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

April 14, 2015

Mr. Benjamin C Waldrep, Vice President
Shearon Harris Nuclear Power Plant
5413 Shearon Harris Rd.
New Hill, NC 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 - 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. MF0874 AND MF0792)

Dear Mr. Waldrep:

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. ML13112A020), Duke Energy Progress, Inc. (Duke, the licensee), doing business as Carolina Power and Light Company, submitted its OIP for Shearon Harris Nuclear Power Plant, Unit 1 (HNP) in response to Order EA-12-049. By letters dated August 27, 2013, February 27, 2014, August 25, 2014, and February 23, 2015 (ADAMS Accession Nos. ML13239A359, ML14072A051, ML14241A115, and ML15055A101, respectively), Duke submitted its first four 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 HNP interim staff evaluation (ISE) on February 12, 2014 (ADAMS Accession No. ML13364A214), and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13086A096), Duke submitted its OIP for HNP in response to Order EA-12-051. By letter dated July 11, 2013 (ADAMS Accession No. ML13189A225), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated August 12, 2013, August 26, 2013, February 27, 2014, August 22, 2014, and February 23, 2015 (ADAMS Accession Nos. ML13225A494, ML13242A010, ML14063A198, ML14251A015, and ML15055A107, respectively), Duke submitted its RAI responses and first four six-month updates to the OIP. The NRC staff issued the HNP ISE and RAI on November 19, 2013 (ADAMS Accession No. ML13280A482). 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 audits allow the NRC 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 NRC 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 Duke's OIPs, as supplemented, the NRC staff conducted an onsite audit at HNP from December 8-12, 2014, per the audit plan dated November 26, 2014 (ADAMS Accession No. ML14322A188). 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 301-415-1544 or by e-mail at Stephen.Monarque@nrc.gov.

Sincerely,

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

Docket No.: 50-400

Enclosure:
Audit report

cc w/encl: Distribution via Listserv

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 PROGRESS, INC

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

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. ML13112A020), Duke Energy Progress, Inc. (Duke, the licensee), doing business as Carolina Power and Light Company, submitted its OIP for Shearon Harris Nuclear Power Plant, Unit 1, (HNP, or Harris) in response to Order EA-12-049. By letters dated August 27, 2013, February 27, 2014, August 25, 2014, and February 23, 2015 (ADAMS Accession Nos. ML13239A359, ML14072A051, ML14241A115, and ML15055A101, respectively), Duke submitted its first four 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

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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 HNP interim staff evaluation (ISE) on February 12, 2014 (ADAMS Accession No. ML13364A214), and continues with in-office and onsite portions of this audit.

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The ongoing audits allow the NRC staff to review open (OI) and confirmatory items (CI) from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions (AQs). 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 HNP from December 8-12, 2014, as discussed in the audit plan dated November 26, 2014 (ADAMS Accession No. ML14322A188). 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 NRC 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 Project 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 NRC 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 NRC 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 HNP facility from December 8 – 12, 2014. The NRC staff that participated in this audit was as follows:

Title	Team Member	Organization
Lead Project Manager	Stephen Monarque	NRR/JLD
Technical Support – Electrical	Kerby Scales	NRR/JLD
Technical Support – Reactor Systems	Joshua Miller	NRR/JLD
Technical Support – Balance of Plant	Kevin Roche	NRR/JLD
Technical Support – SFPI	Khoi Nguyen	NRR/JLD

The NRC staff executed the onsite portion of the audit pursuant to the three part approach discussed in the November 26, 2014, plan, to include conducting a tabletop discussion of the site's integrated mitigating strategies 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 (December 8, 2014)

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

2.0 Integrated Mitigating Strategies Compliance Program Overview

As an introduction to the site's program, Duke provided a presentation to the NRC staff titled "Harris Nuclear Plant, FLEX Strategy Overview for NRC Audit 12/08/2014." Duke discussed its strategy to implement the two orders, the overall FLEX program, the installation of the spent fuel pool level instrumentation, changes to the Emergency Preparedness Communications Program, the design and location of the FLEX equipment storage facility, the FLEX equipment, and the access routes to the plant.

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 the Duke 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 the Duke staff to discuss the timing of the injection of water into the reactor coolant system, the use of raw water in the reactor vessel, the leakage out of the system, and the flow rates needed to make up to the system.

a. The NRC staff reviewed the procedures and analyses regarding the use of the generic NOTRUMP analysis. HNP was a case plant in the generic analysis and therefore the input parameters used by Duke were very similar to the actual plant parameters. Duke plans to be able to inject into the reactor coolant system (RCS), prior to the initiation of reflux condensation cooling, leaving some margin to the currently calculated values. The NRC staff had no further questions and ISE CI 3.2.1.A, CI 3.2.1.1.A, 3.2.1.1.B, and SE No. 6 were closed.

b. The NRC staff reviewed the O-rings that are used at HNP. Duke has not yet decided whether to use the high temperature O-rings that are currently installed or use an improved design in the future. HNP also has an alternate seal injection system that may be available during the postulated BDBEE. This alternate seal injection system could be powered from a separate diesel generator. In the event this alternate system cannot be started, it will lock out so that it will not thermally shock the potentially hotter seals. The NRC staff had no further questions and ISE CI 3.2.1.2.B and 3.2.1.2.C were closed. SE Nos. 3, 4, and 5 address the validation of the reactor coolant pump (RCP) seal leakage rates.

c. The NRC staff reviewed the decay heat model used for the HNP analysis. The NRC staff had no further questions and ISE CI 3.2.1.3.A is closed.

d. The NRC staff reviewed the HNP analysis for the available volume of water after a potential missile strike to the Refueling Water Storage Tank (RWST). The RWST is partly protected from postulated missiles. Duke analyzed various missile hazards and angles to find a conservative value for the remaining water that would be available inside the RWST, and determined that the remaining water inside the RWST would be available for multiple days into the event. The NRC staff had no further questions and ISE CI 3.2.4.7.A is closed.

e. The NRC staff reviewed the availability of the steam generator (SG) Power Operated Relief Valves (PORVs) following postulated events. The PORVs are safety related and are located in fully protected buildings. The PORVs are hydraulically operable following the BDBEE. The PORVS can be operable either by operator action to

hydraulically charge the PORVs, or by the use of the Phase 2 FLEX DGs. The NRC staff had no further questions and AQ 52 and 53 are closed.

f. The NRC staff reviewed the procedures for venting the RCS. Duke has procedures for venting the RCS using the reactor head vents. In order to become operable, the head vents will need to be powered by the Phase 2 FLEX DGs. Duke plans to open the reactor head vents to decrease the pressure or the level in the RCS for inventory injection. The use of the pressurizer PORVs is not part of the FLEX procedures for venting the RCS. The NRC staff had no further questions and SE No. 2 was closed.

g. The NRC staff reviewed various aspects of the RCP seals and the associated leakage rates. The seal leakoff line configuration for HNP plant was of a favorable configuration. No modifications are needed. Other aspects of the seal leakage rates were left open including the benchmarking of the leakage rates, as well as the capability of the leakoff lines to withstand the pressures that may be seen during the postulated events. The Pressurized-Water Reactor Owners Group (PWROG) is working to develop and validate the assumed seal leakage rates. SE No.3 was closed; however, SE No. 4 and SE No.5 will remain open.

h. The NRC staff reviewed the ability of the HNP plant to ensure that clogging of pump suction strainers would not jeopardize the mitigating strategies. The suction strainer design was looked at as well as the availability of personnel to ensure that the strainer remained cleaned. Duke plans to use multiple suction strainers for this pump so that one can be cleaned while the pump remains in operation. The NRC staff had no further questions and SE No. 8 was closed.

i. The NRC staff toured inside and outside the plant and observed aspects of human factors in making connections and hauling equipment. The NRC staff discussed other human factors questions during interviews. These ranged from operator actions during a potentially hazardous event to the effects of the mitigating strategies planning on the current plant operations. The NRC staff had no further questions and SE No. 9 was closed.

3.2 Electrical Technical Discussions and Walk-Downs

a. The NRC staff reviewed the licensee's assessment of temperature effects on the electrical equipment as a result of extreme temperature hazards. During the on-site audit, the NRC staff reviewed Draft EC 91690, Rev. 0, "Att. T01: Loss of HVAC Analysis" and HNP-M/FLEX-0012, Rev. 0, "Harris Reactor Auxiliary Building Extended Loss of AC Power FLEX Response," and FSG-004, Rev. 0, "Draft C: ELAP DC Bus Load Shed / Management."

Calculation HNP-M/FLEX-0012 analyzes the heat-up of the vital battery rooms during Phases 1 and 2 of the extended loss of alternating current (ac) power (ELAP) event to ensure the loss of forced ventilation and resulting room temperatures would not affect any credited mitigation equipment required for FLEX strategies. The analyses showed no issues in terms of equipment function for the duration of an ELAP.

Duke has determined that the vital batteries will not be adversely affected by increases in temperature as a result of loss of Heating Ventilation and Air Conditioning (HVAC). The NRC staff did not find any discrepancies during its review; therefore, ISE CI 3.2.4.2.B and AQ 43 were closed.

b. The NRC staff reviewed the licensee's assessment of battery room hydrogen accumulation due to loss of the HVAC system during an ELAP event. The NRC staff reviewed calculation, HNP-M/FLEX-0012, Rev. 0, "Harris Reactor Auxiliary Building Extended Loss of AC Power FLEX Response" and draft EC 91690, Rev. 0, Att. T01, "Loss of HVAC Analysis," and walkdown the vital battery rooms to verify that hydrogen gas accumulation in the 125 Volt (V) direct current (dc) vital battery rooms will not reach combustible levels (4 percent) while HVAC is lost during an ELAP. Duke noted that the primary strategy for maintaining environment of the battery room during Phase 1 is to open the vital battery room doors. Battery room temperature and hydrogen levels are not expected to exceed the equipment limitation during Phase 1. Hydrogen generation is only a concern when batteries are charging, and therefore hydrogen generation will not occur during Phase 1. Battery charging operation would not start until restoration of power using the FLEX DG during Phase 2 FLEX operations. Battery exhaust fans would also be restored to operation when the Phase 2 FLEX DG is available, which would be sufficient to maintain battery room hydrogen below combustible levels.

Duke has determined that the mitigating strategies and procedures ensure that accumulation of hydrogen in the battery rooms will not reach the point of combustibility. The NRC staff did not find any discrepancies during its review; therefore, ISE CI 3.2.4.2.C and AQ 30 were closed.

The NRC staff reviewed HNP-C/FLEX-002, "Seismic Qualification of Supports for Battery Packed Emergency Lighting Units," Procedure AD-OP-ALL-1000, "Conduct of Operations," Section 5.11.2, "Expectations," to confirm that adequate lighting would be available throughout the plant during an ELAP, and Duke employees would be able to access locked areas within the protected area. The NRC staff reviewed Operations Management Manual OMM002, "Shift Turnover Package," which discussed Duke's strategy for providing a turnover of security keys that would allow Duke personnel to obtain access to locked FLEX Buildings during an ELAP. Duke provided a summary that stated sufficient lighting will be available for manual actions. DC lighting in the main control room is powered by 125 V non Class 1E battery capable of coping for 4 hours. Additional load shedding will extend the coping time for this battery to 8 hours. Duke plans to use light equipped hardhats for the Main Control Room (MCR). In addition, there are flashlights, batteries, and light equipped hardhats located in the Auxiliary Control Panel tool locker located below the MCR. Duke also has available, the self- contained dc emergency lighting that can be used after the loss of ac power. These lights can last for 8 hours.

Duke's Phase 2 strategy is to use the FLEX diesel generators (DGs) to power the ac lighting throughout the plant. The Phase 2 FLEX DGs can be connected to either A

or B train VAC switchgear 1A3-SA or 1B3-SB with the opposite train as backup connection point. Therefore, ISE CI 3.2.4.4.A and Audit Questions 31 and 32 were closed.

c. Battery Run Time

During the audit, the NRC staff found that Duke's FLEX strategy station battery run-time was calculated in accordance with the Institute of Electrical and Electronic Engineers (IEEE) Standard (Std.) 485 methodology using manufacturer discharge test data applicable to the licensee's FLEX strategy as outlined in the NEI position paper, "EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concerns," (ADAMS Accession No. ML13241A186).

The NRC staff reviewed calculation E4-0008, Rev. 7, "125VDC 1E Battery Sizing and Battery/Panel Voltages for Station Blackout." The NRC staff noted that the licensee calculated the extended battery discharge to approximately 10.7 and 10.2 hours, for batteries 1A-SA and 1B-SB, respectively. The vital batteries at HNP are C&D LCR-19, 60 cells with 1350 ampere-hours (A-H). Nuclear-grade batteries are qualified to support up to an 8-hour discharge. The NRC staff reviewed procedures FSG-004, Rev. 0 Draft C, "ELAP DC Bus Load Shed / Management," EOP-Copy of ECA-0.0, Rev. ELAP Draft, "Loss of All AC Power," and FSG-020, Rev. 0 Draft B, "FLEX Electrical Distribution," and found that Duke doesn't plan to cope on their vital batteries greater than 8 hours. Therefore, CI 3.2.4.10.A were closed.

d. Battery Duty Cycle Load Profiles and Load Shedding

The NRC staff reviewed summaries of the results, conclusions, and key assumptions of the licensee's battery calculation, "E4-0008, Rev. 7, "125VDC 1E Battery Sizing and Battery/Panel Voltages for Station Blackout." The NRC staff reviewed these summaries to verify the adequacy of the capacity and capability of the vital batteries to supply dc power to the required loads during the first phase of the HNP FLEX mitigation strategies plan for an ELAP as a result of a BDBEE. The NRC staff also successfully walked down the load shedding procedures (FSG-004, Rev. 0 Draft C: ELAP DC Bus Load Shed / Management and EOP-Copy of ECA-0.0, Rev. ELAP Draft: Loss of All AC Power) with the licensee to verify that load shedding could be completed within the time assumed in its analysis.

Duke's evaluations identified the required loads and their associated ratings (ampere and minimum required voltage) and the loads that would be shed in the time period from 1 to 2 hours to ensure vital battery operation for least 10.7 and 10.2 hours for 1A-SA and 1B-SB batteries, respectively. Power is expected to be restored to the battery chargers by the end of the battery coping period. Duke's evaluations identified the minimum end voltage of 107 V will be required to meet the minimum required voltage of the downstream equipment to ensure their proper operation.

Duke has determined that the HNP dc system has adequate capacity and capability to power the loads required to mitigate the consequences during the first phase of an ELAP as a result of a BDBEE, and necessary load shedding should be accomplished

within the times assumed in the licensee's analysis. The NRC staff did not find any discrepancies during its review; therefore, AQ 38, AQ 39, and AQ 40 were closed.

e. The NRC staff performed a walkdown of the FLEX DG pre-staging area (Unit 2B Emergency Diesel Generator (EDG) bay) and reviewed Duke's FLEX DG sizing calculations, manufactures specifications, and FLEX Support Guidelines (FSGs) to confirm that they are of sufficient capacity to supply the expected loads. The NRC staff reviewed calculation E-6009, Rev.0: Fukushima Diesel Generator Sizing Calculation and FSG-020, Rev. 0 Draft B: FLEX Electrical Distribution.

   The licensee plans to utilize 120VAC and 480VAC FLEX DGS for Harris as part of its Phase 2 mitigating strategy during an ELAP event as a result of a BDBEE. The design rating for the 120VAC and 480VAC FLEX DGs is 6 kilowatts (kW) and 830kW, respectively. For HNP, the total load for the 480VAC diesel generator is 578kW. Duke plans to receive a 1 megawatt, 480VAC FLEX DG from the SAFER Response Center as part of its Phase 3 mitigating strategy, but they plan to cope indefinitely with the Phase 2 pre-staged FLEX DG.

   Duke has determined that the FLEX generators will have adequate capacity and capability to power the loads assumed during Phases 2 and 3 of an ELAP event as a result of a BDBEE. The NRC staff did not find any discrepancies during its review; therefore, CI 3.2.4.10.D and AQ 41 were closed.

f. The licensee's staff provided copies of conceptual design electrical single line diagrams showing electrical connections to the 6900 VAC switchgear, 480 VAC load centers, and motor control centers for the FLEX generators. The 480 VAC load center supply breakers for the FLEX generators can be closed or opened manually by using FLEX procedures to prevent electrical equipment damage from simultaneous power supply from two electrical power sources (i.e., FLEX generator and the existing Class 1E power supply).

   The NRC staff reviewed procedure FSG-020, Rev. 0 Draft B, "FLEX Electrical Distribution" and FSG-004, Rev. 0 Draft C, "ELAP DC Bus Load Shed / Management." The NRC staff walked down the FLEX DG pre-staging location (Unit 2 EDG bay) and switchgear rooms, and reviewed single line diagrams showing connection points for FLEX equipment. Therefore, AQ 37 was closed.

g. During the onsite audit the NRC staff expressed concerns about the fact that Duke has permanently installed two FLEX DGs, approximately 20 feet apart, inside a seismic category 1 FLEX building. Each DG is connected to the HNP electrical distribution system and is ready for operation. The NRC staff also indicated to the licensee that the proposed strategy should be considered an alternative to the guidance of NEI 12-06, since the FLEX equipment would not be portable. The NRC staff questioned the reliability and flexibility of the alternative approach, specifically considering the potential for scenarios associated with the BDBEE, such as fires or equipment damage, which could disable both DGs.

The NRC staff reviewed HNP Position Paper for Permanent Pre-Staging of FLEX Diesel Generators; Duke Energy Harris Nuclear Plant - Unit 1, Plant Drawing No. 6-G-0090, Revision 16, "Diesel Generator Building Conduit & Grounding Plan Sheet 1 - Unit 1," and Duke Energy Harris Nuclear Plant, Plant Drawing No. 2166-G-0651, "Fukushima FLEX Diesel Generator one Line Diagram 480V System." In the first document, Duke identified the pre-staging of the Phase 2 FLEX DGs as an alternative to JLD-ISG-2012-01 and NEI 12-06. The NRC staff has reviewed these documents and found this proposed alternative to be acceptable. As such, NRC staff closed SE No. 11. Duke, in its six-month update dated February 23, 2015, provided the NRC staff a docketed justification for this proposed alternative.

3.3 Balance of Plant Technical Discussions and Walk-Downs

a. The NRC staff needed to confirm completion of Duke's flooding analysis to determine the impact of flooding from sources that are not seismically robust or require ac power. The NRC staff reviewed EC 91690 Attachment S01 Rev 1, "Evaluation of the Impact of Internal Flooding on FLEX Strategies." Duke's evaluation examined potential internal flooding sources and their potential impact on FLEX equipment storage and strategies. Duke systematically evaluated flood compartments, eliminating those that do not contain credited structures, systems, and components that are relied upon for FLEX strategies and areas that do not need to be accessed during FLEX implementation. Duke identified two areas that contained potential internal flooding sources. The 261' elevation in the Reactor Auxiliary Building (RAB) and the RAB and Tank Area at 236' elevation. Duke's analysis assumed internal flooding sources can be isolated within 30 minutes of the event. The NRC staff determined this is a reasonable time as the flooding sources are in the open, would be readily apparent and operators will be performing post event actions in the area. The evaluation showed that flooding levels in the two areas would not impact FLEX strategies and the licensee included steps in FSG-005, "Initial Assessment and FLEX Equipment Staging," Rev 0 to asses any flooding sources and notify the control room. The NRC staff has reviewed Duke's confirmation of condensate transfer flooding analysis; and did not find any discrepancies. Therefore, ISE CI 3.1.1.3.A is closed.

b. The NRC staff reviewed Duke's strategy to deploy FLEX equipment under extreme cold, snow, or ice conditions. The NRC staff reviewed Duke procedure FSG-005, "Initial Assessment and FLEX Equipment Staging," Attachment 2, Rev 0, which states the preferred deployment path for the diesel powered FLEX Emergency Service Water (ESW) pump suction is through the ESW intake structure which is protected from surface icing by a concrete baffle wall which extends more than 10 ft below the normal level of the Auxiliary Reservoir level so a substantial amount of surface icing would be required to affect the suction of the FLEX ESW pump. Additionally, FSG-005, "Initial Assessment and FLEX Equipment Staging," Rev 0 establishes a recirculation path for the ESW FLEX pump to ensure constant flow and prevent freezing.

   Additionally, the NRC staff walked down the ESW pump placement and deployment paths with Duke. The preferred suction is the ESW intake structure discharging to a

connection in the A or B ESW system. The alternate suction is place the pump suction hose directly in the Auxiliary Reservoir. ISE CI 3.1.4.2.A is closed.

c. The NRC staff reviewed a number of procedures in order to determine whether the performance requirements for the Phase 2 FLEX pumps are sufficient to support Duke's Phase 2 FLEX strategies.

First, the NRC staff reviewed HNP-M/FLEX-0006, "FLEX AFW Pump Sizing and Pressure Drop Calculation," Rev 1. The purpose of this calculation was to determine the basis for sizing of the FLEX Auxiliary Feedwater Pump and associated flexible hose, using the most limiting case, filling from the condensate storage tank. The design flow rate to all three SGs is 325 gallons per minute (gpm) at a pressure of 300 pounds per square inch gauge (psig). The calculation of 120' for flexible hose takes into account hose bends and fittings, valves and piping for the auxiliary feedwater (AFW) system. The friction factors for the hoses and piping were included in this calculation. Duke performed this calculation using the PROTO-FLO model. In addition, the NRC staff reviewed EC 91680 Rev 2 "FLEX RCS Injection Evaluation" to determine the adequacy of the FLEX RCS Makeup pump. This EC procedure specified a positive displacement pump capable of pumping 40 gpm at 1600 psig.

Second, the NRC staff reviewed HNP-M-FLEX-0008, "ESW Pump and Hose Sizing for FLEX Strategies," Rev 0 to determine the adequacy of the FLEX ESW Pump. This procedure presents the calculation for the required flow rate for the FLEX ESW pump. The model takes into account both the primary suction using the ESW intake structure and putting the suction hose directly in the Aux Reservoir. The pump will be able to provide up to 3000gpm at 150 psig, which the calculation showed was sufficient to support Duke's Phase 2 FLEX strategies. The pump provides an net positive suction head margin of 8 ft from normal level in the Auxiliary reservoir.

Furthermore, the NRC staff walked down the FLEX portable pump deployment paths with Duke. The FLEX pumps are stored on the 236' level of the Tank Building (Seismic Cat 1) on a cart, and will be rolled 200 ft into place by operators, and placed in the vicinity of the AFW pump and the charging pumps in the RAB. The NRC staff walked down the hose deployment routes and found them to be consistent with the hydraulic analysis. From those points, multiple connections can be made from the pump locations to multiple trains of AFW and Charging.

Finally, the NRC staff also walked down the placement of the FLEX ESW pump at the intake structure. The pump can be placed outside of the ESW intake building with the both the suction and the discharge will be routed into the ESW building. The ESW FLEX pump can also take suction directly from the Aux reservoir if the ESW intake structure is block or otherwise disabled. ISE CI 3.2.1.9.A is closed.

3.5 SFPI Technical Discussions and Walk-Downs

NRC staff met with Duke and reviewed diagrams and walked down the areas showing the locations and routing cables from the SFP area to the display locations. The NRC staff also reviewed documentation related to the mounting of the SFPI to the SFP deck and discussed the issue of electromagnetic interference with Duke.

a. The RAI response did not provide an assessment of potential susceptibilities of electromagnetic interference/ radio frequency interference (EMI/RFI) for HNP. To address the NRC staff concern, Duke provided the following assessment:

   The EMI/RFI susceptibility and emissions testing performed by AREVA for the SFPI provides reasonable assurance the instrumentation will be compatible in the design locations. The testing was conservatively performed with unshielded interconnecting wiring. The HNP SFP level channel design includes shielded signal cabling, and grounding of the power control panel. The Control Room area is a No Transmit Zone for radio transmission, therefore radio transmission interference with the level indicators is not a concern.

   The A, B, and C channel power control panels, remote indicators, and radar transmitters are located in the Fuel Handling Building and Waste Processing Building at the ~261' elevation and as such are separated by more than 75 feet. This separation assures that a single radio transmission would not affect both channels at the same time. During normal operation, if a discrepancy in level was observed it would be entered in the Corrective Action Program (CAP) for resolution. During a postulated BDBEE, it is possible that intermittent ultrahigh frequency radio operation could occur in the vicinity of the radar transmitter. Successful long-term SFP monitoring capability during a postulated BDBEE would not be inhibited by potential intermittent radio transmission interference.

   Post-modification testing will further demonstrate the functionality of the SFPI equipment in the installed locations and that the as-built condition of the SFPI equipment is not affected by adjacent existing equipment. The NRC staff found the assessment acceptable. Therefore, SE No. 1 is closed.

b. In response to SFPI RAI No. 1, Duke provided a drawing of the SFP area that showed the location and placement of the primary and backup SFPI, and the routing of the cables. Duke also provided several drawings which describes the arrangement for the SFP. During this audit, the NRC staff walked down Reactor Building SFP area to observe the cable routing areas for the primary and backup SFPI. The NRC staff observed the cables were mostly separated by more than 1 foot apart using conduits and existing cable trays. The cable routing areas were also protected from internal and external missiles. The NRC staff has no further questions and SFPI RAI No. 1 is closed.

c. In response to SFPI RAI No. 2, Duke states, in part, that the SFP instrumentation has been seismically tested to the requirement of IEEE Std. 344-2004. The required response spectra (RRS) envelopes the maximum seismic ground motion for the safe shutdown earthquake (SSE). The shake table test has a peak horizontal and vertical

acceleration of 14g for SSE and 10g for operating basis earthquake. This RRS bounds the HNP response spectra for the Fuel Handling Building. The horn end assembly is qualified for a vertical and side pressure (slosh) loading of 3.37 psi. Actual loading from impact and drag due to sloshing is calculated to be maximum vertical pressure loading of 1.09 psig and a maximum side pressure loading of 0.505 psig. Therefore the horn end assembly is structurally qualified for seismic and hydrodynamic loading including the horn cover.

The mounting design for the power control panel is qualified considering the total weight of the panel, its associated components, and the seismic accelerations for the building structure. All of the mounting supports for the waveguide piping are attached to either the concrete wall or concrete floor. These concrete structures have a maximum concrete strength of 4000 psi.

The NRC staff reviewed the above documents and found that while methodology of the sloshing analysis acceptable, it does not adequately address the hydrodynamic impact for all three pools where the SFP level sensors are located. Pools 'A' and 'B' were not analyzed for the hydrodynamic impact. In response to the NRC staff's concern, Duke provided a supplemental response, in which it states that in accordance with Calculation NAI-1725-003, "GOTHIC Verification and Sensitivity Studies for Predicting Hydrodynamic Response to Acceleration in Rectangular Shaped Pools," damping of the slosh height associated with the convective response is highest for pools of short length and the damping tends toward zero as the width of the pool increases. From this it is evident that modeling the seismic event for the long axis of a rectangular pool is conservative as it lessens damping of the convective response. Hydrodynamic response of liquid filled pools is highly sensitive to the pool size and shape. Of the three SFPs A, B and C, SFPs B and C are same width and length, 27' x 50'. SFP A is smaller in size, 13' x 38'. Based on the sensitivity study and the above discussion, SFP C was utilized in the sloshing analysis, HNP-C/FLEX-0003, to determine the hydrodynamic impact and drag forces on the SFPI waveguide horn assembly. This pool selection gives more conservative results. The NRC staff found the supplemental response to be acceptable. In addition, the provided document showed that the waveguide supports are adequately mounted to the Fuel Handling Building and Waste Processing Building structures. Therefore, SE No. 2 was closed.

d. In response to SFPI RAI No. 4, Duke states that the affected structures and equipment were qualified using American Institute of Steel Construction (AISC) Code 8th, 9th, and 13th Edition for structure steel elements and American Society of Mechanical Engineers (ASME) B31.1-1986 Edition Anchorage for Pressure Piping. The NRC staff reviewed the Fuel Handling Building design specifications and found it provided the design criteria and loads (including allowance) for electrical and mechanical components. The NRC staff found the response acceptable. Therefore, SFPI RAI No. 4 is closed.

e. In response SFPI RAI No. 5, Duke provided the equipment qualification information already provided by the vendor (AREVA). However, the information did not describe the environmental conditions of the locations where the SFP equipment was to be

located. In addition, the qualifications of the Weschler indicators, model VX-252, located in the Control room were not addressed. During the audit, in response to the NRC staff's concern, Duke provided the following documents: Engineering Change (EC) 91690, "Loss of HVAC Analysis," Calculation HNP-M/FLEX-0015, "Shearon Harris Unit 1 Doses at SFP Level Instrumentation," and Report ER-20130518-01, "Report of Qualification Testing" (for indicator model VX-252).

However, the documents did not identify the humidity condition of the locations where the SFP instrument is located. In response to the NRC staff's concern, Duke subsequently submitted the response which states that Channel "B" and "C" SFP level instrumentation is located on the 261' elevation of the Fuel Handling Building. Channel "A" SFP level instrumentation is located in the I&C shop on the 261' elevation in the Waste Processing Building. The SFP level instrumentation is considered mild since these areas are not Environmentally Qualified Zones. The NRC staff found the response acceptable as the humidity of mild environment is bounded by the equipment qualifications. Therefore, SFPI RAI No. 5 was closed.

f. In response SFPI RAI No. 8, which requested Duke to provide the results of the calculation depicting the battery backup, the staff reviewed the back-up battery qualification analysis during the vendor audit and found the analysis acceptable. Therefore, SFPI RAI No. 8 is closed.

g. The NRC staff reviewed the AREVA SFP instrument test report for the instrument channel accuracy, during the vendor audit, and found the test report acceptable. During the site audit, the NRC staff requested the document related to the Weschler-indication VX-252 accuracy. In response, HNP provided Report ER-20130518-01, "Report of Qualification Testing" (for Weschler indicator model VX-252), which indicates that the indicator was tested with the accuracy acceptance criteria of ±1.5 percent. The NRC staff found that the accuracy for the Weschler indicators acceptable.

However, the NRC staff found that the calibration accuracy for AREVA radar waveguide instrument was listed inconsistently throughout the HNP document. Duke subsequently provided a supplemental response, in which it stated that the SFPI system acceptable accuracy in the Engineering Change package was defined as +/- 2 inches. This response will reflect +/- 2 inches when updated in E-Portal. AREVA's documented accuracy for the system is +/- 1 inches which was achieved in lab/shop test conditions. However, this accuracy may not be achieved under plant conditions since the condition for HNP SFP area does not accommodate lab/shop conditions. Since the system target and horn section is located on elevation 286 ft where verification of the system reading will be made and the system itself is located at elevation 261 ft., this would cause the change from the lab accuracy reading. However, +/- 2 inches accuracy meets the guidance described in NEI 12-02. Therefore, the NRC staff found the supplemental response acceptable and SFPI RAI No 9 is closed.

h. The NRC staff requested that Duke provide further information describing the maintenance and testing program that it will establish and implement in order to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Duke was also requested to provide a plan to ensure that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment. Duke is to provide the compensatory actions that will be taken when one or both channels out-of service in accordance with the guidance in NEI 12-02 section 4.3. Therefore, SFPI RAI No. 13 is an open item.

i. The NRC staff requested that Duke provide a table listing all possible pool interconnections and separation conditions with gate combinations, and the available number(s) of level indication for each pool under those conditions. In addition, Duke was asked to describe in detail, assuming one instrument is out-of-service, the compensatory measures to assure that reliable level monitoring still exists for each pool under those gate operating conditions. Duke is to provide the NRC staff with compensatory measures and address any changes to the SFP gate configuration. SFPI RAI No. 14 is an open item.

3.6 Other Technical Discussion Areas and Walk-Downs

a. The NRC staff needed to review the Response Center local staging area, evaluation of access routes, and method of transportation to the site, support the implementation of the mitigating strategies for a BDBEE. During this audit, the NRC staff determined that Duke needed to develop its RRC playbook and determine the specific Phase 3 equipment needed for a BDBEE. Duke initiated Licensee Identified Open Items 75 and 76 in order to develop its RRC Playbook to determine the specific RRC portable equipment needed for Phase 3. Subsequent to this audit, Duke closed Licensee Identified Open Items 75 and 76. The NRC staff has no additional questions and ISE CI 3.1.1.4.A is closed.

b. The NRC staff met with Duke to discuss ISE 3.2.4.4.B Communications Assessment. The NRC staff reviewed Nuclear Operating Fleet Administrative Procedure AD-EP-ALL-0400, 'Emergency Communication Equipment,' Revision 0, Harris Nuclear Plant Operating Manual Volume 2 Part 10 EPM-410, 'Communication Facility Performance Tests,' Harris Nuclear Plant Operating Manual, Volume 1 Part 2 Plant Program PLP-201, 'Emergency Plan, Revision 62 Section 3.8, 'Communications Systems,' and EPL-001, "Emergency Phone List Harris Plant," and performed tour of communications areas. The NRC staff observed Duke's plans to use satellite phones, contact plant personnel in the event of an emergency, use of repeaters to boost radio coverage, uninterrupted power supplies, proposed connections to portable DG, hand held radios, and rechargeable batteries. The NRC staff has confirmed that upgrades to the site communications have been completed. Therefore, ISE 3.2.4.4.B is closed.

a. The NRC staff reviewed drawing Z26R1, "FLEX Delivery Paths and Staging Areas Site Plan, and document XO3R1, "Analysis of Delivery Path for FLEX Equipment." The site drawing shows the various routes that can be used by Duke to transfer fuel

after a BDBEE. Duke Procedure "Diesel Fuel Oil Transfer Evaluation for NTTF [Near-Term Task force] 4.2 (FLEX)," PCHG-EVAL Engineering Change 00091683R0 states that a 1000 gallon mobile tanker will be used to transport fuel to FLEX equipment. This mobile tanker will be stored in a FLEX building and will be pulled by a John Deere Tracker. Duke has identified a strategy and equipment that will be used to transport fuel onsite. The NRC staff had no further questions and ISE CI 3.2.4.9.B is closed.

b. The NRC staff reviewed AP-300, "Severe Weather Response," "Guidelines for Winter Storm Preparation," Revision 18 to identify Duke's plan for ice removal to support the transportation of FLEX equipment from storage to its deployment. This procedure discussed the use of sand and salt on sidewalks and roadways and the plowing of the parking lot. The NRC staff had no further questions and AQ 8 is closed.

4.0 Exit Meeting (December 12, 2014)

The NRC staff 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 open items were discussed at the exit meeting (see Attachment 3 for additional information):

a. Installation of Phase 2 FLEX Diesel Generators

Duke has permanently installed two FLEX DGs, approximately 20 feet apart, inside a seismic category 1 FLEX building. Each DG is connected to the HNP electrical distribution system and is ready for operation. The NRC staff considers this to be an alternative to ISG JLD-ISG-2012-01. During the exit meeting, the NRC staff informed Duke that it needs to identify this as an alternative and provide a justification to the NRC staff. However, subsequent to this meeting, the NRC staff closed SE No. 11 as shown in Section 3.2, "Electrical Technical Discussions and Walk-Downs," above.

b. FLEX Storage Buildings

Duke has two FLEX storage buildings. The first FLEX building is a seismic category 1 concrete building, and the second FLEX building is a metal warehouse that does not meet the standards of ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures." Duke uses this metal building to store one ESW pump. The NRC staff considers this to be an alternative to ISG JLD-ISG-2012-01, 7.3.1.1. Duke, in its six-month update dated February 23, 2015, provided the NRC staff a docketed justification for this proposed alternative. The NRC staff had no further questions and this issue is closed.

CONCLUSION

The NRC staff completed all three parts of the November 26, 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 Duke proceeds towards OOrders 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 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. ISE OIs and CIs

b. AQs

c. Licensee-identified OIP OIs

d. SFPI RAIs

e. Additional Staff 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: PNPS 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 November 26, 2014, the ongoing audit process continues as discussed in 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:

Stephen Monarque	NRR/JLD
Kerby Scales	NRR/JLD
Joshua Miller	NRR/JLD

Kevin Roche	NRR/JLD
Khoi Nguyen	NRR/JLD

Duke and Support Staff:

Troy Nietschmann	FLEX Program Engineer – HESS Design
David Llewellyn	Fleet Fukushima Director – Fukushima Fleet
Ben Waldrep	Site Vice President - HNP
Dave Corbett	Regulatory Affairs Manager - HNP
Paul Guill	Lead Licensing Engineer – Fleet Program
Jeff Thomas	Fukushima Support Manager - Fleet Program
Larry Prince	MP NUS Assessor - NUS
Ingrid Norby	Senior Licensing Engineer - HNP
Mike Weber	HNP FRO Manager – HNP
Brad Morrison	HNP FRO Project Manager – HNP
Dave Walker	HNP FRO SME - HNP
K. Houger	FRO - HNP

Shearon Harris Nuclear Power Plant, Unit 1, Documents Reviewed

- Engineering Change 91690, Attachment S01 "Evaluation of the Impact of Internal Flooding on FLEX Strategies," Revision 1
- Drawing Markup CAR-2165 G-022, "General Arrangement Fuel Handling Building Plants – Sheet 1," Revision 25
- Engineering Change (EC) 89579, "Fukushima Response Project – SFP Wide Range Level Indication – HNP"
- Nuclear Generation Group HNP-C/FLEX-0003, "Seismic Induced Hydraulic Response in the Harris Spent Fuel Pool," Revision 0
- Z05RO Spent Fuel Pool Wave Guide Support Qualification (EC 89579, Revision 0)
- Drawing 02-9214553B, Harris Nuclear Plant Spent Fuel Pool "A" VEGAPULS 62 ER Waveguide Installation Dimensions," Revision 0
- Drawing 02-9214554B, Harris Nuclear Plant Spent Fuel Pool "B" VEGAPULS 62 ER Waveguide Installation Dimensions," Revision 0
- Drawing 02-9214555B, Harris Nuclear Plant Spent Fuel Pool "C" VEGAPULS 62 ER Waveguide Installation Dimensions," Revision 0
- Calculation 32-9221971-000, "Qualification of Difference in as-tested and as-fabricated Mounting Configuration for VEGA Power Control Panel Mounting Assembly," Revision 0
- Engineering Change 89579, "Fukushima Response Project – SFP Wide Range Level Indication – HNP," Revision 0
- Engineering Change 91690, Attachment T01 "Loss of HVAC Analysis," Revision 0
- Calculation HNP-M/FLEX-0015, "Shearon Harris Unit 1 Doses at SFP Level Instrumentation," Revision 0
- Report ER-20130518-01, "Report of Qualification Testing," Revision 1
- CAR 2166-B-041 Sheet 650, " Unit No. 1 Power Distribution & Motor Data 208/120V Power Panel PP-1&4A33-SA," Revision 10
- CAR 2166-B-041 Sheet 651, " Unit No. 1 Power Distribution & Motor Data 208/120V Power Panel PP-1&4B33-SB," Revision 11
- Harris Unit 1 Technical Procedure (Maintenance) PIC-I709, "Radar Wave Guide System Spent Fuel Pool Level Instrumentation," Revision 0 Draft
- CM-I0084, "Methodology of Scale Replacement for VX-252 Indicators"
- HNP-C/FLEX-002, "Seismic Qualification of Supports for Battery Packed Emergency Lighting Units," Revision 0
- Procedure AD-OP-ALL-1000, "Conduct of Operations," Section 5.11.2, "Expectations," Operations Management Manual OMM002, "Shift Turnover Package," Revision 3
- Nuclear Operating Fleet Administrative Procedure AD-EP-ALL-0400, 'Emergency Communication Equipment,' Revision 0
- Harris Nuclear Plant Operating Manual Volume 2 Part 10 EPM-410, 'Communication Facility Performance Tests,' Revision 13
- Harris Nuclear Plant Operating Manual, Volume 1 Part 2 Plant Program PLP-201, 'Emergency Plan, Section 3.8, 'Communications Systems,' Revision 62
- EPL-001, "Emergency Phone List Harris Plant," Revision 90

- HNP-M/FLEX-0006, "FLEX AFW Pump Sizing and Pressure Drop Calculation," Revision 1
- HNP-M-FLEX-0008, "ESW Pump and Hose Sizing for FLEX Strategies," Revision 0
- Engineering Change 91691, Z26R0, "FLEX Delivery Paths and Staging Areas Site Plan, Revision 1
- Engineering Change 91691, XO3R0, "Analysis of Delivery Path for FLEX Equipment," Revision 1
- CN-SEE-II-13-29 "Harris Nuclear Plant FLEX Alternate Cooling Evaluation Input Auxiliary Feedwater Usage"
- HNP-C/FLEX-0001 "Tornado Affects on RWST for FLEX NTTF 4.2 Coping Strategies"
- FSG-001 "Long Term RCS Inventory Control," Revision 0 Draft
- FSG-002 "Alternate TDAFW Pump Suction Source," Draft
- FSG-003 "FLEX Low Pressure Feed Water," Draft
- FSG-005 Attachment 2 "Initial Assessment and FLEX Equipment Staging," Revision 0 Draft
- FSG-008 "FLEX RCS Boration" Revision 0 Draft
- FSG-021 "FLEX Water Management," Revision 0 Draft
- LTR-LIS-14-501 "Documentation of the Westinghouse 3-Loop Plant with Tcold Upper Head Configuration Input Information," dated November 20, 2014
- LTR-LIS-14-219 "Documentation of 2-Loop, 3-Loop, and 4-Loop Analysis Input Information for Task 1 of PA-ASC-1272," dated May 1, 2014
- HNP-F/NFSA-0240 "HNP Boration During Extended Loss of AC Power Event," Revision 1
- HNP-M/FLEX-0005 "SG PORV Steam Relief Capability," Revision 0
- HNP-M/FLEX-0012, "Harris Reactor Auxiliary Building Extended Loss of AC Power FLEX Response," Revision 0
- FSG-004, Rev. 0, "Draft C: ELAP DC Bus Load Shed / Management"
- Calculation E4-0008, "125VDC 1E Battery Sizing and Battery/Panel Voltages for Station Blackout," Revision 7
- Emergency Operating Procedure EOP-Copy of ECA-0.0, Rev. ELAP Draft, "Loss of All AC Power"
- FSG-020, "FLEX Electrical Distribution," Revision 0 Draft B
- HNP Position Paper for Permanent Pre-Staging of FLEX Diesel Generators, Revision 0
- Duke Energy Harris Nuclear Plant - Unit 1, Plant Drawing No. 6-G-0090, "Diesel Generator Building Conduit & Grounding Plan Sheet 1 - Unit 1," Revision 16
- Duke Energy Harris Nuclear Plant, Plant Drawing No. 2166-G-0651, "Fukushima FLEX Diesel Generator One Line Diagram 480V System," Draft
- AREVA Inc. Document No 51-9233076-002, "Shearon Harris Nuclear Power Plant SAFER Response Plan," dated January 30, 2014

Shearon Harris Nuclear Plant, Unit 1
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 CI 3.2.1.8.B	Confirm that Duke's analysis for boron addition demonstrates that the core will remain subcritical as RCS inventory is maintained throughout the three phases of an ELAP event.	Duke to show that reactor will remain subcritical through all phases of the event, including the second cooldown and after xenon decay.
SFPI RAI 13	Provide further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment. a) Provide compensatory actions will be taken when one or both channels out-of service in accordance with the guidance in NEI 12-02 section 4.3. b) Provide compensatory actions will be taken when a non-functioning instrument channel cannot be restored to functional status within 90 days.	Duke to describe compensatory actions

Audit Item Reference	Item Description	Licensee Input Needed
SFPI RAI 14	Please provide a table listing all possible pool interconnections and separation conditions with gate combinations, and the available number(s) of level indication for each pool under those conditions. Assuming one instrument is out-of-service, describe in detail the compensatory measures to assure that reliable level monitoring still exists for each pool under those gate operating conditions.	Duke to describe possible SFP gate configurations and associated compensatory actions.
SE-4	Please 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. The justification should include a discussion of the following factors: a. benchmarking of the seal leakage model against relevant data from tests or operating events, b. 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, c. clarification whether the second-stage RCPseal would remain closed under ELAP conditions predicted by the revised seal leakage model and a technical basis to support the determination, and, d. justification that the interpolation scheme used to compute the integrated leakage from the RCPseals from a limited number of computer simulations (e.g., three) is realistic or conservative.	This is a generic issue that is being worked on by the owners group. Benchmarking should provide justification that the seal leakage model used is acceptable for this application and conservative with respect to generating a time to initiation of reflux cooling.

Audit Item Reference	Item Description	Licensee Input Needed
SE-5	The NRC staff understands that Westinghouse has recently recalculated seal leakoff line pressures under loss of seal cooling events based on a revised seal leakage model and additional design-specific information for certain plants. a. Please clarify whether the piping and all components (e.g., flow elements, flanges, valves, etc.) in your seal leakoff line are capable of withstanding the pressure predicted during an ELAP event according to the revised seal leakage model. b. Please clarify whether operator actions are credited with isolating low-pressure portions of the seal leakoff line, and if so, please explain how these actions will be executed under ELAP conditions. c. If overpressurization of piping or components could occur under ELAP conditions, please discuss any planned modifications to the seal leakoff piping and component design and the associated completion timeline. d. Alternately, please identify the seal leakoff piping or components that would be susceptible to overpressurization under ELAP conditions, clarify their locations, and provide justification that the seal leakage rate would remain in an acceptable range if the affected piping or components were to rupture.	Duke should provide justification that the seal leakoff line will withstand the pressure that could be seen during the postulated event. The owners group is still working on the pressures that may be seen. The justification should include the ability of the leakoff line to the orifice to withstand the potentially seen pressures as well as the downstream piping to withstand the pressure it could see. If any are not capable of withstanding the potential pressures, justification should be given for the leakage remaining within acceptable range or whether or not modification will be done.

If you have any questions, please contact me at 301-415-1544 or by e-mail at Stephen.Monarque@nrc.gov.

Sincerely,

/RA/

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

Docket No.: 50-400

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