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

June 21, 2018

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - REPORT FOR THE AUDIT OF LICENSEE RESPONSES TO INTERIM STAFF EVALUATIONS OPEN ITEMS RELATED TO NRC ORDER EA-13-109 TO MODIFY LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS (CAC NO. MF4464; EPID L-2014-JLD-0049)

Dear Mr. Hanson:

On June 6, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13143A334), the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-13-109, "Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," to all Boiling-Water Reactor licensees with Mark I and Mark II primary containments. The order requirements are provided in Attachment 2 to the order and are divided into two parts to allow for a phased approach to implementation. The order required licensees to submit for review overall integrated plans (OIPs) that describe how compliance with the requirements for both phases of Order EA-13-109 will be achieved.

By letter dated June 30, 2014 (ADAMS Accession No. ML14181B117), Exelon Generation Company, LLC (the licensee) submitted its Phase 1 OIP for James A. FitzPatrick Nuclear Power Plant (JAF, FitzPatrick). By letters dated December 19, 2014, June 30, 2015, December 29, 2015 (which included the combined Phase 1 and Phase 2 OIP), June 30, 2016, December 22, 2016, June 29, 2017, and December 15, 2017 (ADAMS Accession Nos. ML14353A359, ML15181A261, ML15363A412, ML16182A377, ML16357A787, ML17180A951, and ML17349A029, respectively), the licensee submitted its 6-month updates to the OIP. The NRC staff reviewed the information provided by the licensee and issued interim staff evaluations (ISEs) for Phase 1 and Phase 2 of Order EA-13-109 for FitzPatrick by letters dated February 12, 2015 (ADAMS Accession No. ML15007A090), and December 16, 2016 (ADAMS Accession No. ML16343B030), respectively. When developing the ISEs, the staff identified open items where additional information was still needed to complete its review.

The NRC staff is using the audit process described in letters dated May 27, 2014 (ADAMS Accession No. ML14126A545), and August 10, 2017 (ADAMS Accession No. ML17220A328), to gain a better understanding of licensee activities being performed for compliance with the order. As part of the audit process, the staff reviewed the licensee's closeout of the ISE open

items. The NRC staff conducted a teleconference with the licensee on June 7, 2018. The enclosed audit report provides a summary of that aspect of the audit.

If you have any questions, please contact me at (301) 415-1025 or by e-mail at Rajender.Auluck@nrc.gov.

Sincerely,

RAuluck

Rajender Auluck, Senior Project Manager
Beyond-Design-Basis Engineering Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket No. 50-333

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

AUDIT OF LICENSEE RESPONSES TO INTERIM STAFF EVALUATIONS OPEN ITEMS

RELATED TO ORDER EA-13-109 MODIFYING LICENSES

WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF

OPERATION UNDER SEVERE ACCIDENT CONDITIONS

EXELON GENERATION COMPANY, LLC

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

BACKGROUND

On June 6, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13143A334), the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-13-109, "Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," to all Boiling-Water Reactor (BWR) licensees with Mark I and Mark II primary containments. The order requirements are divided into two parts to allow for a phased approach to implementation.

Phase 1 of Order EA-13-109 requires license holders of BWRs with Mark I and Mark II primary containments to design and install a Hardened Containment Vent System (HCVS), using a vent path from the containment wetwell to remove decay heat, vent the containment atmosphere (including steam, hydrogen, carbon monoxide, non-condensable gases, aerosols, and fission products), and control containment pressure within acceptable limits. The HCVS shall be designed for those accident conditions (before and after core damage) for which containment venting is relied upon to reduce the probability of containment failure, including accident sequences that result in the loss of active containment heat removal capability or extended loss of alternating current (ac) power (ELAP). The order required all applicable licensees, by June 30, 2014, to submit to the Commission for review an overall integrated plan (OIP) that describes how compliance with the Phase 1 requirements described in Order EA-13-109 Attachment 2 will be achieved.

Phase 2 of Order EA-13-109 requires license holders of BWRs with Mark I and Mark II primary containments to design and install a system that provides venting capability from the containment drywell under severe accident conditions, or, alternatively, to develop and implement a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions. The order required all applicable licensees, by December 31, 2015, to submit to the Commission for

review an OIP that describes how compliance with the Phase 2 requirements described in Order EA-13-109 Attachment 2 will be achieved.

By letter dated June 30, 2014 (ADAMS Accession No. ML14181B117), Exelon Generation Company, LLC (the licensee) submitted its Phase 1 OIP for James A. FitzPatrick Nuclear Power Plant (JAF, FitzPatrick). By letters dated December 19, 2014, June 30, 2015, December 29, 2015 (which included the combined Phase 1 and Phase 2 OIP), June 30, 2016, December 22, 2016, June 29, 2017, and December 15, 2017 (ADAMS Accession Nos. ML14353A359, ML15181A261, ML15363A412, ML16182A377, ML16357A787, ML17180A951, and ML17349A029, respectively), the licensee submitted its 6-month updates to the OIP, as required by the order.

The NRC staff reviewed the information provided by the licensee and issued interim staff evaluations (ISEs) for Phase 1 and Phase 2 of Order EA-13-109 for FitzPatrick by letters dated February 12, 2015 (ADAMS Accession No. ML15007A090), and December 16, 2016 (ADAMS Accession No. ML16343B030), respectively. When developing the ISEs, the staff identified open items where additional information was still needed to complete its review.

The NRC staff is using the audit process in accordance with the letters dated May 27, 2014 (ADAMS Accession No. ML14126A545), and August 10, 2017 (ADAMS Accession No. ML17220A328), to gain a better understanding of licensee activities as they come into compliance with the order. The staff reviews submitted information, licensee documents (via ePortals), and preliminary Overall Program Documents (OPDs)/OIPs, while identifying areas where additional information is needed. As part of this process, the staff reviewed the licensee closeout of the ISE open items.

AUDIT SUMMARY

As part of the audit, the NRC staff conducted a teleconference with the licensee on June 7, 2018. The purpose of this audit teleconference was to continue the audit review and provide the NRC staff the opportunity to engage with the licensee regarding the closure of open items from the ISEs. As part of the preparation for the audit call, the staff reviewed the information and/or references noted in the OIP updates to ensure that closure of ISE open items and the HCVS design are consistent with the guidance provided in Nuclear Energy Institute (NEI) 13-02, Revision 1, other related documents (e.g. white papers (ADAMS Accession Nos. ML14126A374, ML14358A040, ML15040A038 and ML15240A072, respectively) and frequently asked questions (FAQs), (ADAMS Accession No. ML15271A148)) that were developed and reviewed as part of overall guidance development. The NRC staff audit members are listed in Table 1. Table 2 is a list of documents reviewed by the staff. Table 3 provides the status of the ISE open item closeout for FitzPatrick. The open items are taken from the Phase 1 and Phase 2 ISEs issued on February 12, 2015, and December 16, 2016, respectively.

FOLLOW UP ACTIVITY

The staff continues to audit the licensee's information as it becomes available. The staff will issue further audit reports for FitzPatrick, as appropriate.

Following the licensee's declarations of order compliance, the licensee will provide a final integrated plan (FIP) that describes how the order requirements are met. The NRC staff will evaluate the FIP, the resulting site-specific OPDs, as appropriate, and other licensee documents, prior to making a safety determination regarding order compliance.

CONCLUSION

This audit report documents the staff's understanding of the licensee's closeout of the ISE open items, based on the documents discussed above. The staff notes that several of these documents are still preliminary, and all documents are subject to change in accordance with the licensee's design process. In summary, the staff has no further questions on how the licensee has addressed the ISE open items, based on the preliminary information. The status of the NRC staff's review of these open items may change if the licensee changes its plans as part of final implementation. Changes in the NRC staff review will be communicated in the ongoing audit process.

Attachments:
1. Table 1 – NRC Staff Audit and Teleconference Participants
2. Table 2 – Audit Documents Reviewed
3. Table 3 – ISE Open Item Status Table

Table 1 - NRC Staff Audit and Teleconference Participants

Title	Team Member	Organization
Team Lead/Sr. Project Manager	Rajender Auluck	NRR/DLP
Project Manager Support/Technical Support – Containment / Ventilation	Brian Lee	NRR/DLP
Technical Support – Containment / Ventilation	Bruce Heida	NRR/DLP
Technical Support – Electrical	Kerby Scales	NRR/DLP
Technical Support – Balance of Plant	Garry Armstrong	NRR/DLP
Technical Support – I&C	Steve Wyman	NRR/DLP
Technical Support – Dose	John Parillo	NRR/DRA

Table 2 – Audit Documents Reviewed

Calculation JAF-CALC-14-00015, "Hardened Containment Vent Capacity," Revision 0
Engineering Change (EC) 52721, "Phase 1 Hardened Containment Vent System (Parent EC)," Revision 0
JAF-CALC-14-00017, "Hardened Containment Vent System: Process Piping Support Analysis," Revision 0
JAF-CALC-15-00008, "Hardened Containment Vent System: New Pipe Supports," Revision 0
JAF-CALC-15-00033, "Standby Gas Treatment Supports," Revision 0
JAF-CALC-14-00016, ""Hardened Containment Vent System: Process Piping Stress Analysis," Revision 0
Calculation JAF-CALC-15-00031, "FLEX Strategy – Portable Generator System Sizing," Revision 0
Calculation JAF CALC-15-00013, "Hardened Containment Vent System: N2 Bottle and Venting Capacity," Revision 0
Calculation JAF CALC-15-00038, "Hardened Containment Vent System: Purge Bottle Sizing and PCV Setpoint," Revision 0
Calculation JAF CALC 17-00105, "Evaluation of JAF RHRSW Pump Rooms Minimum Temperature during the Extended Loss of AC Power (ELAP)," Revision 0
Engineering Report JAF-RPT-17-00029, "Hardened Containment Vent System Equipment Seismic Evaluations," Revision 0
Calculation JAF-CALC-14-00027, "Temperature Evaluation of Battery Room and DC Equipment Room During Extended Loss of Offsite Power (FLEX)," Revision 0
Calculation 14620.9011-US(N)-004, "Suppression Chamber (20") and Drywell (24") Vent and Purge Butterfly Valves Evaluation Based on RELAP5/MOD2 56 PSIG and 62 PSIG Results," Revision 0
Calculation JAF-CALC-15-00025, "Reactor Building Heat UP During Extended Loss of AC Power (ELAP)," Revsion 0
Calculation JAF-CALC-14-00029, "Hardened Containment Vent System: Dose Assessment," Revision 0
EC 620605 Attachment 6.003 – HCVS Phase 2 Torus Evaluation
BWROG-TP-008, "Severe Accident Water Addition Timing"
BWROG-TP-011, "Severe Accident Water Management Supporting Evaluations"

James A. FitzPatrick Nuclear Power Plant
Vent Order Interim Staff Evaluation Open Items:

Table 3 - ISE Open Item Status Table

ISE Open Item Number Requested Action	Licensee Response – Information provided in 6 month updates and on the ePortal	NRC Staff Close-out notes	Safety Evaluation (SE) status Closed; Pending; Open (need additional information from licensee)
Phase 1 ISE OI 1 Make available for NRC staff audit analyses demonstrating that HCVS has the capacity to vent the steam/energy equivalent of one (1) percent of licensed/rated thermal power (unless a lower value is justified), and that the suppression pool and the HCVS together are able to absorb and reject decay heat, such that following a reactor shutdown from full power containment pressure is restored and then maintained below the primary containment design pressure and the primary containment.	JAF is capable of (a) venting the equivalent of (1) percent of licensed/rated thermal power and (b) the Torus is capable of absorbing the decay heat for the first three hours to maintain the integrity of primary containment. Auditable analyses to justify the capability of the Torus, as described in this action, have been issued as calculation JAF-CALC-14-00015 (part of the approved design change package EC 52721) and calculation JAF-CALC-15-00026 (part of the approved design change package EC 58158). For additional discussion, see EC 52721 Topic Notes Section 3.1.7 entitled "Hydraulic Requirements". References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. Calculation JAF-CALC-14-00015, "Hardened Containment Vent Capacity," Revision 0 used a rated thermal power of 2,536 MWt [megawatt thermal]. The flow rate equivalent of 1% reactor power thermal energy is 95,369 lbm/hr at 51.1 per square inch gauge (psig). The primary containtment pressure limit (PCPL) is 62 psig which translates to a torus pressure of 51.1 psig with the torus water level at anticipated maximum water level and downcomer submergence. The venting capacity based on a torus pressure of 51.1 psig is 95,472 lbm/hr steam. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.1]
Phase 1 ISE OI 2 Make available for NRC staff audit the seismic and tornado	The Hardened Containment Vent System (HCVS) piping from the Torus to the discharge above the Reactor Building (RB) Roof is designed to be seismically rugged as supported by calculations JAF-	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal.	Closed [Staff evaluation to be included in SE Section 3.2.2]

missile final design criteria for the HCVS stack.	CALC-14-00017, JAF-CALC-15-00008, JAF-CALC-15-00033, and JAF-CALC-14-00016 (part of the approved design change package EC 52721). Protection from tornado missiles is acceptable in accordance with evaluations based on the HCVS-WP-04 guidance. See EC 52721 Topic Notes Section 3.1.3 entitled "Structural Requirements". Specifically, see the associated subsection entitled "Tornado Missiles". References have been provided on the ePortal.	Calculations JAF-CALC-14-00017, JAF-CALC-15-00008, JAF-CALC-15-00033, and JAF-CALC-14-00016 evaluates adequate seismic and wind loading design on the HCVS. The HCVS is routed inside the reactor building (RB). It exits the tornado protected portion of the RB at the refueling floor (elevation 369'-6"). The RB above the refueling floor has metal siding which does not provide tornado protection. The refueling floor is roughly 100 feet above grade. The HCVS is protected from large tumbling missiles. Engineering Change (EC) 52721 addresses how the assumptions in NRC-endorsed HCVS-WP-04 apply to JAF. No follow-up questions.	
Phase 1 ISE OI 3 Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.	The HCVS Battery System will support a minimum of 24 hours of operation. Refer to EC 52721 Topic Notes, Section 3.1.4 entitled "Electrical Requirements." Specifically, refer to the subsections entitled "Battery Selection and Sizing," "Battery Charger Selection and Sizing," and the associated Engineering Change (EC) attachment, P2e Sequence No. 6.003. The HCVS battery load has been incorporated into the FLEX Diesel Generator (DG) via approved EC 52736	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee stated that all electrical power required for operation of HCVS components is provided by the 24 VDC [volt direct current] battery/battery charger. The battery sizing requirements (in EC 52721) confirmed that the HCVS batteries have a minimum	Closed [Staff evaluation to be included in SE Section 3.1.2.6]

	(FLEX Strategy) and associated calculation JAF-CALC-15-00031. References have been provided on the ePortal.	capacity capable of providing power for 24 hours without recharging, and therefore is adequate. The licensee provided EC 52736 and JAF-CALC-15-00031, which discusses re-powering of the HCVS battery charger using a FLEX DG. No follow-up questions.	
Phase 1 ISE OI 4 Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	The HCVS pneumatic system design sizing will be capable of 12 cycles in the first 24 hours. The sizing of the nitrogen motive force and purge systems is provided in calculations JAF CALC-15-00013 and JAF-CALC-15-00038, respectively (part of the approved design change package EC 52721). For additional discussion, see EC 52721 Topic Notes Section 3.1 .6.3 entitled "Cross Flow & Hydrogen Detonation". Specifically, see the associated subsection entitled "HCVS Pipeline Protection". References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. Calculations JAF-CALC-15-00013, "Hardened Containment Vent System: N2 Bottle and Venting Capacity," Revision 0 and JAF-CALC-15-00038, "Hardened Containment Vent System: Purge Bottle Sizing and PCV Setpoint," Revision 0, evaluates nitrogen requirements for 12 purging cycles. The licensee provided the assumptions and formulas to identify the pressure and purge time for the nitrogen bottles to be used throughout the 24 hours. The licensee concluded that 5 nitrogen bottles rated at 2640 psig each is needed to complete 12 purging cycles. The minimum bottle pressure needed to change out the nitrogen bottles was determined by the licensee to be at 2230 psig.	Closed [Staff evaluation to be included in SE Section 3.1.2.6]

		No follow-up questions.	
Phase 1 ISE OI 5 Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	The JAF strategy for preventing hydrogen detonation and deflagration beyond the final isolation point (valve) is a nitrogen purge system. Concurrent with closing the isolation valve, the purge system will be initiated to purge the vented fluid from the HCVS pipeline. For additional discussion, see EC 52721 Topic Notes Section 3.1.6.3 entitled "Cross Flow & Hydrogen Detonation". Specifically, see the associated subsection entitled "HCVS Pipeline Protection". References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. EC 52721 describes that the HCVS design will include a nitrogen purge system to support the HCVS in preventing hydrogen detonation. The licensee provided the areas where hydrogen migration is possible, and how the purge system will be used in those areas. The licensee's design is consistent with Option 3 of the NRC-endorsed white paper HCVS-WP-03. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.11]
Phase 1 ISE OI 6 Provide a description of the strategies for hydrogen control that minimizes the potential for hydrogen gas migration and ingress into the reactor building or other buildings.	At JAF, the interfaces between the RB and the HCVS pipeline are limited to normally closed, small bore drain and instrument valves minimizing the hydrogen gas migration and ingress into the Reactor Building. In addition, migration to the Standby Gas Treatment System (SGTS) is minimized through the use of existing Class VI Motor Operated Valves (MOVs) that have been leak tested in accordance with NEI 13-02. For additional discussion, see EC 52721 Topic Notes Section 3.1.6.3 entitled "Cross Flow & Hydrogen Detonation". Specifically, see the associated subsection entitled "Interconnecting Systems".	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The HCVS wetwell pipe provides minimal interface with the RB, which is limited to normally closed, small bore drain and instrument valves. In addition, migration to the SGTS is minimized through the use of existing Class VI MOVs that have been leak tested in accordance with NEI 13-02. The staff's review of the proposed system indicates that the licensee's design appears to minimize the	Closed [Staff evaluation to be included in SE Section 3.1.2.12]

	References have been provided on the ePortal.	potential for hydrogen gas migration and ingress into the reactor building or other buildings. No follow-up questions.	
Phase 1 ISE OI 7 Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	The required instrumentation and controls (existing and new) are identified as part of the JAF OIP, Part 2. The qualification of the equipment has been described within the approved design change package EC 52721; however, additional documentation must be supplied by vendors before this item is completed. Upon completion, the evaluations will be posted to ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The existing plant instuments required for HCVS (i.e. wetwell level instruments and drywell pressure instruments) meet the requirements of RG 1.97. EC 52721 discusses the qualifications for new HCVS I&C components. The NRC staff's review indicated that the qualification met the order requirements. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.8]
Phase 1 ISE OI 8 Make available for NRC staff audit documentation of a seismic qualification evaluation of HCVS components.	The qualification of the equipment has been described within the approved design change package EC 52721; however, additional documentation must be supplied by vendors before this item is completed. Upon completion, the evaluations will be posted to ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. EC 52721 and Engineering Report JAF-RPT-17-00029, "Hardened Containment Vent System Equipment Seismic Evaluations," demonstrate the seismic adequacy of the HCVS components. Evaluations support the qualifications of HCVS components to withstand a seismic event.	Closed [Staff evaluation to be included in SE Section 3.2.2]

		No follow-up questions.	
Phase 1 ISE OI 9 Make available for NRC staff audit the descriptions of local conditions (temperature, radiation and humidity) anticipated during ELAP and severe accident for the components (valves, instrumentation, sensors, transmitters, indicators, electronics, control devices, and etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.	The approved design change package EC 52721 describes the conditions and capability of the equipment to function within the stated conditions. The qualification of the equipment has been described within the approved design change package EC 52721; however, additional documentation must be supplied by vendors before this item is completed. Upon completion, the evaluations will be posted to ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. EC 52721 and Calculation JAF-CALC-14-00029, "Hardened Containment Vent System: Dose Assessment," Revision 0 discusses the environmental conditions during an accident at the locations containing I&C components. The staff's review indicated that the environmental qualification met the order requirements. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.1.4]
Phase 1 ISE OI 10 Make available for NRC staff audit an evaluation verifying the existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during BDBEE and severe accident wetwell venting.	At JAF, the existing Primary Containment Isolation Valves (PCIVs) (27AOV-117 and - 118) that will be part of the EA-13-109 HCVS flow path are currently a part of the Generic Letter (GL) 89-16 containment hardened pipe flow path. Calculation 14620.9011-US(N)-004 "Suppression Chamber (20") & Drywall (24") Vent & Purge Butterfly Valves based on RELAP 5/MOD2 56 psig and 62 psig Results" concludes the valves can be opened against the maximum expected differential pressure during an Order EA-13-109 event, the primary containment pressure limit of 62 psig. References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. Calculation 14620.9011-US(N)-004 determined that the existing PCIVs can be used as part of the Vent order event. The licensee did not have to provide any modifications or operational changes to the functionality of these PCIVs. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.2.1]
Phase 1 ISE OI 11	JAF utilizes the site Ultra-High Frequency (UHF) security radio system (Ref. EC 53903) to communicate between the	The NRC staff reviewed the information provided in the 6-	Closed

Make available for NRC staff audit documentation that demonstrates adequate communication between the remote HCVS operation locations and HCVS decision makers during ELAP and severe accident conditions.	MCR and the operator at the HCVS control location. This communication method is the same as accepted in Order EA-12-049. These items will be powered and remain powered using the same methods as evaluated under EA-12-049 for the period of sustained operation. References have been provided on the ePortal.	month updates and on the ePortal. The communication methods are the same as accepted in Order EA-12-049. No follow-up questions.	[Staff evaluation to be included in SE Section 3.1.1.1]
Phase 1 ISE OI 12 Make available for NRC staff audit an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment	The approved design change package EC 52721, along with supporting calculations, has identified the anticipated conditions during ELAP and a Severe Accident and confirm the capability for operating personnel to safely access and operate controls and support equipment. For additional discussion, see EC 52721 Topic Notes Section 3.1.11.3 entitled "HCVS Manual Actions". References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The main control room (MCR) temperatures have been addressed as part of the FLEX order and were found to be acceptable by the NRC staff. EC 52721 discusses the environmental conditions for the remote operating station (ROS) as it relates to personnel habitability and equipment operability. The ROS is located in an administration control building corridor between the turbine building and reactor building. Calculation JAF-CALC-15-00025, "Reactor Building Heat UP During Extended Loss of AC Power (ELAP)," indicates that with compensatory actions of opening selected doors, the temperature in the corridor does not exceed 110°F, and with a constant	Closed [Staff evaluation to be included in SE Sections 3.1.1.2 and 3.1.1.3]

		outdoor temperature of 93°F the calculated corridor temperature is roughly 105°F. Calculation JAF-CALC-14-00029, "Hardened Containment Vent System: Dose Assessment," Revision 0 was performed to determine the integrated radiation dose due to HCVS operation. The NRC staff reviewed this calculation and determined that the licensee used conservative assumptions and followed the guidance outlined in NEI 13-02 Revision 1 and HCVS-WP-02 Revision 0. Based on the expected integrated whole body dose equivalent in the MCR and ROS and the expected integrated whole body dose equivalent for expected actions during the sustained operating period, the NRC staff believes that the order requirements are met. Based on the these evaluations, the temperature and radiological conditions should not inhibit operator actions needed to initiate and operate the HCVS during an ELAP with severe accident conditions. No follow-up questions.	
Phase 2 ISE OI 1 Licensee to evaluate the SAWA equipment and controls, as well as the ingress	Temperature and Humidity The location of SAWA [severe accident water addition] equipment and controls including ingress and egress paths that	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal.	Closed [Staff evaluation to be included in SE Sections 4.1.1.4 and 4.2.1.4]

and egress paths for the expected severe accident conditions (temperature, humidity, radiation) for the sustained operating period.	are the same or similar as FLEX and are bounded by the FLEX evaluations for temperature and humidity (see EC 52736). Ingress and Egress Specific SAWA dose values are calculated in calculation JAF-CALC-14-00029 updated as part of EC 620605. For locations inside the Reactor Building between 1 and 7 hours when SAWA is being deployed, JAF has performed a quantitative evaluation of expected dose rates per HCVS-FAQ-12 and found the dose rates at deployment locations including ingress/egress paths are acceptable. For locations outside the Reactor Building between 7 hours and 7 days when SAWA is being utilized, JAF has performed a quantitative evaluation of expected dose rates per HCVS-WP-02 and found the dose rates at deployment locations including ingress/egress paths are acceptable. Attachment 10.07 ("Manual Actions Table") to EC 620605 provides a list of SAWA manual actions along with the expected environmental conditions and associated operational limitations. References have been provided on the ePortal.	For temperature review of the MCR and ROS, see Phase 1 ISE Open Item-12 above. The NRC staff reviewed Attachment 10.07 ("Manual Actions Table") to EC 620605 and determined that it is reasonable to assume the operator actions required to implement the HCVS and SAWA/SAWM [severe accident water management] strategies can be accomplished. The NRC staff reviewed calculation JAF-CALC-14-00029, "Hardened Containment Vent System: Dose Assessment," Revision 0 and determined that the licensee used conservative assumptions and followed the guidance outlined in NEI 13-02 Rev.1 and HCVS-WP-02 Rev.0. Based on the expected integrated whole body dose equivalent in the MCR and ROS and the expected integrated whole body dose equivalent for expected actions during the sustained operating period, the NRC staff believes that the order requirements are met. Temperature and radiological conditions should not inhibit operator actions or SAWA equipment and controls needed to initiate and operate the HCVS during an ELAP with severe accident conditions.	

		No follow-up questions.	
Phase 2 ISE OI 2 Licensee to demonstrate how instrumentation and equipment being used for SAWA and supporting equipment is capable to perform for the sustained operating period under the expected temperature and radiological conditions.	<u>Equipment and Controls</u> Plant instrumentation for SAWA that is qualified to RG 1.97 or equivalent is considered qualified for the sustained operating period without further evaluation. The following plant instruments are qualified to RG 1.97: • Drywell Pressure: 27PI-115A2 • Torus Water Level: 23LI-202A Passive components that do not need to change state after initially establishing SAWA flow do not require evaluations. The following additional equipment performing an active SAWA/SAWM function is considered for temperature and radiation effects: • SAWA/SAWM flow instrument • SAWA/SAWM pump (FLEX pump) • SAW A/SAWM generator (FLEX generator) • Active valves in SAWA flow path <u>Temperature</u> The location of SAWA equipment and controls that are the same or similar as FLEX will be bounded by the FLEX evaluations for temperature and humidity. A supplementary calculation (JAF-CALC-17-00105) was completed as part of the SAWA Engineering Change (EC 620605) to evaluate the temperature conditions	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The drywell pressure and torus level indications are RG 1.97 compliant and are acceptable as qualified. Calculation JAF-CALC-14-00029, "Hardened Containment Vent System: Dose Assessment," Revision 0 was performed to determine the integrated radiation dose due to HCVS operation. No follow-up questions.	Closed [Staff evaluation to be included in SE Sections 4.4.1.3 and 4.5.1.2]

	local to flow meter during extreme cold conditions. See Phase 2 ISE OIP Item 5 for more information. <u>Radiation</u> Specific SAWA dose values are calculated in calculation JAF-CALC-14-00029 updated as part of EC 620605. For additional discussion, see EC 620605 Topic Notes Section 3.1.8 entitled "Instrumentation and Controls Characteristics" and 3.1.9 "Mechanical Requirements". Attachment 10.07 ("Manual Actions Table") to EC 620605 provides a list of SAWA expected environmental conditions. References have been provided on the ePortal.		
Phase 2 ISE OI 3 Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.	The wetwell vent has been designed and will be installed to meet NEI 13-02 Rev 1 guidance, which will ensure that it is adequately sized to prevent containment overpressure under severe accident conditions (Ref. JAF-CALC-14-00015). The SAWM strategy will ensure that the wetwell vent remains functional for the period of sustained operation. JAF will follow the guidance (flow rate and timing) for SAWA/SAWM described in BWROG [Boiling Water Reactor Owners Group] TP-15-008 and BWROG-TP-15-011. References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The initial SAWA flow rate of 361 was determined by scaling the ratio of JAF licensed thermal power to that of the reference plant and applying that to the 500 gallons per minute (gpm) injection flow rate of the reference plant per the guidance in NEI 13-02. BWROG-TP-15-008 demonstrates adding water to the reactor vessel within 8-hours of the onset of the event will limit the peak containment drywell	Closed [Staff evaluation to be included in SE Sections 4.1 and 4.2]

	The wetwell vent will be opened prior to exceeding the PCPL value of 62 PSIG. Therefore, containment over pressurization is prevented without the need for a drywell vent. JAF is bounded by the reference plant analysis that shows the SAWM strategy is successful in making it unlikely that a drywell vent is needed as demonstrated by the following table. The values in this table are formalized in Attachment 6.004 to EC 620605. <u>Reference Plant</u> Torus freeboard volume is 525,000 gallons SAWA flow is 500 GPM at 8 hours followed by 100 GPM from 12 hours to 168 hours <u>James A. FitzPatrick</u> Torus freeboard volume is determined to be 813,012 gallons SAWA flow is 361 GPM at 8 hours followed by 73 GPM from 12 hours to 168 hours The above parameters for JAF compared to the reference plant that determine success of the SAWM strategy demonstrate that the reference plant values are bounding. Therefore, the SAWM strategy implemented at JAF makes it unlikely that a DW vent is	temperature significantly reducing the possibility of containment failure due to temperature. Drywell pressure can be controlled by venting the suppression chamber through the suppression pool. BWROG-TP-011 demonstrates that starting water addition at a high rate of flow and throttling after approximately 4-hours will not increase the suppression pool level to that which could block the suppression chamber HCVS. As noted under Phase 1, the vent is sized to pass a minimum steam flow equivalent to 1% rated core power. This is sufficient permit venting to maintain containment below the lower of PCPL or of design pressure. No follow-up questions.	

	needed to prevent containment overpressure related failure.		
Phase 2 ISE OI 4 Licensee to demonstrate that there is adequate communication between the MCR and the operator at the FLEX pump during severe accident conditions.	JAF utilizes the site Ultra-High Frequency (UHF) security radio system (Ref. EC 53903) to communicate between the MCA and the operator at the SAWA/SAWM flow control location. This communication method is the same as accepted in Order EA-12-049. These items will be powered and remain powered using the same methods as evaluated under EA-12-049 for the period of sustained operation. References have been provided on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The communication methods are the same as accepted in Order EA-12-049. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 4.1]
Phase 2 ISE OI 5 Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions.	JAF utilizes a four inch size Seametrics AG2000 flowmeter. The flow meter is deployed in the RHRSW 'B' / 'D' room which is part of the plant circulating water Screen House building. This room is located a substantial distance from the Hardened Containment Vent System (HCVS) vent line and is well shielded from the expected HCVS vent line dose. For locations outside the Reactor Building between 7 hours and 7 days when SAWA is being utilized, JAF performed a quantitative evaluation of equipment and deployment locations and confirmed they are protected by buildings with substantial shielding to minimize dose rates. Specific SAWA dose values are calculated in calculation JAFCALC-14-00029 updated as part of EC 620605. Attachment 10.07 ("Manual Actions Table") to EC 620605 provides a list of SAWA expected environmental conditions.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee provided environmental conditions for radiation and temperature as well as the qualified temperature range for the flow instrument in EN-DC-115/EC620605 and JAF CALC 17-00105. The NRC staff found the instrument appears to be qualified for the anticipated conditions during an ELAP for the proposed location. No follow-up questions.	Closed [Staff evaluation to be included in SE Sections 4.1.1.3 and 4.2.1.3]

	The selected instrument is designed for the expected flow rate, temperature and pressure for SAWA over the period of sustained operation. The instrument qualification for pressure, temperature and flow provided in the table below is from the product technical data. References have been provided on the ePortal. **SAWA Flow Instrument Qualification** 2.21 to 736 GPM -4 to 140 °F 0 to 285 PSI **SAWA Parameter Range** 0 to 400 GPM 32 to 120 "F 0 to 120 PSI		

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - REPORT FOR THE AUDIT OF LICENSEE RESPONSES TO INTERIM STAFF EVALUATIONS OPEN ITEMS RELATED TO NRC ORDER EA-13-109 TO MODIFY LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS (CAC NO. MF4464; EPID L-2014-JLD-0049) DATED June 21, 2018

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