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

June 16, 2015

Mr. Mark E. Reddemann
Chief Executive Officer
Energy Northwest
P.O. Box 968 (Mail Drop 1023)
Richland, WA 99352-0968

SUBJECT: COLUMBIA GENERATING STATION - 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. MF0796 AND MF0797)

Dear Mr. Reddemann:

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. ML13071A614), Energy Northwest (the licensee) submitted its OIP for Columbia Generating Station (Columbia) in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, and August 28, 2014 (ADAMS Accession Nos. ML1325A180, ML14073A122, and ML14254A403, respectively), the licensee submitted its first three 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 Columbia interim staff evaluation (ISE) on January 29, 2014 (ADAMS Accession No. ML13337A365), and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13071A470), the licensee submitted its OIP for Columbia in response to Order EA-12-051. By letter dated June 20, 2013 (ADAMS Accession No. ML13165A093), the NRC staff issued a request for additional information (RAI). By letters dated July 19, 2013, August 23, 2013, February 27, 2014, and August 28, 2014 (ADAMS Accession Nos. ML13274A241, ML13248A448, ML14069A078, and ML14254A408, respectively), the licensee submitted its RAI response and first three six-month updates to the OIP. By letter dated November 7, 2013, NRC staff issued the Columbia ISE and RAI (ADAMS Accession No. ML13302C136). 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 the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Columbia from February 2-5, 2015, per the audit plan dated January 16, 2015 (ADAMS Accession No. ML15006A322). 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 R Monarque

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

Docket No.: 50-397

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

ENERGY NORTHWEST

COLUMBIA GENERATING STATION

DOCKET NO. 50-397

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. ML13071A614), Energy Northwest (the licensee, EN) submitted its OIP for Columbia Generating Station (Columbia, CGS) in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, and August 28, 2014 (ADAMS Accession Nos. ML1325A180, ML14073A122, and ML14254A403, respectively), the licensee submitted its first three 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 Columbia interim staff evaluation (ISE) on January 29, 2014 (ADAMS Accession No. ML13337A365), 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 Columbia from February 2-5, 2015, per the audit plan dated January 16, 2015 (ADAMS Accession No. ML15006A322). 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 Columbia facility from February 2-5, 2015. 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	Prem Sahay	NRR/JLD
Technical Support – Reactor Systems	Joshua Miller	NRR/JLD
Technical Support – Balance of Plant	Kevin Roche	NRR/JLD
Technical Support – Containment	Brett Titus	NRR/JLD
Technical Support – SFPI	Duc Nguyen	NRR/JLD
Deputy Director Japan Lessons Learned Division	Michael Franovich	NRR/JLD
Branch Chief Policy & Support Branch	Gregory Bowman	NRR/JLD
Branch Chief Electrical & Reactor Systems Branch	Sheena A. Whaley	NRR/JLD
Senior Project Manager	Victor Hall	NRR/JLD

The NRC staff executed the onsite portion of the audit pursuant to the three part approach discussed in the January 16, 2015, 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 (February 2, 2015)

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, EN provided a presentation to the NRC staff titled "Columbia Generation Station SFPI and FLEX Strategies." The licensee discussed its strategy to implement the two orders, the overall FLEX program, the installation of the

spent fuel pool level instrumentation (SFPLI), the design and location of the FLEX equipment storage facilities, 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 conducted interviews with EN 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

a. The licensee proposed to use the Modular Accident Analysis Program (MAAP) 4 code for simulating an extended loss of alternating current (ac) Power (ELAP) event for boiling-water reactors (BWRs). The NRC staff had endorsed the generic June 2013 NEI position paper subject to several conditions.

The first condition is that EN identify benchmarks which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event. The licensee stated that extensive benchmarking has been done and reported in the MAAP4 Applications Guidance document. The licensee's overall agreement was noted to be good. In addition, MAAP4 was shown to have good agreement when used on other BWR transients such as loss of feedwater and loss of off-site power. The Electric Power Research Institute (EPRI) documentation provided benchmarking for the ELAP event.

The second condition is that the collapsed reactor pressure vessel level (RPVL) must remain above the Top of Active Fuel (TAF) and the cooldown rate must be within the technical specification (TS) limits. The MAAP INP file was created to simulate the cooldown of the RPVL. The criterion used at Columbia was an 80 degree Fahrenheit (°F)/per hour (hr) cool down rate which is less than the TS rate of 100 °F/hr. The collapsed water level is maintained above the TAF.

For the third condition, EN had the MAAP4 Model evaluated independently by ERIN using their computers and the results compared favorably. MAAP4 was installed on another Columbia computer and the model was run to verify that the same results were obtained. The NRC staff agreed with ENs analysis that the MAAP4 code executed correctly and provided consistent results.

The licensee created the Columbia parameter file. The results are reviewed in detail to assure that they are consistent with the magnitude and timing events, such as flow resistance and opening of the wetwell vent, and the establishment of makeup flow. The NRC staff agrees with the licensee's analysis that the results show that the behavior predicted by the program was consistent with engineering judgment and expectations.

The licensee stated that the MAAP4 analyses was used to determine conditions inside containment while preventing core damage. The methods and parameters used have

been reviewed and benchmarked by ERIN Engineering and Research, Inc. Vent line flow resistance has been modeled as a single hardened vent line. The decay heat in Columbia MAAP4 models has been adjusted upward to agree with the ASB BTP 9-2 formulation with uncertainties included. Attachment A, Tables from EPRI Report 1020236, identifies the parameters in Tables 4-1 through 4-6 as noted in the limitation on use. The discussion of parameters and the values is contained in the MAAP PAR files used at Columbia. The NRC staff did not find any discrepancies in its review.

The licensee's MAAP4 analyses in Calculation ME-02-14-13 Rev. 0, reflects the conditions expected to exist during an ELAP with varying vent flow resistance. A major objective of the calculation was to determine how high the containment hardened vent flow resistance could be and still limit the Suppression Pool temperature to 240 °F. The results for K=4 reflect a maximum Suppression Pool temperature below 240 °F. The results for K=5 reflect a maximum Suppression Pool temperature above 240 °F. A K value of 4.6 resulted in a maximum Suppression Pool temperature just under 240 °F, which is the goal of the calculation. The licensee developed a design criterion for the containment hardened vent which required the vent flow resistance K to be less than or equal to 4.6, based on the wetwell penetration inside diameter of 11.374 inches. The NRC staff did not find any discrepancies in its review and ISE CI 3.2.1.1.A-E is closed.

b. The NRC staff audited the EN's strategy for addressing the potential loss of heat tracing. EN informed the NRC staff that the credited source of water for Reactor Core Isolation Cooling (RCIC) during Phase 1 is the suppression pool. The Suppression pool makeup will be conducted using a FLEX pump to either the suppression pool or the RPVL during Phase 2. As such, EN stated that no specific actions were needed to compensate for the loss of condensate storage tank (CST) heat tracing. The NRC staff did not find any discrepancies in its review and ISE CI 3.2.4.3 is closed.

c. The NRC staff reviewed EN's assessment of the CST. The licensee stated that the CSTs were not qualified for all events and were not credited to mitigate an ELAP event. Should CST water become unavailable and automatic switch-over of RCIC suction from CST to the suppression pool fails to occur due to multiple instrument failures, the operators have redundant and diverse indications in the control room to trigger manual actuation. The RCIC pump will trip on low suction pressure. The RCIC trip status, RCIC flow rate, and RPVL are three indications in the control room that will inform the control room operators of a need for manual actuation. The NRC staff did not find any discrepancies in its review and AQ 29 is closed.

3.2 Electrical Technical Discussions and Walk-Downs

a. During the site audit, the NRC staff reviewed the ELAP FLEX strategy battery sizing and load profile analyses in CGS Calculation 2.05.01, Revision 11 "Battery Sizing for ELAP Event". The battery sizing and load profile analyses were performed based on the methodology recommended by the Institute of Electrical and Electronics Engineers (IEEE) Standard 485 "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications". The NRC staff also reviewed the licensee's analysis of extended battery duty cycles and confirmed that the analysis was consistent with the NEI White Paper on Battery Life Issue endorsed by the NRC (ADAMS Accession No. ML13241A188). During the walk down, the NRC staff observed a sample demonstration of the load shed procedure and load shed completion time, and confirmed the licensee's ability to complete the specific load shed actions in the specified times in the procedure. The CGS staffing and timing validation also validated the load shed completion time. The NRC staff had no further questions and AQ Item 22-A was closed.

b. The NRC staff reviewed the licensee's development of the ELAP load shedding procedure to ensure it included directions to depressurize the main generator manually. In its six-month status update dated August 28, 2014, EN stated that the load shedding procedure will also direct operators to depressurize the main generator manually if the generator is pressurized with hydrogen before shedding the air side seal oil backup pump. Battery Load Shed Procedure No.5.6.2, "The Station Blackout And Extended Loss of AC Power ELAP Attachments," Revision 003 requires shedding of the Air Side Seal Oil Backup Pump after ensuring that the Main Generator has been depressurized and coasted to standstill. The NRC staff had no further questions and ISE CI 3.2.4.10.C was closed.

c. The NRC staff reviewed the licensee's assessment of battery room hydrogen accumulation that occurs after the loss of the heating, ventilation, and air conditioning system, during an ELAP event. During site audit, the NRC Staff reviewed CGS Calculation NAI-1721-001, Rev. 1, Appendix D.2 "Hydrogen Concentration." Figure 16 of this calculation shows that the hydrogen concentration is less than 0.3 percent over the 72 hour transient. Since the lower flammability limit (LFL) for hydrogen is about 4 percent, the expected hydrogen concentration in the battery rooms is an order of magnitude of less than the LFL. The NRC staff confirmed EN's assessment that the calculated hydrogen concentration level is much lower for the 72 hours transient than the criteria of 4 percent LFL. As such, hydrogen concentration in the battery room is not an issue. The licensee stated that no change is needed to the existing exhaust path in the battery room as a result of hydrogen concentration level. The NRC staff had no further questions and ISE CI 3.2.4.2.A.1 is closed.

d. The licensee used the Gothic Code in Calculation NAI-1721-001, Revision 1, "Gothic Analysis of Columbia Generating Station RadWaste Building" and demonstrated that the battery rooms peak temperature would be lower than the Licensee Controlled Specifications (LCS) limits 72 hours after station blackout (SBO) and therefore no mitigation action is required. This calculation concluded that most of the doors in the

vital island will be credited as open, two hours after SBO since the peak calculated temperature in some area of vital island may exceed LCS limits. In addition to opening the doors, one 6000 cubic feet minute portable floor fan must be located in the corridor at Door 221, with flow in to Room C216, Battery Charging No 1. The fan is credited at 12 hours for electrical equipment operability. The NRC Staff had no further question and AQ item 26-B is closed.

e. The licensee performed sizing calculations to demonstrate that the Phases 2 and 3 FLEX diesel generators (DGs) can supply adequate power loads. The licensee, in its six month update dated August 28, 2014, stated that the evaluation of the electrical power requirements for Phase 2 showed that one FLEX generator rated at 480-V ac and 400 kW will have adequate capacity for the estimated load during Prolonged Station Blackout (PSBO)/ELAP. This capacity was based on the capacity of Columbia's Diesel Generator DG4, which provides an alternate ac source to Division 1 or Division 2 loads. The licensee stated that the term PSBO came from earlier mitigation strategies documents. As such, the terms PSBO or ELAP have been used interchangeably in all Columbia calculations and documents.

   The licensee's evaluation of the electrical power requirements for Phase 3 showed that two generators from the National SAFER Response Center (NSRC), rated at 4160-V ac and 1 megawatt, will have adequate capacity to supply one residual heat removal (RHR) pump, related valves, and miscellaneous required loads when connected in parallel. The miscellaneous required loads include a fuel pool recirculating pump, the direct current battery chargers, and the room coolers for the control room, cable spreading room switchgear room and RHR room.

   Calculation E/I-02-91-03, Revision 17 shows the Beyond-Design-Basis External Event (BDBEE) Loading during the ELAP that will be supported by power source E-GEN-DG4 (DG4). The DG4 is rated at 400 Kilo Watts (KW), 480 Volt (V) at 104 °F. Columbia document CVI 999-00-194-1, states that DG4 is reduced by 1 percent for every 10 °F above 104 °F. During a BDBEE, the site maximum temperature of 115 °F was assumed. Thus for a conservative approach, the DG4 is reduced by 2 percent from 400 KW to 392 KW. The NRC Staff questioned EN for assuming 115 °F in the calculation. The licensee provided a copy of CGS Final Safety Analysis Report (FSAR) Section 2.3.1 showing summer maximum temperature to be from 100 °F to 115 °F, and stated that the CGS Calculation E/I-02-91-03 used the FSAR maximum temperature of 115 °F to de-rate 400 KW Flex Generator capacity to 392 KW. The NRC staff had no further questions and ISE CI 3.2.4.8.A is closed.

f. The licensee provided Single Line Diagrams showing the proposed connections of Phase 2 and 3 electrical equipment. During site audit, the NRC staff reviewed drawings FSKE-012229-001, Rev. N/A, "Connection Diagram Cable/Raceway Routing 4.16kv Generator Connections Fukushima Effort"; FSKE-12245-003, Rev. A 480V "Alternate Connection Critical Loads Simplified One Line Diagram"; EC 12245 "Figure 1A – Existing Single Line of Distribution System (before EC 12218)"; EC 12245 "Figure 1B – DG-4 Alternate Connection Point Simplified Connection Diagram." The NRC staff had no further questions and AQ 38 was closed.

3.3 Balance of Plant Technical Discussions and Walk-Downs

a. The NRC staff wanted to confirm that the spray ponds contained enough water to dissipate for 72 hours, the decay heat from the reactor core and SFP during Phases 1 and 2, with sufficient margin to account for some potential loss of inventory due to a tornado. The NRC staff reviewed Calculation, ME-02-14-02, "General Technical Support of Fukushima Related Licensing Documents," which showed that EN would require 7.3E5 gallons (5.8 percent) to dissipate for 72 hours, the decay heat of the reactor core and SFP. The service water (SW) spray ponds contain 12.5 E06 gallons of water. Therefore, the occurrence of winds at 130 mph removing 94 percent of the water in the SW spray ponds is not reasonable. The NRC staff has reviewed EN's analysis and did not find any discrepancies. Therefore, ISE CI 3.1.1.3.A is closed.

b. The NRC staff reviewed EN's strategy to maintain satisfactory SFP cooling, during an ELAP, when a full core offload is in the SFP. The licensee stated it plans to take the following actions prior to off-loading the full core: Open a hatch in the Reactor Building, open various doors, and lineup the one of two FLEX pumps to take suction from one of the SW spray ponds. The secondary containment will not be breached until an ELAP event occurred.

   Once the ELAP has occurred, EN plans to finish connecting the temporary hoses and provide 600 gallons per minute (gpm) through fire hoses routed up one of two stairwells in the Reactor Building and provide spray flow to the SFP within 2 hours. Licensee Action Request AR 245604-59.04, "Develop Procedure for Supplemental Cooling," was written to provide this instruction. The NRC staff has reviewed EN's analysis and did not find any discrepancies. Therefore, ISE CI 3.2.2.C is closed.

c. The NRC staff reviewed EN's SFP makeup strategy to ensure that SFP makeup can be provided without accessing the refueling floor, or that an acceptable alternate approach was developed. The licensee's primary and alternate method of filling the SFP will be via hoses routed from either FLEX pump drawing suction from one of two SW spray ponds. The hoses will be routed into one of two entrances into the Reactor Building. The primary method goes through the Reactor Building Railway Bay which is robust because it is rated as Category 1 seismic and into the Reactor Building on the 447 foot level. From that level the hoses will be routed up one of two stairwells (in opposite ends of the Reactor Building) to the 606 foot level and into the pool via hose or spray nozzles. The licensee's Procedure ABN-FSG-002, "Water Makeup Strategies for RPVL, SFP, DW, WW, CSTS During an Extended Loss of AC Power or other Beyond Design Basis Event," specifies the start of makeup flow to the SFP within 12 hours. According to the GOTHIC analysis, if no ventilation or makeup to the SFP is performed, the SFP will boil in approximately 50 hours for the nominal SFP heat load. However, the licensee also has a method to make up to the SFP and over flow to the suppression pool via a connection to the B RHR line that does not require access to the 606 foot elevation of the RHR line. Hoses are routed from the FLEX pumps to the Reactor Building 447 level using the same method described above to flange that will have to be installed on the B RHR line. The NRC

staff has requested that EN provide the flow analysis for filling the SFP through RHR B Loop. As such, ISE CI 3.2.2.D is an open item.

d. The NRC staff reviewed EN's strategy for providing different SFP make up flow rates. The licensee performed CGS Calculation CVI 1201-00, 2, "GOTHIC Analysis of CGS Reactor Building Response to SBO," Rev 0. This analysis determined that significantly more flow was required to the SFP to maintain habitability than for inventory makeup. The licensee will provide 300 gpm for the nominal case and 600 gpm for the full core offload. Both of these numbers are based on the FSAR fuel pool heat loads of 8.2 MBtu/hr and 44.3 MBtu/hr. The licensee performed a calculation to show that the makeup numbers were approximately 15 gpm and 81 gpm for nominal and full core offload. Calculation ME-2-12-06, "Evaluation of the Use of Portable Equipment During an Extended Station Blackout," Rev 1, shows that these flows can be provided with either FLEX pump. The NRC staff did not find any discrepancies in the calculations. Therefore, AQ 21-B is closed.

3.4 Containment Systems

a. During the audit, EN and the NRC staff discussed whether EN had completed the GOTHIC analyses and developed the SFP cooling strategies. The licensee provided a copy of Calculation ME-02-14-04, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) While Operating at Full Power", Rev. 0. This procedure states that "with the roof access hatch opened within 2 hours and 300 gpm of makeup flow to the spent fuel pool commencing at or before 12 hours following the ELAP event, the 606' elevation of the Reactor Building never becomes uninhabitable. During the first two hours of the event, stay times are indefinite in this area, and at 5 hours the stay times are 120 minutes. The action times allowed in this are never are less than 30 minutes, and all manual actions in the spent fuel pool area (opening the roof hatch and aligning hoses) are not expected to exceed this minimum allowed action time." Calculation ME-02-14-07, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) With Full Core Off-Load", Rev. 0, was also reviewed by the NRC staff. Under full core off-load conditions, with several mitigating actions performed in anticipation of an event, the SFP area becomes uninhabitable at approximately 5.5 hours. Within 15 minutes, the operators must open the railroad bay doors and the roof hatch. Also, within 2 hours 600 gpm for SFP makeup will commence and personnel will be evacuated from this area. The NRC staff had no further questions and ISE CI 3.2.2.B is closed.

b. During the audit, EN provided a copy of ME-02-14-04, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) While Operating at Full Power", Rev. 0. In its calculation, EN concluded that, before the floor plug to the RCIC room is removed and Door-R5 opened (which analytically occurs 12 hours into the ELAP event), the minimum stay time in the RCIC room is 65 minutes. However, when the mitigating actions of removing the plug and opening the door are taken, the room quickly returns to conditions which support an unlimited stay time. The remaining Radwaste Building essential rooms (Switchgear Rooms, Battery Rooms, Main Control Room, etc.) were evaluated in Calculation CVI 1202-00, 1/NAI-1721-001, "GOTHIC Analysis of CGS Radwaste Building Response to SBO", Rev. 1. This

calculation shows how each of the locations does not exceed their respective stay time limits during an ELAP scenario. The licensee also provided a copy of Columbia Technical Memorandum (TM) TM-2187, "Actions, Limitations, and Notes Associated with an Extended Loss of AC Power", Rev. 0. This document lists all applicable actions and the time frames in which they must be taken to support the FLEX strategies. This includes doors to be opened, ceiling tiles to be removed, and a fan to be moved to the Battery Charging Room. These actions are controlled by procedure PPM 5.6.2, "Station Blackout (SBO) and Extended Loss of AC Power (ELAP) Attachments", which will be revised to include the actions listed in TM-2187. The NRC staff has no further questions and ISE CI 3.2.4.2.B is closed.

c. During the audit, EN provided copies of Calculations ME-02-14-04, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) While Operating at Full Power", Rev. 0, ME-02-14-07, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) With Full Core Off-Load", Rev. 0, CVI 1201-00, 1, "GOTHIC Analysis of CGS Radwaste Building Response to SBO", Rev. 1, and CVI 1202-00,2, "GOTHIC Analysis of CGS Reactor Building Response to SBO", Rev. 0. The NRC staff did not find any discrepancies with EN's calculations which demonstrate that, with the appropriate mitigating actions taken, all areas remained habitable for the minimum stay time limits, and this allows accomplishment of the tasks necessary in those areas. The NRC staff has no further questions and ISE CI 3.2.4.6.A is closed.

3.5 SFPI Technical Discussions and Walk-Downs

The NRC staff 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 EN.

a. The SFPI vendor did not perform any susceptibility testing to confirm the EFP-IL system is not susceptible to portable radiofrequency (RF) transmitting devices (i.e., radio). The licensee also stated that the SFP level probes are essentially antennas, and therefore may be susceptible to interference from electromagnetic devices. The probes are constructed with a metal sheath that acts as a faraday cage protecting the antennae inside. The metal sheath is built with holes in it to allow the flow of water and air which ensures the antenna sees a representative water level. These holes may also provide a path for interference from operation of hand held radio close proximity. Because the probe is a passive device (antenna), an erroneous signal at the probe would only temporally disrupt system function, manifesting itself as a system error or temporary false signal. Personnel operating a radio close enough to the EFP-IL have the potential to effect the level indication. The licensee stated that personnel operating a radio will be close to the SFP water level, following a BDBEE. The licensee plans to add a precaution into plant procedure, SOP-SFP-LEVEL-OPS that operation of hand held radios in close proximity to the probe have potential to effect the level indication momentarily. However, adding a precaution into plant procedure is not adequate to mitigate the electromagnetic interference/radio frequency interference (EMI)/RFI to the SFPI system in the SFP

area because personnel can still inadvertently enter the SFP area with a hand held radio which could have potential EMI/RFI to the SFPI in this area. The licensee needs to have an adequate strategy to mitigate EMI interference in the SFP area. Therefore, SE No. 11 is open.

b. In response to SFPI RAI Number 1, EN stated that the existing station procedures PPM 6.1.1, "Spent Fuel Pool Inventory", PPM 9.2.1, "Special Nuclear Material Control," and ABN-FSG-002, "Diverse Pumping (Phase 2)," were used to establish cooling flow to the SFP and suppression pool. The purpose of PPM 6.1.1 is to establish an inventory of radioactive or irradiated non-SNM equipment in the SFP that would be expected to be removed during a SFP cleanup campaign. Procedure PPM 9.2.1 is used to satisfy the accountability requirements of Special Nuclear Material (SNM). The accountability is maintained through the inventory and control processes. The procedure controls the movement and locations of SNM and defines when an inventory is required. The licensee calculated the SFP Level 2 to be at 10 foot +/- 1 foot. At Level 2, the dose from the control rods could make the necessary operations in the vicinity of the SFP dose restrictive. Currently, the time-to-boil at the beginning of a refueling outage is approximately 40 hours. The actions being taken in ABN-FSG-002 to establish water addition and removal for cooling in the SFP are completed within 12 hours. Therefore, no additional compensatory measures are needed to preserve access to the refueling floor. The NRC staff reviewed procedures PPM 6.1.1 and PPM 9.2.1, which contain instruction for accountability of irradiated material stored in SFP. The NRC staff also reviewed EN's procedures, which will complete actions to add water for cooling in the SFP within 12 hours, well ahead of the time to boil, at beginning of a refueling outage at level 2. The NRC staff has no further questions and SFPI RAI No. 1 is closed.

c. In response to SFPI RAI Number 3, EN stated that the loading on the probe mount and probe body includes both seismic and hydrodynamic loading, using seismic response spectra that bounds the site design-basis maximum seismic loads applicable to the installation location(s). The static weight load is also accounted for in the modeling but is insignificant in comparison to seismic and hydrodynamic loads. Analytic modeling has been performed by the instrument vendor using IEEE-344:2004, Standard for Seismic Qualification of Equipment for Nuclear Power Plants, methodology. A detailed computational SFP hydrodynamic model has been developed for the instrument vendor by Numerical Applications, Inc., author of the GOTHIC computational fluid dynamics code. The computational model accounts for multi-dimensional fluid motion, pool sloshing, and loss of water from the pool. Seismic loading response of the probe and mount is separately modeled using finite element modeling software. The licensee stated that the proximal portion of the level probe is designed to be attached near its upper end to a Seismic Category I mounting bracket configured to suit the requirements of the Columbia SFP. The bracket will be "bolted or welded" to the SFP deck per Seismic Category I requirements. During the audit, the NRC staff reviewed Calculation NAI-1725-004, Rev. 3, "Seismic Induced Hydrodynamic Response for CGS Spent Fuel Pool" and CE-02-13-13 Rev. 0, "Calculation for the Mounting of the Probes and Other Related Equipment to be Used for By Beyond Design Basis External Event (BDBEE) Spent

Fuel Pool Level Instrumentation". The NRC staff had no further questions and SFPI RAI No. 3 is closed.

d. In response to SFPI RAI Number 5, EN stated that the SFPI level probe is mounted as a cantilever onto the pool curb via a bracket. The probe mounting bracket is designed according to the plant design-basis for Seismic Category 1 requirements. Design inputs included the weight of the probe and forces determined by vendor analyses including seismic and pool sloshing effects on the probe. Besides the SFPI level probes, the mountings of all other equipment are qualified using the safe shutdown earthquake seismic factors of 4.0g horizontal and 1.2g vertical that are either equal to or higher than the seismic factors provided by CIVES-2, Energy Northwest Design Standard. The qualification is even more conservative by considering the load combination of all three directions. The NRC staff confirmed EN's analysis and also reviewed drawings Drawing E701, "Reactor Building EL 606-10 ½ Instrumentation and Control Conduit and Tray Plan"; Drawing FSKE-11797-001 Rev. 0, "Electrical Cable/Raceway Routing Functional Diagram Reactor Building – Fuel Pool Level Instrumentation" and walked down the SFPI locations. The NRC staff had no further questions and SFPI RAI No. 5 is closed

e. In response to SFPI RAI Number 7, EN stated that probe assembly, signal processor electronics and the external battery enclosure provide shock resistance appropriate for general robustness per IEC 60068-2-27. IEC 60068-2-27 states that a sample was exposed to (3) half-sine shock pulses of 15g and 11ms, repeated in all (6) directions. The NRC staff did not identify any deficiencies in EN's analysis. The NRC staff reviewed vibration and shock testing during the vendor audit at MOHR's facilities and found it acceptable. The NRC staff had no further questions and SFPI RAI No. 7 is closed

f. In response SFPI RAI No. 18, EN stated that the instrument automatically monitors the integrity of its level measurement system using in-situ capability. Deviation of measured test parameters from manufactured or as-installed configuration beyond a configurable threshold prompts operator intervention.

   MOHR document No. 1-0410-12, "MOHR EFP-IL Signal Processor Operator's Manual," 1-0410-13, "MOHR EFP-IL Signal Processor Technical Manual," and 1-0410-14, "MOHR SFP-1 Level Probe Assembly Technical Manual" provide the testing and calibration procedures for the SFPI. MOHR's SFPI design can be calibrated in-situ without removal from its installed location. The system is calibrated using a CT-100 device and processing of vendor scanned files. The NRC staff did not identify any deficiencies in EN's analysis, as EN will perform periodic calibration, test, and maintenance as recommended by MOHR. The NRC staff had no further questions and SFPI RAI No. 18 is closed.

3.6 Other Technical Discussion Areas and Walk-Downs

a. The NRC staff reviewed the Response Center local staging area, evaluation of access routes, and method of transportation to the site, in order to support the implementation of the mitigating strategies for a BDBEE. During this audit, the NRC staff reviewed the "SAFER Response Plan for CGS," Revision 001, dated January 7, 2015. The NRC staff assessment for the "NSRCs Established in Response to Order EA-12-049" was issued on September 16, 2014 (ADAMS Accession No. ML14265A107). The NRC staff observed that if the roads to CGS cannot be accessed, the NSRC equipment would be flown to Seattle, then flown to Connell, WA, and transported to Staging Area B. There are alternate roads from Staging Area B to Staging Area A. The NRC staff had no additional questions and ISE CI 3.1.2.4.A, AQ 28, and AQ 54 are closed.

b. The NRC staff reviewed the licensee's communications assessment (ADAMS Accession No. ML13091A295) to confirm that EN had implemented the upgrades to Columbia's communications systems. The NRC staff toured the site and observed that EN plans to use satellite phones, portable radios, and sound powered phones. A portable diesel generator will be used to recharge batteries for the radios and satellite phones. The NRC staff has confirmed that upgrades to the site communications have been completed. Therefore, ISE 3.2.4.4.A is closed.

c. The licensee identified snow removal routes and provided a map that showed the different routes that will be cleared of debris, including snow. The FLEX building contains a John Deere snow plow that would be used to clear plant site roads and to break ice that forms on the Ultimate Heat Sink. The NRC staff reviewed "Snow Removal Plan 2014/2015 PA/IA of Columbia Generating Station, IDC (access road), and Firing Range," which discusses the responsible persons and the instructions for clearing areas of snow. The NRC staff had no further questions and ISE CI 3.1.4.2.A and AQ 50 are closed.

d. The NRC staff reviewed EN's strategy for identifying portable lighting necessary for ingress and egress to plant areas, and gaining entry to the protected area and internal locked areas where remote equipment operation is necessary during an ELAP event. The NRC staff reviewed Procedure 5.6.2, "Station Blackout (SBO) and Extended Loss of AC power ELAP Attachments," Revision 002, dated December 11, 2014, discusses security measures to be taken during a station blackout. This procedure states that compensatory measures should be taken as directed by the security Lieutenant and a shift manager. Additionally, security is to be notified of a station blackout by a secondary alarm. The licensee stated that, during an ELAP event, hand held flashlights and head lamps will be used for portable lighting. Outdoor yard lights, powered by portable generators, are also available. Procedure 01-18, "Equipment Operator Rounds," discusses the use of flashlights and head lamps. The NRC staff had no further questions and AQ 27 is closed.

4.0 Exit Meeting (February 5, 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 item was discussed at the exit meeting (see Attachment 3 for additional information):

Provide an environmental qualification evaluation which demonstrates continued operability of the safety relief valves under the containment conditions predicted by the analysis for all Phases of an ELAP event.

CONCLUSION

The NRC staff completed all three parts of the January 16, 2015, 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 Energy Northwest proceeds towards the order 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 SFPI 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: CGS 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 January 16, 2015, 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
Prem Sahay	NRR/JLD
Joshua Miller	NRR/JLD
Kevin Roche	NRR/JLD
Brett Titus	NRR/JLD

Duc Nguyen	NRR/JLD
Michael Franovich	NRR/JLD
Victor Hall	NRR/JLD
Sheena A. Whaley	NRR/JLD
Gregory Bowman	NRR/JLD

Energy Northwest and Support Staff:

Dave Swank	Project Management
Dennis Myers	Mechanical Design
Pauline Brown	Mechanical Design
Bicky Ghuman	Electrical Design
Greg Lisle	Civil Design
Andy Langdon	Mitigation Strategies
Greg Smith	Procedures
Danny Stephens	Operations
Dan Moon	Training
Dave Strote	Emergency Planning
Steve Sheahan	Spent Fuel Pool level Instrumentation
Rich Rogalski	Regulatory Affairs

Columbia Generating Station, Documents Reviewed

- PPM 6.1.1, Spent Fuel Pool Inventory
- PPM 9.2.1, Special Nuclear Material Control
- ABN-FSG-002, Diverse Pumping
- MOHR document No. 1-0410-12, "MOHR EFP-IL Signal Processor Operator's Manual"
- MOHR document No. 1-0410-13, "MOHR EFP-IL Signal Processor Technical Manual"
- MOHR document No 1-0410-14, "MOHR SFP-1 Level Probe Assembly Technical Manual"
- Columbia Calculation NAI-1721-001, Rev. 1, Appendix D.2 Hydrogen Concentration
- Columbia Calculation E/I-02-91-03, Revision 17
- AR 314476 RIE (Analysis of Voltage Drop and Short Circuit Analysis)
- Battery Load Shed Procedure No.5.6.2 title The Station Blackout And Extended Loss of AC Power ELAP Attachments, Major Rev. 003
- E514-3.pdf, E514-4.pdf, E514-5.pdf, E514-7.pdf, E514-5.pdf, FSKE-12218-002.pdf
- FSKE-012229-001, Rev. N/A, Connection Diagram Cable/Raceway Routing 4.16kv Generator Connections Fukushima Effort
- FSKE-12245-003, Rev. A 480V Alternate Connection Critical Loads Simplified One line Diagram, PDC Page No. 26
- EC 12245 Figure 1A – Existing Single Line of Distribution System (before EC 12218), PDC Page No. 28
- EC 12245 Figure 1B – DG-4 Alternate Connection Point Simplified Connection Diagram
- ME-02-14-04, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) While Operating at Full Power", Rev. 0
- Calculation ME-02-14-13 Rev. 0
- Calculation ME-02-14-07, "Reactor Building Accessibility Following an Extended Loss of AC Power (ELAP) With Full Core Off-Load", Rev. 0
- Calculation CVI 1202-00,1/NAI-1721-001, "GOTHIC Analysis of CGS Radwaste Building Response to SBO", Rev. 1
- TM-2187, "Actions, Limitations, and Notes Associated with an Extended Loss of AC Power", Rev. 0
- PPM 5.6.2, "Station Blackout (SBO) and Extended Loss of AC Power (ELAP) Attachments
- CVI 1201-00, 1, "GOTHIC Analysis of CGS Radwaste Building Response to SBO", Rev. 1
- Calculation, ME-02-14-02, "General Technical Support of Fukushima Related Licensing Documents"
- AR 245604-59.04, "Develop Procedure for Supplemental Cooling"
- Procedure ABN-FSG-002, "Water Makeup Strategies for RPV, SFP, DW, WW, CSTS During an Extended Loss of AC Power or other Beyond Design Basis Event"
- Snow Removal Plan 2014/2015 PA/IA of Columbia Generating Station, IDC (access road), and Firing Range

- Procedure 5.6.2, "Station Blackout (SBO) and Extended Loss of AC power ELAP Attachments," Revision 002, dated December 11, 2014
- Procedure 01-18, "Equipment Operator Rounds"
- Columbia Generating Station Calculation 2.05.01, Revision 11 "Battery Sizing for ELAP Event"
- Calculation NAI-1721-001, Revision 1, "Gothic Analysis of Columbia Generating Station RadWaste Building"

Columbia Generating Station
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:

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

Audit Item Reference	Item Description	Licensee Input Needed
ISE OI 3.1.2.1.A	Confirm that FLEX equipment can be adequately protected and deployed in such an event and whether flooding procedures account for the use of FLEX equipment.	Licensee Open Items 43 through 45 remain open as EN is performing a local intense precipitation analysis.
ISE CI 3.2.1.4.A	The licensee has not completed calculations supporting the design of the FLEX equipment. Confirm that portable FLEX equipment is adequate to perform its credited mitigation function(s).	Licensee to evaluate head loss to the spent fuel pool while simultaneously filling SFP and RPVL.
ISE CI 3.2.2.D	Confirm that EN's SFP makeup strategy for Columbia provides for SFP makeup without accessing the refueling floor, as recommended in NEI 12-06, Table C-3, or that an acceptable alternate approach is developed.	Licensee to evaluate flow analysis for filling SFP through RHR B loop.
ISE CI 3.2.3.B	The licensee's proposed strategy for maintaining containment will rely on installation of the HCVS as required by Order EA-13-109. When complete, the licensee's calculations supporting the revised containment response and sequence of events timeline should be reviewed to confirm that the timeline is appropriate and that containment functions will be maintained following an ELAP event.	The licensee needs to provide to the NRC staff the final configuration and calculations for the HCVS.

Audit Item Reference	Item Description	Licensee Input Needed
AQ 41	The alternate strategy for Phase 2 core cooling involves removal, replacement, and reconfiguration of several flanges and piping elbows during the ELAP event. The NRC staff requests that the licensee provide a description of the available lighting and habitability around the RHR piping where connections need to be made.	The NRC staff asked the licensee to provide further detail of the paths and the locations of the connections points as well as the validation of the ability to perform the actions.
AQ 52	On page 18 of 60 Columbia's OIP states that load shedding will be performed to "prolong battery life to 10 hours." On page 22 of 60 Columbia's OIP states, "The 125 VDC batteries are available for 10 hours without recharging. The 250 VDC batteries are available for 17 hours without recharging." On page 35 of 60, with reference to power for containment hardened vent valve solenoids and instrumentation, Columbia's OIP states, "This battery will be designed to support at least 24 hours of operation without any outside power source." Provide justification for the above discrepancy.	The licensee to design the containment hardened vent system battery for a cycle of 24 hours.

Audit Item Reference	Item Description	Licensee Input Needed
1-E	Please address the following items regarding the use of raw water sources for mitigating an ELAP event: a. Discuss the quality of the water (e.g., suspended solids, dissolved salts) that will be used for primary makeup during ELAP events, accounting for the potential for increased suspended or dissolved material in some raw water sources during events such as flooding or severe storms. b. Discuss whether instrumentation available during the ELAP event is capable of providing indication that inadequate core cooling exists for one or more fuel assemblies due to blockage at fuel assemblies' inlets or applicable bypass leakage flowpaths. c. Provide justification that the use of the intended raw water sources will not result in blockage of coolant flow across fuel assemblies' inlets and applicable bypass leakage flowpaths to an extent that would inhibit adequate core cooling. Or, if deleterious blockage at the core inlet cannot be precluded under ELAP conditions, then please discuss alternate means for assuring the adequacy of adequate core cooling in light of available indications.	Licensee to justify that the ashfall event would not plug the inlets of the fuel assemblies or that top down cooling would be used to ensure core cooling.

Audit Item Reference	Item Description	Licensee Input Needed
2-E	a. Discuss the design of the suction strainers used with FLEX pumps taking suction from raw water sources, including perforation dimension(s) and approximate surface area. b. Provide reasonable assurance that the strainers will not be clogged with debris (accounting for conditions following, flooding, severe storms, earthquakes or other natural hazards), or else that the strainers can be cleaned of debris at a frequency that is sufficient to provide the required flow. In the response, consider the following factors: i. The timing at which FLEX pumps would take suction on raw water relative to the onset and duration of the natural hazard. ii. The timing at which FLEX pumps would take suction on raw water relative to the timing at which augmented staffing would be available onsite. iii. Whether multiple suction hoses exist for each FLEX pump taking suction on raw water, such that flow interruption would not be required to clean suction strainers.	Licensee to analyze the suction strainer design and how far into the water it sits as well as the procedure for ensuring that flow is not interrupted to such a length of time that the fuel would remain covered.
10-E	Evaluation of FLEX equipment to be completed to ensure proper functioning under the design-basis temperatures and ash fall conditions during both operation and storage. This includes manual actions to transport and set up the equipment as well as storage conditions.	Licensee to complete evaluation of operating FLEX equipment under ash fall conditions.

Audit Item Reference	Item Description	Licensee Input Needed
11-E	Please provide an assessment of potential susceptibilities of EMI/RFI in the areas where the SFP instrument is located and how to mitigate those susceptibilities.	A strategy to mitigate EMI/RFI interference in the SFP area.
14-E	The licensee is requested to provide a summary evaluation to confirm that the temperature and pressures within containment will not exceed the environmental qualification (EQ) of electrical equipment that is being relied upon as part of their FLEX strategies. The licensee needs to ensure that the EQ profile of the required electrical equipment remains bounding for the entire duration of the event.	Licensee evaluate EQ.

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 the licensee's OIPs, as supplemented, the NRC staff conducted an onsite audit at Columbia from February 2-5, 2015, per the audit plan dated January 16, 2015 (ADAMS Accession No. ML15006A322). 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,
/RA/
Stephen Monarque, Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket No.: 50-397
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DATE	05/22/15	05/20/15	06/01/15	06/01/15
OFFICE	NRR/JLD/JOMB/BC(A)	NRR/JLD/JOMB/PM		
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