are as follows:

a. Interim Staff Evaluation (ISE) Open Items (OIs) and Confirmatory Items (CIs)

b. Audit Questions (AQs)

c. Licensee-identified Overall Integrated Plan (OIP) Open Items (OIs)

d. SFPI Requests for Additional Information (RAIs)

e. Additional information needed to support the SE

The attachments provide audit information as follows:

a. Attachment 1: List of NRC staff and licensee staff audit participants

b. Attachment 2: List of documents reviewed during the onsite audit

c. Attachment 3: MS/SFPI SE Audit Items currently under NRC staff review (licensee input needed as noted)

While this report notes the completion of the onsite portion of the audit per the audit plan dated June 10, 2015, the ongoing audit process continues, as per the letters dated August 28, 2013, and March 26, 2014, to all licensees and construction permit holders for both orders.

Additionally, while Attachment 3 provides a list of currently open items, the status and progress of the NRC staff's review may change based on licensee plan changes, resolution of generic issues, and other NRC staff concerns not previously documented. Changes in the NRC staff review will be communicated in the ongoing audit process.

Attachments:
1. NRC and Licensee Staff Onsite Audit Participants
2. Onsite Audit Documents Reviewed
3. MS/SFPI Audit Items currently under NRC staff review

Onsite Audit Participants

NRC Staff:

John Boska	NRR/JLD/JOMB
Prem Sahay	NRR/JLD/JERB
Joshua Miller	NRR/JLD/JERB
Stewart Bailey	NRR/JLD

Laura Okruhlik	NRR/JLD/JERB
Khoi Nguyen	NRR/JLD/JERB
On Yee	NRR/JLD/JCBB
David Nelson	MTS (contractor)

Oconee Staff:

Dana Jones	Manager, Fukushima Response
David Garland	Supervisor, Operations Support
Jim Weir	Lead Engineer, Fukushima Response
Eddie Welch	Principal Engineer, Fukushima Response
Greg Saxon	Lead Engineer, Fukushima Response
David Haile	Regulatory Assurance
Rusty Childs	Fukushima Response Team
Laura Todd	Fukushima Response Team
Tom Loflin	Fukushima Response Team
Danny Staudt	Fukushima Response Team
Dean Hubbard	Manager, Flooding Response
Adam Johnson	Fukushima Response Team
Guy Levy	Fukushima Response Team
Jeff Thomas	Corporate Fukushima Response
Paul Guill	Corporate Fukushima Response
Eric Henshaw	Corporate Safety Analysis

Documents Reviewed

- OSC-619, Analysis for Use of Spent Fuel Pool Inventory for Standby Shutdown Facility, Revision 43.
- OSC-1879, Seismic Evaluation of the Borated Water Storage Tank, Revision 4, August 22, 1995.
- OSC-2509-ICC-0011, "Seismic Qualification for EC105805 R000" (Calculation OSC-2509 revision to add weight to Panel 2AB3 IQF).
- OSC-2509-ICC-0012, "Seismic Qualification for EC105806 R000" (Calculation OSC-2509 revision to add weight to Panel 3AB3A IQF).
- OSC-8655, Maximum Turbine Building Flood Flow Rate Caused by Failure of a Condenser Inlet Pipe, Rev. 2.
- OSC-8671, Auxiliary Building Flood Design Values, Rev. 4.
- OSC-9595 - Protected Service Water System Hydraulic Model Appendix H: B5b Case Alignments, 8/13/14.
- OSC -9648, Oconee Nuclear Station Units 1, 2 and 3 - Units 1, 2 and 3 BWST Tornado Missile Loading and Evaluation, Revision 1, October 29, 2009.
- OSC-10937, Extended Loss of AC Power FLEX RELAP5 Analysis, Revision 2, 7/1/15.
- OSC-11176, - ELAP - Steam Generator Makeup Hydraulic Model Using FLEX Equipment, rev. 001.
- OSC-11179, Portable RCS Makeup Pumps NPSH, Rev. 1.
- OSC-11230, Non PSW Installed Auxiliary Building Electrical Equipment That Supports PSW-Temperature Rating Evaluations, Rev 1.
- OSC-11232, Flow model for portable pump feeding Steam Generators through SSF ASW piping from CTP #1 or Intake Canal.
- OSC-11253, Auxiliary Building GOTHIC Heat-Up Analysis - ELAP Event Cases, Revision 1.
- OSC-11295, ELAP Containment Response Analysis, Revision 1, 7/20/15.
- OSC-11329, FLEX Strategy Intermediate Cooling Hydraulic Calculation, rev. 0.
- OSC-11347, ONS Permanent FLEX Storage Building Structural Analysis, Rev. 0.
- OSC-11349, FLEX Spent Fuel Pool Makeup, rev. 0.
- OSC-11358, U2 FLEX Primary and Alternate Strategy Electrical System Calculation, Revision 0.
- OSC-11383, Revision 0, Attachment 1, Reliance time on the Standby Shutdown Facility (SSF) during an ELAP for a T=0 Event, Revision 0, 7/9/15.
- OSC-11383, Revision 0, Attachment 3, Performing a Deep Load Shed Analysis
- OSC-11383, Revision 0, Attachment 4, Fuel Oil Evaluation.
- OSC-11383, Revision 0, Attachment 5, Clarification of Applicable External Flooding at ONS, Revision 0, 6/12/15.
- OSC-11383, Revision 0, Attachment 7, Calculation of Minimum Spare Hoses and Cables, Revision 0.
- OSC-11383, Revision 0, Attachment 8, Portable Equipment Deployment Pathway Hazard Assessment, Revision 0.

- OSC-11383, Revision 0, Attachment 9, Atmospheric Dump Valve – Survivability and Accessibility (Seismic), Revision 0, 7/15/15.
- OSC-11383, Revision 0, Attachment 10, Atmospheric Dump Valve – Survivability and Accessibility (Tornado, Wind & Missile), Revision 0, 7/15/15.
- OSC-11383, Revision 0, Attachment 11, Oconee Mitigating Strategies Revised Sequence of Events Timelines, Revision 0, 7/9/15.
- OSC-11383, Revision 0, Attachment 12, Beyond Design Basis External Events (BDBEE) / Extended Loss of AC Power (ELAP) Communications Position Paper, Draft
- OSC-11383, Revision 0, Attachment 13, FLEX Strategies Lighting Assessment, Draft
- OSC-11383, Revision 0, Attachment 15, FLEX Mitigating Actions For Environmental Cooling, Revision 0, 7/10/15.
- OSC-11383, Revision 0, Attachment 17, FSB Seismic Overturning.
- OSC-11383, Revision 0, Attachment 17, FSB Seismic Interaction.
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Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review, Requiring Licensee Input As Noted

Audit Item Reference	Item Description	Licensee Input Needed
ISE OI 3.2.1.1.A	Provide a description and justification for the specific evaluation model(s) used in the ELAP analyses for Oconee.	No input needed at this time. The staff is reviewing the RELAP5 evaluation model used at Oconee.
ISE OI 3.2.1.6.C	When further analyses are completed, the licensee should provide additional information that either supports a conclusion that pressurizer relief or safety valves do not lift during the ELAP event or that lifting of the valve(s), if it occurs, is acceptable.	The licensee's analysis shows that the pressurizer relief valves lift until feed flow is established to the SGs. The staff requests that the licensee make available for audit a quantification of how much water is lost from the RCS, and if there is two-phase flow through the reliefs, an evaluation of the capability of the reliefs to handle this flow.
ISE OI 3.2.1.6.D	Provide additional information demonstrating successful mitigation of an ELAP event involving an uncontrolled cooldown resulting from consequential damage to the main steam system due to the severe natural hazard that initiates the ELAP event.	Due to having no main steam isolation valves, and steam lines that are exposed to tornado missiles, the NRC staff's judgment is that a guillotine break of a main steam line with no automatic feedwater isolation signal should be postulated. The staff requests that the licensee make available for audit an analysis of this event.
ISE CI 3.2.1.1.B	Confirm that the final ELAP computer code analyses for core cooling, reactor coolant system inventory, shutdown margin, and containment integrity have acceptable methodology and assumptions and support the sequence of events timeline.	None at this time. The staff is reviewing the computer codes used at Oconee.

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.2.1.2.B	Confirm that RCP seal temperature would be maintained at an acceptably low value by establishing injection flow to the RCP seals via the SSF RCMU pump within 20 minutes of event initiation.	The RCP seal heats up until SSF RCMU pump flow is established about 20 minutes after the ELAP occurs. The staff requests that the licensee make available for audit an analysis of the temperatures reached in the RCP seal.
ISE CI 3.2.1.2.C	Confirm there is justification for the assumed seal leakage rates for the Bingham RCPs with Sulzer seal assemblies.	No input needed at this time. The staff is reviewing the information provided by the licensee.
ISE CI 3.2.1.2.D	Confirm there is justification for the assumed seal leakage rates for the Westinghouse 93-A RCPs with Flowserve N-9000 seals with the Abeyance feature.	No input needed at this time. The staff is reviewing the information provided by the licensee and the vendor.
ISE CI 3.2.1.6.E	When evaluations are completed, confirm that the survivability and performance of the atmospheric dump valves is adequate to support Oconee's mitigation strategy.	The staff requests that the licensee make available for audit an analysis of possible damage to the ADVs from seismic interaction or damage to main steam branch lines from seismic interaction. The staff also requests additional analysis and/or justification that exposed main steam piping and the ADVs will survive a beyond design basis high wind event, including wind-generated missiles.
SFPI RAI-8-D	Please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the order requirements.	No input needed at this time. The staff is reviewing the information provided by the licensee.
SE 20-E	Please (1) state the ambient conditions (temperature, pressure, humidity) under which the SSF RCMU pumps are qualified or otherwise expected to function and provide a basis, (2) state the expected conditions in containment during the period when the functionality of the SSF RCMU pumps is credited and provide a basis, and (3) confirm that the credit taken for the SSF RCMU pumps under ELAP conditions is justified.	The staff requests that the licensee make available for audit the analyses that show the conditions in containment and the qualification data for the SSF RCMU pumps.

If you have any questions, please contact me at 301-415-2901 or by e-mail at John.Boska@nrc.gov.

Sincerely,

/RA/

John P. Boska, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-269, 50-270, and 50-287

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