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

April 28, 2015

Mr. Peter M. Orphanos
Site Vice President
Nine Mile Point Nuclear Station
348 Lake Road
Oswego, NY 13126

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNITS 1 AND 2 - REPORT FOR THE ONSITE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (TAC NOS. MF1129, MF1130, MF1131, AND MF1132)

Dear Mr. Orphanos:

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. ML13066A171), Exelon Generation, LLC, previously as Constellation Energy Nuclear Group, LLC (Exelon, the licensee) submitted its OIP for Nine Mile Point Nuclear Station, Units 1 and 2 (NMP), in response to Order EA-12-049. By letter dated March 8, 2013 (ADAMS Accession No. ML13074A056), Exelon submitted a complete revision of the OIP for NMP. By letters dated August 27, 2013, February 27, 2014, August 26, 2014, and February 19, 2015 (ADAMS Accession Nos. ML13254A278, ML14069A318, ML14241A380, and ML15062A036, respectively), the licensee 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 NMP interim staff evaluation (ISE) (ADAMS Accession No. ML13225A584) and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13066A172), the licensee submitted its OIP for NMP in response to Order EA-12-051. By letter dated June 5, 2013 (ADAMS Accession No. ML13154A399), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 5, 2013, August 27, 2013, February 24, 2014, August 26, 2014, and February 19, 2015 (ADAMS Accession Nos. ML13197A220, ML13254A279, ML14069A180, ML14241A016, and ML15062A035, respectively), the licensee submitted its RAI responses and first four six-month updates to the OIP.

The NRC staff's review to date led to the issuance of the NMP ISE and RAI dated November 15, 2013 (ADAMS Accession No. ML13281A205). 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 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 NMP from November 3-7, 2014, per the audit plan dated October 8, 2014 (ADAMS Accession No. ML14274A288). 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,

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

Docket Nos.: 50-220 and 50-410

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

EXELON GENERATION, LLC

NINE MILE POINT NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-220 AND 50-410

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). 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.

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Enclosure

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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 staff potential concerns.

In support of the ongoing audit of the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at NMP from November 3-7, 2014, per the audit plan dated October 8, 2014 (ADAMS Accession No. ML14274A288). 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 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 NMP facility from November 3, 2014, through November 7, 2014. The NRC audit team staff was as follows:

Title	Team Member
Team Lead/Project Manager	Jason Paige
Technical Support	Michael Levine
Technical Support	Prem Sahay
Technical Support	Stephen Wyman
Technical Support	Brett Titus
Technical Support	Joshua Miller
Branch Chief	Stewart Bailey

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the October 8, 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

NMP1 and NMP2 compliance dates for the orders are spring 2015 and spring 2016, respectively. As communicated in the October 8, 2014, plan, NMP1 and NMP2 have two sets of questions due to the units having different strategies to mitigate an extended loss of alternating current power (ELAP) event. Therefore, the staff focused its onsite review on the NMP1 strategy, which is reflected in the summary below. However, Attachments 3 and 4 provide a status of NMP1 and NMP2 items that require additional information from the licensee and items that are still under NRC review.

1.0 Entrance Meeting (November 3, 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 "Nine Mile Point Nuclear Station FLEX and

SFPLI [spent fuel pool level instrumentation] NRC Audit Orientation." The licensee provided an overview of its strategy to maintain core cooling, containment, and SFP cooling in the event of a beyond-design-basis external event (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 National SAFER Response Center (NSRC), 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 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 NRC staff reviewed NMP1 modeling of an 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. Originally, the staff understood that the licensee would use the code Modular Accident Analysis Program (MAAP4) to perform its analysis of reactor coolant system (RCS) cooling and inventory control during an ELAP. However, in a 6-month update, the licensee stated that NMP1 is not intending to use the MAAP4 pathway, but will rely on the SAFE and SUPERHEX codes. These codes have not been reviewed for an ELAP condition. Therefore, the staff is currently reviewing the licensee's use of the SAFE and SUPERHEX codes to analyze an ELAP condition at NMP1.

3.2 Electrical Technical Discussions and Walk-Downs

The NRC staff reviewed the calculations on sizing for the FLEX diesel generators (DG), calculations on extending battery life based on load shedding, and walked down the switchgear, direct current (dc) equipment, and battery rooms to evaluate strategies for hydrogen and temperature control. The NRC staff reviewed the licensee's NMP1 FLEX DG sizing calculation and verified that the total calculated power demand for the FLEX DGs is less than the generator rating of 563 kVA. In addition, the NRC staff reviewed the licensee's NMP1 load shed calculation. The licensee will begin the NMP1 load shed at the beginning of the ELAP event and will complete the shed within 30 minutes. The calculation determined that the maximum coping time would be approximately 8.3 hours for the batteries upon load shed occurring within 30 minutes following the event. The licensee plans to deploy the FLEX DGs within 2 hours of the event and energize the battery chargers in 6 hours to repower the 125VDC loads.

During normal plant operation, the battery room ventilation is provided from the turbine building (TB) ventilation system. The battery room ventilation occurs by air flow being drawn through the battery door louvers and room air volume being discharged through

the TB ventilation exhaust ducts located in the room. The TB ventilation is non safety-related and during an ELAP condition, this system is not functional. Therefore, during an ELAP, the hydrogen gas will accumulate in the ventilation duct, which is located above the battery rooms, while the batteries are being recharged. To prevent unacceptable hydrogen gas concentrations in the battery room ventilation ducts, 3 inch diameter holes are located on the top of the battery room exhaust ducts. The exhaust holes are normally closed by dampers and open during a loss of power. The exhaust holes will allow the hydrogen gas to escape from the duct into the TB atmosphere. Due to the immense volume of the TB, the hydrogen concentration will be extremely low (below 1 percent). This condition has been previously analyzed for loss of forced ventilation due to loss of offsite power in NMP Calculation S10-H2GAS-HV01, Revision 0 and disposition 00A. The NRC staff verified with the licensee that the damper controlling hole induct above the batteries fail open and will remain open to dissipate hydrogen to the TB.

3.3 SFPI Technical Discussions and Walk-Downs

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

3.4 Other Technical Discussion Areas and Walk-Downs

a. The NMP FLEX storage configuration consists of two storage buildings. One building will store N sets of FLEX equipment (N-building) and the second building (+1-building) will contain the additional +1, set of FLEX equipment. The N-building is hardened against all BDBEEs and the +1-building is hardened against all BDBEEs except for tornado winds/missiles.

NRC staff identified that the NMP N-building / +1-building FLEX equipment storage configuration is not consistent with the tornado wind/missile hazard reasonable protection configurations described in the guidance contained in Section 7.3.1 of NEI 12-06. Section 7.3.1.1.a describes a configuration where FLEX equipment is reasonably protected in a structure designed to withstand the tornado wind/missile hazard. The +1 building is not hardened against tornado hazards and, therefore, does not meet the guidance contained in NEI 12-06, Section 7.3.1.1.a.

NEI 12-06, Sections 7.3.1.1.b and 7.3.1.1.c describe configurations where FLEX equipment is reasonably protected against tornado hazards by an adequate separation distance and orientation. The NRC position is that configuration 7.3.1.1.b and 7.3.1.1.c require N sets of equipment to be stored in each diverse location for a FLEX storage configuration that consists of only 2 locations. While the N-building and +1-building are adequately separated, only one of the locations contains the full N set of FLEX equipment and, therefore, does not meet the guidance contained in NEI 12-06, Section 7.3.1.1.b or 7.3.1.1.c.

NEI 12-06, Section 11.3.3 states the following:

> FLEX mitigation equipment should be stored in a location or locations informed by evaluations performed per Sections 5 through 9 such that no one external event can reasonably fail the site FLEX capability (N).NEI Section 10.1, "Aggregation of FLEX Strategies," includes the following:
>
> Provision of at least N+1 sets of portable on-site equipment stored in diverse locations or in structures designed to reasonably protect from applicable BDBEEs is essential to provide reasonable assurance that N sets of FLEX equipment will remain deployable to assure success of the FLEX strategies.

Per the guidance above, it is essential to reasonably protect at least N+1 sets of FLEX equipment from all applicable BDBEEs to reasonably assure that N sets (FLEX capability, per section 11.3.3) will remain deployable after the BDBEE. When the reasonable protection scheme of either Section 7.3.1.1.b or 7.3.1.1.c. is utilized, 2 sets of N FLEX equipment must be located in the separate locations. The NMP FLEX equipment storage configuration does not meet the reasonable protection schemes of Section 7.3.1.1.b or 7.3.1.1.c since N sets of FLEX equipment are not contained in both locations. Also, as noted above, the NMP FLEX equipment storage configuration does not meet the reasonable protection scheme of Section 7.3.1.1.a since only N sets of FLEX equipment are stored in a robust structure that protects against all BDBEEs. Therefore, the NMP FLEX equipment storage configuration does not meet the guidance contained in NEI 12-06, Section 10.1, in that it only affords reasonable protection from all applicable BDBEEs for N sets of FLEX equipment, not N+1 sets, as stipulated in the NEI guidance as described above.

The NRC staff further identified that the NMP FLEX storage configuration would not support the maintenance and testing provisions contained in Section 11.5.3 of NEI 12-06. Specifically, section 11.5.3.b states:

> Portable equipment may be unavailable for 90 days provided that the site FLEX capability (N) is available.

Should an item of FLEX equipment be made unavailable in the N-building, the site FLEX capability (N) would no longer be available to mitigate a tornado related BDBEE. The corresponding +1 item of FLEX equipment is not considered to be reasonably protected against the tornado hazard, and therefore, is not reasonably assured to be available or remain deployable to assure success of the FLEX strategies. The remaining available and deployable FLEX equipment, reasonably protected in the N-building, would be less than the site FLEX capability (N). Therefore, the NMP FLEX equipment storage configuration would not meet the condition included in NEI 12-06, Section 11.5.3.b (site Flex capability (N) is available) stipulated for the allowance of the 90-day portable equipment unavailability.

The NRC staff communicated to the licensee that the NMP FLEX storage configuration is not consistent with guidance contained in NEI 12-06. Further consideration of the

NMP FLEX storage configuration by the NRC staff would require that the licensee propose the configuration as an alternative to the guidance of NEI 12-06, accompanied with appropriate justification. Lastly, the NRC staff recognizes that the N-building is hardened against all BDBEEs and stores the required minimum set of FLEX equipment for NMP1 to mitigate an ELAP event; therefore, this issue is applicable once NMP2 must comply with the mitigating strategies (MS) order and is being tracked as a NMP2 item (see Attachment 3, NMP2 MS/SFPI safety evaluation (SE) Audit Items currently under NRC staff review and requiring licensee input as delineated).

b. The NRC staff reviewed the licensee's evaluation of the refueling floor SFP area for the possibility of steam and condensation during an ELAP event. The licensee provided calculation S0-GOTHIC-ELAP001 that concluded, by opening specific doors and vents within 3 hours, the maximum temperature would be 168 °F in the SFP area. Special Operating Procedure, N1-SOP-33A.2, "Station Blackout/ELAP", Section 5.6, directs that some of the subject doors will be breached when the hoses are initially laid (within approximately 1 hour) while other doors and vents will be opened by or before 8 hours. Figure 1B shows that the difference between opening the doors at 1 hour, 3 hours, or not at all causes a variance of only 5 degrees °F at the 8-hour mark, so the opening of the doors is not time critical, and the verbiage of the procedure is sufficient. The licensee identified this lack of sensitivity to the timing of the door opening on page 28 of the S0-GOTHIC-ELAP001 calculation stating, "The impact of the time to open the door has essentially no impact on the temperature transient."

c. The NRC staff reviewed the licensee's FLEX equipment hydraulic analysis; Calculation S0-FLEX-F001, "NMP1 FLEX Hydraulic Flow Evaluation." The staff's review focused on the FLEX flow path characteristics including net positive suction head available, friction and elevation head losses, and pressures and flow rates required for injection and whether the FLEX pumps have the capability to meet these requirements. The staff questioned the licensee's ability to inject into the reactor pressure vessel (RPV) following the isolation of one of the emergency condensers (ECs), as the resulting RPV pressure increase is above that required for injection. The licensee stated that procedures will be revised to direct operators to maintain RPV pressure below the limit required for FLEX injection using the emergency relief valves.

   In addition, the staff reviewed the flow and pressure requirements for core cooling, containment, and SFP cooling and whether the pumps supplied by the NSRC are capable of meeting those requirements. The staff reviewed the licensee's calculation (S0-FLEX-F001) and compared the flow and pressure values to the pump capacities listed in the NSRC Equipment Technical Requirements, AREVA document 51-919971-012.

d. The NRC staff reviewed the licensee's plan for sharing facility resources between units. The staff's review focused on the identification of any shared resources and the management of those resources during an ELAP event. The licensee stated that the two units will share FLEX resources for debris removal, towing, refueling, FLEX storage, and offsite communications. The licensee stated that deployment strategies include expected priority for equipment. The licensee no longer plans to share the dry hydrants

from one unit to the other. The licensee stated that dry hydrants are no longer planned for NMP1 and that the dry hydrant design for NMP2 is not presently expected to be sized to accommodate the combined flow for NMP1 and NMP2.

e. The NRC staff reviewed the licensee's evaluation of the accessibility and survivability of equipment housed in the TB following a BDBEE. For example, the licensee's strategy requires operators to respond and control level in the ECs by throttling manual valves in the TB. The licensee stated that although the TB is a Class II structure, for seismic design, the entire TB complex was evaluated as a Class I structure and is designed to withstand the same peak ground acceleration as the reactor building, a Class I structure.

4.0 Exit Meeting (November 7, 2014)

The NRC staff audit team conducted an exit meeting with the 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 still under NRC review were discussed at the exit meeting (see Attachments 3 and 4 for additional information):

a. ISE CI 3.2.1.2.A, Recirculation System Leakage
The staff requested that the licensee provide justification of the pressure dependence of the assumed recirculation system leakage rates and the recirculation pump seal leakage rates that were used in the ELAP analysis, whether the leakage was determined to be single-phase, two-phase, or steam at the donor cell, and how mixing of the leakage flow with the drywell atmosphere was modeled. The licensee provided calculations ET-S-331, "Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions," and ET-S-426, "Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions - Phase 2," for justification of the seal leakage rates under station blackout conditions. The staff is currently reviewing the calculations.

b. ISE CI 3.2.4.2.B and SE Review Item 7, Battery Board and Charger Rooms Ventilation
While the NRC staff was reviewing the licensee's evaluation of the ventilation provided in the battery room, the staff requested that the licensee provide an evaluation on the ventilation in the battery board and charger rooms to protect against the effects of extreme temperatures. The licensee provided NMP1 calculation S10-HVAC-HV05, Rev. 2, "Battery Board Room Low temperature." The NRC staff reviewed and discussed this calculation with the licensee and identified that for low temperatures in the battery board room, this calculation recommended interim actions to be taken if the temperature in the room dips below a certain level. However, these interim actions were not defined in the calculation. After the onsite audit, the licensee provided a revised calculation. In addition, the licensee provided its evaluation of the ventilation in the battery charger room. The NRC staff is currently reviewing the calculations.

c. AQ 13, Analytical Code(s) to Predict ELAP Timeline
The NRC staff requested that the licensee provide NMP1 analytical results to support the conclusions that the predictions of the code(s) used are consistent with expected

plant behavior and that core cooling would be maintained by performing the identified actions within their time constraints. The licensee provided NMP1 SAFE and SUPERHEX calculations to demonstrate that adequate core cooling is maintained during an ELAP event. The staff is currently reviewing the SAFE and SUPERHEX calculations.

d. SE Review Item 4, Raw Water Sources
The NRC staff requested that the licensee address the use of raw water sources for core cooling to mitigate an ELAP event and the potential for fuel channel inlet blockage. Specifically, the NRC staff discussed with the licensee that if raw water is used for core cooling (even if it is filtered), the licensee should provide assurance of top-down cooling, where rising steam may have the capability to dislodge blockage across channel outlets which typically have more open area and larger openings than channel inlets. After the onsite audit, the licensee provided a position paper to justify using raw water sources. The NRC staff is currently reviewing the position paper.

e. SE Review Item 5, Human Factors
During the onsite audit, the NRC staff verified that appropriate human factors are being applied for the implementation of the NMP1 FLEX strategies. As a follow-up item from discussions, the NRC staff requested that the licensee provide the validation for the timing of the staging and setup of the NMP1 FLEX RCS injection pump. After the onsite audit, the licensee provided the NMP1 FLEX pump deployment validation. The NRC staff is currently reviewing the validation.

CONCLUSION

The NRC staff completed all three parts of the October 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 SE 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 Level Instrumentation (SFPLI) Requests for Additional Information (RAIs)

e. Additional 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: NMP1 and NMP2 MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input as delineated

d. Attachment 4: NMP1 and NMP2 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 October 8, 2014, the ongoing audit process continues as per the letters dated August 28, 2013, and March 26, 2014, to all licensees and construction permit holders for both orders.

Additionally, while 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 e-Portal.

Attachments:
1. NRC and Licensee Staff Onsite Audit Participants
2. Onsite Audit Documents Reviewed
3. NMP1 and NMP2 MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input
4. NMP1 and NMP2 MS/SFPI SE Audit Items currently under NRC staff review but not requiring further licensee input

Onsite Audit Participants

NRC Staff:

Jason Paige	NRR/JLD/JOMB
Michael Levine	NRR/JLD/JCBB
Prem Sahay	NRR/JLD/JERB
Stephen Wyman	NRR/JLD/JERB

Brett Titus	NRR/JLD/JCBB
Joshua Miller	NRR/JLD/JERB
Stewart Bailey	NRR/JLD/JCBB

NMP Staff:

Gregg Pitts	Fukushima Project
Terry Syrell	Manager, Regulatory Assurance
Brandon Varga	Regulatory Assurance
Peter Orphanos	Site Vice President
Kathy Picciott	Site Fukushima Project Lead
Michael Conway	Fukushima Project
Phil Amway	Corporate Severe Accident Management Group
Barry Thurston	Corporate Severe Accident Management Group
Josh Rocks	Design Engineering
George Wrobel	Ginna Site Fukushima Project Lead
Carol Kronich	Manager, Site Nuclear Oversight
Todd Fiorenza	Manager, Site Project Management

Documents Reviewed

- Calculation ET-S-331, Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions
- Calculation ET-S-426, Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions - Phase 2
- Calculation S0-GOTHIC-ELAP001
- Calculation S0-GOTHIC-ELAP002, Primary Containment Response Following An Extended Loss of AC Power, Revision 0
- Special Operating Procedure, N1-SOP-33A.2, Station Blackout/ELAP
- Calculation S10-HVAC-HV05, Battery Board Room Low temperature, Revision 2
- Calculation S10-210HV12-02
- Calculation 600VACDGES-FLEX-BDB, Fukushima 600VAC FLEX-BDB-450KW/563KVA, Revision 0
- Calculation 125DCTRAIN11/12LFVD, 125VDC Power System 11 and 12 Load Flow Voltage Drop
- Procedure OP-NM-102-106, Load Stripping, Revision 0
- Calculation S0-FLEX-F001, NMP1 FLEX Hydraulic Flow Evaluation
- Calculation S10-H2GAS-HV01, Revision 0
- Calculation S14-54SFP-SL1, Hydrodynamic Loading Analysis
- Analysis ECP-13-000651-MU-009 S0-GOTHIC-ELAP001-N/A
- Drawing C-23321-C Sheet 1

NMP1
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
SE Review Item 8	Maintenance and Testing	Make available for review verification that the NMP1 maintenance and testing program for the FLEX equipment include (but not limited to) the acceptance and replacement criteria for electrical equipment (i.e., FLEX DGs, batteries, cables etc.). In addition, provide the shelf life of components (i.e., O-rings, seals, battery life etc.).

NMP2
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 OI 3.2.3.B	Containment Functions	Make available for review a calculation to demonstrate that the assumed timeline is appropriate and that containment functions will be restored and maintained following an ELAP event.
ISE CI 3.1.1.1.A	FLEX Storage Building	Make available for review a proposal that the FLEX storage building configuration is an alternative to the guidance of NEI 12-06, accompanied with appropriate justification.
ISE CI 3.1.1.2.A	Deployment Routes	Make available for review the NMP2 deployment routes and any considerations for possible impacts due to debris and soil liquefaction.
ISE CI 3.2.1.1.A ISE CI 3.2.1.1.B ISE CI 3.2.1.1.C ISE CI 3.2.1.1.D ISE CI 3.2.1.1.E	Analytical Code to Predict ELAP Event	Make available for review the modular accident analysis program (MAAP) calculation once completed.
ISE CI 3.2.1.2.A	Recirculation System Leakage	Make available for review the recirculation pump model and seal model as well as the maximum possible seal leakage and the seal leakage used to model the event.
ISE CI 3.2.2.A	Ventilation	Make available for review an evaluation of the potential of steam and condensation in the refueling floor SFP area.

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.2.3.A ISE CI 3.2.4.2.A SE Review Item 5	Ventilation	Make available for review an evaluation of containment structures to identify necessary actions to enable implementation of the strategy with running RCIC [reactor core isolation cooling] pumps with elevated temperatures. In addition, provide an evaluation of the ventilation in the battery charger rooms to protect electrical equipment from the effects of high or low temperatures during an ELAP event.
ISE CI 3.4.B AQ 16 AQ 17	Hydraulic Analysis	Make available for review the hydraulic analysis for the NMP2 FLEX equipment.
AQ 1 AQ 2	Protection of Equipment and Connection Points	Describe how FLEX equipment will be protected and how connection points will be accessed during a seismic event.
SE Review Item 1	Instrumentation	Identify and make available for review a list of FLEX instrumentations that will be used to monitor FLEX electrical equipment.
SE Review Item 6	Maintenance and Testing	Make available for review verification that the NMP2 maintenance and testing program for the FLEX equipment include (but not limited to) the acceptance and replacement criteria for electrical equipment (i.e., FLEX DGs, batteries, cables etc.). In addition, provide the shelf life of components (i.e., O-rings, seals, battery life etc.).
ISE CI 3.2.4.10.A	Battery Coping Times	The NRC staff review did not find load shed coping time, sizing and load profile analyses for battery 2BYS*BAT2B in Calculation EC-203, Battery 2BYS*BAT2A and 2BYS*BAT2B, Revision 0. Make available for review the sizing, load profile and load shed coping analyses for battery 2BYS*BAT2B.

NMP1
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 3.2.1.2.A	Recirculation System Leakage	The staff requested that the licensee provide justification of the pressure dependence of the assumed recirculation system leakage rates and the recirculation pump seal leakage rates that were used in the ELAP analysis, whether the leakage was determined to be single-phase, two-phase, or steam at the donor cell, and how mixing of the leakage flow with the drywell atmosphere was modeled. The licensee provided calculations ET-S-331, "Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions," and ET-S-426, "Testing of the CAN2A Seal Cartridge Under Station Blackout Conditions - Phase 2," for justification of the seal leakage rates under station blackout conditions. The staff is currently reviewing the calculations.

Audit Item Reference	Item Description	Action
ISE CI 3.2.4.2.B SE Review Item 7	Battery Board and Charger Rooms Ventilation	While the NRC staff was reviewing the licensee's evaluation of the ventilation provided in the battery room, the staff requested that the licensee provide an evaluation on the ventilation in the battery board and charger rooms to protect against the effects of extreme temperatures. The licensee provided NMP1 calculation S10-HVAC-HV05, Rev. 2, "Battery Board Room Low temperature." The NRC staff reviewed and discussed this calculation with the licensee and identified that for low temperatures in the battery board room, this calculation recommended interim actions to be taken if the temperature in the room dips below a certain level. However, these interim actions were not defined in the calculation. After the onsite audit, the licensee provided a revised calculation. In addition, the licensee provided its evaluation of the ventilation in the battery charger room. The NRC staff is currently reviewing the calculations.
ISE CI 3.2.4.9.A	Refueling Strategy	The NRC staff is currently reviewing the NMP1 refueling strategy.
AQ 13	Analytical Code to Predict ELAP Event	The NRC staff requested that the licensee provide NMP1 analytical results to support the conclusions that the predictions of the code(s) used are consistent with expected plant behavior and that core cooling would be maintained by performing the identified actions within their time constraints. The licensee provided NMP1 SAFE and SUPERHEX calculations to demonstrate that adequate core cooling is maintained during an ELAP event. The staff is currently reviewing the SAFE and SUPERHEX calculations.

Audit Item Reference	Item Description	Action
SE Review Item 4	Raw Water Sources	The NRC staff requested that the licensee address the use of raw water sources for core cooling to mitigate an ELAP event and the potential for fuel channel inlet blockage. Specifically, the NRC staff discussed with the licensee that if raw water is used for core cooling (even if it is filtered), the licensee should provide assurance of top down cooling, where rising steam may have the capability to dislodge blockage across channel outlets which typically have more open area and larger openings than channel inlets. After the onsite audit, the licensee provided a position paper to justify using raw water sources. The NRC staff is currently reviewing the position paper.
SE Review Item 5	Human Factors	During the onsite audit, the NRC staff verified that appropriate human factors are being applied for the implementation of the NMP1 FLEX strategies. As a follow-up item from discussions, the NRC staff requested that the licensee provide the validation for the timing of the staging and setup of the NMP1 FLEX RCS injection pump. After the onsite audit, the licensee provided the NMP1 FLEX pump deployment validation. The NRC staff is currently reviewing the validation.

NMP2
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 3.2.4.9.A	Refueling Strategy	The NRC staff is currently reviewing the NMP2 refueling strategy.

If you have any questions, please contact me at 301-415-5888 or by e-mail at Jason.paige@nrc.gov.

Sincerely,

/RA/

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

Docket Nos.: 50-220 and 50-410

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NAME	JPaige	SLent	SBailey (BTitus for)	SWhaley
DATE	04/22/15	04/21/15	04/23/15	04/22/15
OFFICE	NRR/JLD/JOMB/BC(A)	NRR/JLD/JOMB/PM		
NAME	MHalter (MBrown for)	JPaige		
DATE	04/28/15	04/28/15		

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