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

October 9, 2014

Mr. Steven D. Capps
Vice President – McGuire Site
Duke Energy Carolinas, LLC
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078-8985

SUBJECT: MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 - REPORT FOR THE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL POOL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (TAC NOS. MF1160, MF1161, MF1062, AND MF1063)

Dear Mr. Capps:

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. ML13063A185), Duke Energy Carolinas, LLC (the licensee) submitted its OIP for McGuire Nuclear Station, Units 1 and 2 (MNS) in response to Order EA-12-049. By letters dated August 28, 2013, and February 27, 2014 (ADAMS Accession Nos. ML13254A204 and ML14073A462, respectively), the licensee submitted its first two 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 MNS interim staff evaluation (ISE) and audit report (ADAMS Accession No. ML13338A406) 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 MNS in response to Order EA-12-051. By letter dated June 13, 2013 (ADAMS Accession No. ML13157A097), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 11, 2013, August 26, 2013, and February 27, 2014 (ADAMS Accession Nos. ML13197A409, ML13242A009, ML14073A467, respectively), the licensee submitted its RAI responses and first two six-month updates to the OIP.

The NRC staff's review to date led to the issuance of the MNS ISE and RAI dated October 28, 2013 (ADAMS Accession No. ML13281A791). 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. By letter dated April 10, 2014 (ADAMS Accession No. ML14097A426), the NRC staff issued an audit plan to the licensee for an audit of vendor information pertaining to Order EA-12-051.

The ongoing audits allow 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 and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at MNS from August 4-7, 2014 per the audit plan dated July 8, 2014 (ADAMS Accession No. ML14181B321). 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 the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, 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.

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 301-415-5888 or by e-mail at Jason.Paige@nrc.gov.

Sincerely,

John G. Boska for

Jason Paige, Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-369 and 50-370

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

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-369 AND 50-370

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. ML13063A185), Duke Energy Carolinas, LLC (the licensee) submitted its OIP for McGuire Nuclear Station, Units 1 and 2 (McGuire, MNS) in response to Order EA-12-049. By letters dated August 28, 2013, and February 27, 2014 (ADAMS Accession Nos. ML13254A204 and ML14073A462, respectively), the licensee submitted its first two 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). The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the order. This audit

process led to the issuance of the MNS interim staff evaluation (ISE) and audit report (ADAMS Accession No. ML13338A406) 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 MNS in response to Order EA-12-051. By letter dated June 13, 2013 (ADAMS Accession No. ML13157A097), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 11, 2013, August 26, 2013, and February 27, 2014 (ADAMS Accession Nos. ML13197A409, ML13242A009, ML14073A467, respectively), the licensee submitted its RAI responses and first two six-month updates to the OIP. The NRC staff's review to date led to the issuance of the MNS ISE and RAI dated October 28, 2013 (ADAMS Accession No. ML13281A791). 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. By letter dated April 10, 2014 (ADAMS Accession No. ML14097A426), the NRC staff issued an audit plan to the licensee for an audit of vendor information pertaining to Order EA-12-051.

The ongoing audits allow 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 and updated information, audit information provided on ePortals, and preliminary Overall Program Documents (OPDs)/Final Integrated Plans (FIPs) while identifying additional information necessary for the licensee to supplement its plan and address staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at MNS from August 4-7, 2014, per the audit plan dated July 8, 2014 (ADAMS Accession No. ML14181B321). 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 the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, 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.

Following the licensee's declarations of order compliance, the NRC staff will evaluate the OIPs as supplemented, the resulting site-specific OPDs/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 regarding order compliance using the Nuclear Energy Institute (NEI) 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) as providing one acceptable means of meeting the order requirements. For Order EA-12-051, the staff will make a safety determination regarding order compliance using the NEI 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 or other method deviating from the guidance, additional staff review will be required to evaluate if the alternative strategy complies with the applicable order.

AUDIT ACTIVITIES

The onsite audit was conducted at the MNS facility from August 4, 2014, through August 7, 2014. The NRC audit team staff was as follows:

Title	Team Member
Team Lead	Daniel Merzke
Project Manager	Jason Paige
Technical Support	Joshua Miller
Technical Support	Garry Armstrong
Technical Support	Kerby Scales
Technical Support	Stephen Wyman
Branch Chief	Sheena Whaley
Assistant Team Lead	Kevin Roche

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the July 8, 2014, 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 (August 4, 2014)

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 titled "Diverse and Flexible (FLEX) Coping Strategies: NRC Audit Presentation, McGuire Nuclear Station." The licensee provided an overview of its strategy to maintain core cooling, containment, and SFP cooling in the event of a BDBEE, and the plant modifications being done in order to implement the strategies. Also presented was the design and location of the FLEX equipment storage

facility, the FLEX equipment that would be stored there, the interface with the Regional Response Center, and the spent fuel pool level indication modification.

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 that require additional information from the licensee or are still under NRC review are documented in the audit item status tables in Attachments 3 and 4, as discussed in the Conclusion section below.

3.1 Reactor Systems Technical Discussions and Walk-Downs

The staff reviewed MNS' modeling of an extended loss of alternating current power event (ELAP) and its ability to mitigate the event, including the computer code used for the ELAP analysis and input parameters assumed to generate the results of the analysis (i.e., the reactor coolant pump seal leakage, reactor coolant system (RCS) venting, etc.). For example, the NRC staff met with licensee staff to discuss the timing of the injection of borated water into the RCS, and the mixing of that water during natural circulation conditions.

3.2 Electrical Technical Discussions and Walk-Downs

NRC staff reviewed the calculations on extending battery life based on load shedding, and walked down the turbine-driven auxiliary feedwater (TDAFW) Pump, Switchgear, Battery, and Control Rooms to evaluate strategies for hydrogen and temperature control. The staff also walked down panels used for load shedding to evaluate feasibility and timing. Lastly, the NRC staff walked down FLEX electrical equipment which was already on site. Regarding ISE confirmatory item (CI) 3.2.4.10.A, the staff reviewed the licensee's calculations to verify the minimum [direct current] dc bus voltage that is required to ensure proper operation of all required electrical equipment. Currently, the staff does not need any additional information from the licensee; however, the staff will complete a vendor audit of the batteries.

3.3 SFPI Technical Discussions and Walk-Downs

NRC staff walked down the SFP area, SFP instrumentation locations, and related equipment mounting areas. No concerns were identified during the walk-downs.

3.4 Other Technical Discussion Areas and Walk-Downs.

a. In review of ISE CI 3.1.1.2.A and audit question (AQ) 8, regarding deployment of FLEX equipment, the staff verified that the licensee has up to 48 trucks available throughout the site, capable of towing most of the FLEX equipment. The staff also observed the Caterpillar tractor capable of towing the heaviest equipment. The staff was also notified that the site has purchased an additional diesel truck, also capable of deploying the heaviest equipment.

The staff reviewed the locations of Staging Areas B and C, and noted the pathways for deployment of the FLEX equipment from these areas. Based on information from site construction, soil liquefaction was not a concern. The licensee's primary path from Staging Area C has a bridge, which would need to be assessed after a seismic event. However, there are alternate pathways available which do not have bridges which can be used for timely deployment of the FLEX equipment. Additionally, the National SAFER Response Center is working with an aviation contractor to establish helicopter lift capability in the event pathways become unavailable, or the licensee will request helicopter assets from State or Federal agencies.

b. In review of ISE CI 3.1.3.1.A, protection of FLEX equipment, the NRC staff walked down FLEX buildings 1, 2, and 3 to understand the construction and capability to sustain all weather hazards excluding tornado. The licensee provided a detailed analysis to justify placing all three FLEX buildings at least 1400 feet apart from each other. The licensee initially placed the large CAT vehicle needed for large debris removal in FLEX building 3 but, based on NRC staff feedback, the licensee relocated the vehicle to FLEX building 2 to remove it from the potential pathway of the tornado. The staff reviewed the licensee's justification in calculation MCC-1512.00-00-0005 and a diagram of the NOAA archive tornado data for McGuire (1950-2010) and finds that having the three FLEX buildings in diverse locations should be adequate for tornado conditions.

   The licensee also provided information on the buildings capabilities to withstand high temperatures. The staff reviewed the licensee's information and was able to verify during the walkdown that the licensee considered high temperatures as part of the design for the FLEX buildings.

c. In review of ISE CI 3.2.4.7.A and AQ 43, water sources, the NRC staff conducted a walkdown of the locations where the steam generators (SG) will take suction for makeup during an ELAP. The staff also reviewed FLEX support guidelines (FSG) -2 to identify the steps for aligning the water sources to the SG, and the licensee clarified that its strategy focuses on cooling the core even if lower quality water has to be used as makeup to the SGs during ELAP. The staff finds the licensee's strategy for SG makeup to be adequate for ELAP conditions.

d. In review of ISE CI 3.2.4.9.A, portable equipment fuel, the NRC staff discussed with the licensee the amount of fuel available for all of the FLEX equipment to be used and the delivery mechanism throughout the ELAP event. The licensee will have three fuel trucks on site ready for constant delivery and will keep debris removal equipment with a full tank of diesel fuel in the FLEX buildings. The licensee plans to contract out to a local fuel company to provide fuel for the National SAFER Response Center equipment after the initial 72 hours. The licensee also provided a detailed response that describes the amount of fuel needed daily by the FLEX equipment and the available fuel in the four fuel oil storage tanks, which can provide up to 26 days of fuel, if needed. The staff requested that the licensee provide information on the ePortal regarding the fuel quality from the three trucks onsite that will be used initially to refuel FLEX equipment.

After the conclusion of the onsite audit, the licensee provided clarification that the number of fuel trucks available on site needed revision due to logistical issues with spill containment requirements. The two fuel trucks already assigned to the McGuire site remain as described during the onsite auidit: one fuel truck is always on site, whereas the other may be dispatched for storm response as a weather event approaches (the dispatched fuel truck is on immediate recall to McGuire site if needed). This scenario leaves one fuel truck on site, stored at its designated location in the McGuire garage area (towards FLEX Building #1). The BDBEE could therefore incapacitate the fuel truck on site, with the other fuel truck dispatched but on immediate recall.

For defense-in-depth, McGuire will also have a diesel-powered fuel transfer/filter trailer located in the FLEX Building furthest from the McGuire garage area (Building #3). This equipment is used by plant procedures to connect to the Emergency Diesel Generator (EDG) Fuel Oil Storage Tank recirculating pump piping to provide additional filtration of the fuel, or to transfer the fuel from the storage tanks to a fuel truck. It can be towed with any available vehicle due to its small size. A portable 500-gallon fuel tank stored with the fuel transfer trailer will be deployed, along with a flatbed trailer towed by one of the stored debris removal vehicles, in lieu of a third fuel truck. As the refueling of the first large FLEX component (500kW FLEX Diesel Generator) is beyond 24 hours, there will be adequate time for this refueling strategy to be deployed.

This equipment (fuel transfer/filter trailer, portable tank, and flatbed trailer) will be deployed as part of the FLEX response to obtain fuel from the underground EDG tanks as needed if the other two fuel trucks are unavailable.

e. In review of AQ 1, FLEX equipment, the licensee verified that their plan is to strap FLEX components in the FLEX buildings to anchor bolts embedded in the floor of each facility to prevent movement during a seismic event. However, the licensee was finalizing their storage plan prior to installing the anchor bolts.

f. In review of AQ 2, access to connection points of FLEX equipment, the licensee confirmed that there would be multiple access paths to the FLEX connection points through either Turbine Building, into the Auxiliary Building, which is a seismically qualified pathway. They stated their preferred pathway would be through the north end of the Auxiliary Building; however, this area is not seismically qualified. The licensee indicated if debris removal is not possible, then the licensee would use the seismically qualified pathway through the Turbine Buildings.

g. In review of SE Review Item 6, human factors, the NRC staff reviewed various FSGs and walked down procedures, paths, and connection locations in the areas of electrical, balance of plant, reactor systems, spent fuel, and haul routes/storage locations. The staff had discussions with the licensee on various human factors applications at the site, including control room indication, the use of procedures in adverse conditions, protection for employees in adverse conditions, and accessibility of connections. This item was closed out with the following notes: 1) Validation of the FSGs and the overall timeline may be done using Emergency Operating Procedure validation or the NEI guidance; and 2) McGuire is not planning on adding differentiating tags to the FLEX connections or

electrical components. Adding tagging or other equivalent aides may help operators perform these actions in the conditions of the ELAP event.

4.0 Exit Meeting (August 7, 2014)

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. The following items that require additional information from the licensee or are still under NRC review were discussed at the exit meeting (see Attachments 3 and 4 for additional information):

a. ISE CI 3.1.1.4.A, Off-Site Resources
As noted above, the staff walked down and discussed with the licensee the locations of Staging Areas B and C, and noted the pathways for deployment of the FLEX equipment from these areas. However, the licensee indicated that the SAFER Response Plan for MNS, the guidance to implement phase 3 of the OIP has not been finalized. The NRC staff requests that the licensee provide a copy of the SAFER Response Plan on the ePortal once it is finalized.

b. ISE CI 3.2.1.7.A, Shutdown and Refueling Modes
The NRC staff discussed with the licensee its strategy for responding to an ELAP event while McGuire is either in Shutdown or Refueling mode. The licensee indicated that it will follow the generic resolution that is being generated by the pressurized-water reactor (PWR) Owners Group (PWROG), which is the development of high level strategies for maintaining key safety functions when a unit is in a shutdown condition with residual heat removal systems in service at the onset of an ELAP event. However, the licensee noted that the generic resolution will not be completed to support McGuire, Unit 1 implementation of Order EA-12-049, which is scheduled for fall 2014. To support implementation of fall 2014 plants, the licensee indicated that the PWROG developed an interim shutdown guidance that identified minimal coping strategies for PWRs when an ELAP event occurs in a shutdown mode, including the capability to makeup to the RCS with a portable pump. During the onsite audit, the licensee provided a copy of the interim guidance and the NRC staff is currently reviewing the document.

c. ISE CI 3.2.4.4.A, Lighting and Communications
The NRC staff walked down and discussed with the licensee their plans to enhance McGuire's communications systems. The licensee indicated that the modifications and relocating equipment to the MG set room has not been completed. The NRC requested that the licensee provide confirmation of the modifications to the communications systems once completed.

d. ISE CI 3.4.A, Off-Site Resources
The NRC staff discussed with the licensee its plan to address minimum capabilities of off-site resources, outlined in the 10 guidelines in NEI 12-06. The licensee indicated that coordination of McGuire strategies with the National SAFER Response Centers is ongoing. By letter dated September 11, 2014, ADAMS Accession No. ML14259A222, the Nuclear Energy Institute (NEI) provided a white paper titled

"National SAFER Response Centers," which provided the programmatic aspects and implementation plans for the SAFER program. By letter dated September 26, 2014, ADAMS Accession No. ML14265A107, the NRC issued an NRC staff assessment of the National SAFER Response Centers. The NRC staff has concluded that SAFER has procured equipment, implemented appropriate processes to maintain the equipment, and developed plans to deliver the equipment needed to support site responses to BDBEEs, consistent with NEI 12-06 guidance.

e. Licensee Identified OIP Open Item 5, Process Connections
The NRC staff discussed with the licensee the pending plant modifications needed for Units 1 and 2 to implement their FLEX strategy. The NRC staff requested that the licensee provide a summary of the plant modifications for staff review.

f. SE Review Item 2
The staff reviewed the licensee's reactor coolant pump (RCP) leakage rate following the issues raised in NSAL-14-1. The licensee identified the need to modify their RCP seal leakoff line configuration to change the orifice size. This modification will make the MNS RCP leakoff rate consistent with Category 1 of the Westinghouse evaluation of the revised seal flow rate on time to enter reflux cooling and time at which the core uncovers (PWROG-14027-P, Revision 1). The staff closed SE Review Item 2; however, after the completion of the audit, the staff identified two questions that need to be addressed by the licensee. See Attachment 3, questions SE Review Items 7 and 8.

g. SE Review Item 5
The NRC staff discussed with the licensee the basis that calculations performed with the NOTRUMP computer code (e.g., those in WCAP-17601-P, WCAP-17792-P) are adequate to demonstrate that criteria associated with the analysis of an ELAP event (e.g., avoidance of reflux cooling, promotion of boric acid mixing) are satisfied. At this time, no additional information is needed from the licensee; however, the staff performed a confirmatory analysis using the NRC's TRACE computer code and is currently reviewing the results between TRACE and NOTRUMP. In addition, the staff has requested a copy of the PWROG application of NOTRUMP white paper.

CONCLUSION

The NRC staff completed all three parts of the July 8, 2014, 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, Attachments 3 and 4 provide the status of all open audit review items that the NRC staff is evaluating in anticipation of issuance of a combined safety evaluation for both the Mitigation Strategies and Spent Fuel Pool Level Instrumentation 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. Spent Fuel Pool Instrumentation (SFPI) Requests for Additional Information (RAIs)

e. Additional Safety Evaluation (SE) needed information

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: McGuire MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input as delineated

d. Attachment 4: McGuire MS/SFPI SE Audit Items currently under NRC staff review, but not requiring further licensee input

While this report notes the completion of the onsite portion of the audit per the audit plan dated July 8, 2014, the ongoing audit process continues, as per letters dated August 28, 2013 and March 26, 2014, to all licensees and construction permit holders for both orders.

Additionally, while Attachments 3 and 4 provide a progress snapshot of the NRC staff's review of the licensee's OIPs, as supplemented, and as augmented in the audit process, 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.

Lastly, the licensee has identified open items that need to be completed to implement Orders EA-12-049 and EA-12-051, and the staff expects that the licensee continue to provide updates on the status of the licensee identified open items in their 6-month updates or on the ePortal.

Attachments:
1. NRC and Licensee Staff Onsite Audit Participants
2. Onsite Audit Documents Reviewed
3. McGuire MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input
4. McGuire MS/SFPI SE Audit Items currently under NRC staff review but not requiring further licensee input

Onsite Audit Participants

NRC Staff:

Daniel Merzke	NRR/DIRS/IPAB
Kevin Roche	NRR/DIRS/IPAB
Jason Paige	NRR/JLD/JOMB
Joshua Miller	NRR/JLD/MRSB
Kerby Scales	NRR/JLD/MSEB
Sheena Whaley	NRR/JLD/JHMB

Khoi Nguyen	NRR/JLD/JERB
Stephen Wyman	NRR/JLD/JERB
Garry Armstrong	NRR/JLD/JCBB

MNS Staff:

Steve Snider	Engineering Manager
Jeff Bradley	Fukushima Response Manager
Russ Lytton	Fukushima Response Technical Lead
George Murphy	Regulatory Affairs
Don Brenton	Major Projects
Harry Vanpelt	FLEX Equipment Fuel Management
Brian Porch	Validation
Mike Speziali	FLEX Diesels
Brian Casey	DC Load Shed
Mike Weiner	Procedures
Jerry Crump	Staffing
Mark Hunt	Flooding
John Huffman	AFW Strategy
Greg Holbrooks	Modification PM
Bryan Meyer	SFP Level Instrumentation
Ibrahim Canales	SFP Level Instrumentation
Kyle Hemker	Boration Analysis
John Lubatti	Core and Containment Cooling Analysis
Jeff Robertson	Regulatory Affairs Manager
John Cadwallader	Communications
Sherry Andrews	

Documents Reviewed

- Document DPC-1552.08-00-0278, Boration Analysis for Extended Loss of AC Power at MNS/CNS
- Calculation MCC-1512.00-00-0005, High Winds
- Diagram of the NOAA Archive Tornado Data for MNS (1950-2010)
- NUREG/CR-4294
- Document LTR-RES-13-153, Documentation of 7228C O-Rings at ELAP Conditions
- Calculation MCC-1240.00-00-0010, Rev. 1, FLEX Mitigation Strategy: Room Heatup Evaluation For Auxiliary Service and Fuel Buildings during ELAP Event
- Document FSG-5, Initial Assessment and FLEX Equipment Staging
- Calculation MCC-1381.05-00-0352, U1/U2 Alternate AC System Deployment for Extended Loss of AC Power (ELAP), Rev 2
- Document Duke Fleet FLEX Diesel Generator Procurement Specifications
- Document FSG-20, Flex Electrical Distribution
- Document FSG-4, ELAP DC Bus Management
- Calculation MCC-1381.05-00-0351, U1/2, 125 VDC Vital I&C Power System (EPL) Battery Coping SBO Coping Time Estimate for INPO IER L1-11-04
- Engineering Instruction MCEI-1371.53-04, 125 VDC Vital I&C Power (EPL) System Battery Extended SBO Coping Time Estimate for INPO IER L1-11-04, Rev. 0
- Procedure EP/1/A/5000/ECA-0.0, Loss off AC Power
- Calculation MCC-1170.00-00-0001, Specifications of FLEX Buildings
- Calculation MCC-1223.20-00-0020, Portable Equipment Coping Capabilities for ELAP
- Drawings MCCD-1703-07.08, MCCD-1703.06.11, MCCD-1703-06.02, MCCD-1703-06.07, MCCD-1700-00.00, MCCD-2700-00.00, Figures for 600V Portable Pwr Distribution Panel PDP-1 and PDP-2, Phase 3 Electrical Distribution Typical 2, Trystar Cable Legend
- Procedure ECA-0.0, Step 44.f and Enclosure 19, Reducing Non-Safety DC/AC loads
- Document MCS 1465.00-00-0026, FLEX Basis Document
- Drawing MCID-1499-NV.77, Instrument Details Spent Fuel Pool (KF Sys) Wide Range Level Instrumentation Backup
- Drawing MC-1414-22.20-00, Piping Layout NV Plan EL. 725'-0" Thru 738'-3" Reactor Building
- Drawing MC-1414-22.20-01, Piping Layout NV System Sections Reactor Building
- Drawing MCID-1499-NV.77, Instrument Details Spent Fuel Pool (KF Sys) Wide Range Level Instrumentation Backup
- Drawing MCID-2499-NV.77, Instrument Details Spent Fuel Pool (KF Sys) Wide Range Level Instrumentation Backup Channel Flex Strategy
- Drawing MC-1414-22.20-00, Piping Layout NV Plan EL. 725'-0" Thru 738'-3" Reactor Building
- Drawing MC-1414-22.20-01, Piping Layout NV System Sections Reactor Building
- Drawing MC-1091-1, Reactor Building 1 Concrete Shell Developed Elevation-Conc. EL.722'+6" Thru EL. 875'+4 ½"
- Drawing MC-1093-01.00, Reactor Building 2 Concrete Shell Developed Elevation-Conc. EL.722'+6" Thru EL. 875'+4 ½" Sheet 1

- Calculation MCC-1223.20-00-0022, Seismic Induced Hydrodynamic Response in the Catawba and McGuire Spent Fuel Pools (Sloshing Analyses)
- Drawing 9205710 C, MNS Unit 1 VEGA Waveguide Isometric
- Drawing 9205712 C, MNS Unit 2 VEGA Waveguide Isometric
- Drawing MC-1206-3A, Auxiliary Building Fuel Building – Unit 1 General Arrangement – Architectural Longitudinal Section Thru Fuel Pool
- Document 141-9225014-003, Horn Cover Installation, Steam Test, and Shear Test
- Document 174-9213558-006, Seismic Test Report for VEGAPULS
- Calculation MCC-1381.16-0000430/ERN:MCC0139Q, Design Inputs for the Installation of the Primary and Backup SFPIs

McGuire
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review and Requiring Licensee Input

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.1.1.4.A	Off-Site Resources	The NRC staff requests that the licensee provide a copy of the SAFER Response Plan on the ePortal once it's finalized.
ISE CI 3.2.4.4.A	Lighting and Communications	The NRC staff requested that the licensee provide confirmation of the modifications to the communications systems once completed.
Licensee Identified OIP Open Item 5	Process Connections	The NRC staff requested that the licensee provide a summary of the plant modifications to implement the FLEX strategy for staff review.
ISE CI 3.2.3.A	Containment Functions Strategies	The licensee has provided a response to the question on the ePortal; however, the staff requests that the calculations be posted on the ePortal.
ISE CI 3.2.4.9.A	Portable Equipment Fuel	Provide information on the fuel quality from the trucks that will be onsite to initially refuel FLEX equipment.

Audit Item Reference	Item Description	Licensee Input Needed
SE Review Item 5	NOTRUMP Code	Licensee needs to confirm applicability of the PWROG white paper and any plant-specific conditions, as the staff has not agreed with generic scaling methodology. Based on additional discussions with PWROG and vendor after audit as well as NRC staff confirmatory calculations, staff believes that NOTRUMP code is adequate for simulation of ELAP event. However, because of simplifications made in scaling method, comparison of key plant parameters such as initial RCS mass, accumulator mass dumped, and final cooldown pressure are necessary to confirm applicability of coping time from generic case.
SE Review Item 7	RCP Leakage Rate	Licensee needs to provide calculations/analyses demonstrating that (1) piping rupture in seal leakoff line would not occur during ELAP, or that (2) seal leakage rates would not increase if piping in seal leakoff line were to rupture under ELAP conditions. Licensee also needs to demonstrate adequacy of the model used to compute leakoff line pressures as a prerequisite (see item 8-E).

Audit Item Reference	Item Description	Licensee Input Needed
SE Review Item 8	RCP Seal Leakage Rate	Licensee needs to confirm whether it is relying on generic analyses from the Westinghouse seal leakage model or using an alternative plant-specific analysis (e.g., MPR). Licensee needs to provide adequate justification for the seal leakage rates calculated according to the Westinghouse seal leakage model that was revised following the issuance of NSAL-14-1 or an alternative model (e.g., MPR). The justification should include a discussion of the following factors: 1. Benchmarking of the seal leakage model against relevant data from tests or operating events, 2. Discussion of the impact on the seal leakage rate due to fluid temperatures greater than 550°F resulting in increased deflection at the seal interface, 3. Clarification whether the second-stage reactor coolant pump seal would remain closed under ELAP conditions predicted by the revised seal leakage model and a technical basis to support the determination, and, 4. Justification that the interpolation scheme used to compute the integrated leakage from the reactor coolant pump seals from a limited number of computer simulations (e.g., three) is realistic or conservative.

McGuire
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

Audit Items Currently Under NRC Staff Review, But Not Requiring Further Licensee Input

Audit Item Reference	Item Description	Action
ISE CI 3.2.4.10.A	Battery Sizing Calculations	The staff will complete a vendor audit of the batteries.
ISE CI 3.4.A	Off-Site Resources	The NRC staff discussed with the licensee its plan to address minimum capabilities of off-site resources, outlined in the 10 guidelines in NEI 12-06. The licensee indicated that the National SAFER Response Center generated a generic response to address the guidelines, and coordination of McGuire strategies with the National SAFER Response Centers is ongoing. During the onsite audit, the licensee provided a copy of the generic response and the NRC staff is still in the process of reviewing the document.
AQ 35	Loss of Heat Tracing Effects, NEI 12-06, Section 3.2.2, Guideline 12	The staff is currently reviewing the licensee's response on the ePortal
ISE CI 3.2.1.7.A	Shutdown and Refueling Modes	During the onsite audit, the licensee provided a copy of the PWROG interim generic guidance that identified minimal coping strategies for PWRs when an ELAP event occurs in a shutdown mode, and the NRC staff is still in the process of reviewing the document.
SRAI 14, 15, & 16	SFPI Shock and Vibration analysis	The staff is waiting for AREVA to submit a revised shock and vibration analysis.

The NRC staff's review to date led to the issuance of the MNS ISE and RAI dated October 28, 2013 (ADAMS Accession No. ML13281A791). 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. By letter dated April 10, 2014 (ADAMS Accession No. ML14097A426), the NRC staff issued an audit plan to the licensee for an audit of vendor information pertaining to Order EA-12-051.

The ongoing audits allow 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 and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at MNS from August 4-7, 2014 per the audit plan dated July 8, 2014 (ADAMS Accession No. ML14181B321). 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 the correct path for compliance with the Mitigation Strategies and SFPI orders. The onsite activities included detailed analysis and calculation discussion, 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.

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 301-415-5888 or by e-mail at Jason.Paige@nrc.gov.

Sincerely,
/RA by John Boska for/
Jason Paige, Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-369 and 50-370
Enclosure:
Audit report
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NAME	BPham	MHalter	JPaige (JBoska for)	
DATE	10/07/14	10/08/14	10/09/14	

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