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

March 5, 2018

Mr. Dean Curtland
Site Director
NextEra Energy
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - 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. MF4391; EPID L-2014-JLD-0039)

Dear Mr. Curtland:

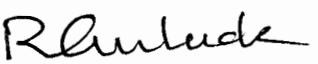
On June 6, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13143A334), the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-13-109, "Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Condition," 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 25, 2014 (ADAMS Accession No. ML14182A423), NextEra Energy Duane Arnold, LLC (NextEra, the licensee) submitted its Phase 1 OIP for Duane Arnold Energy Center (DAEC, Duane Arnold). By letters dated December 10, 2014, June 18, 2015, December 22, 2015 (which included the combined Phase 1 and Phase 2 OIP), June 30, 2016, December 22, 2016, June 29, 2017, and December 19, 2017 (ADAMS Accession Nos. ML14349A324, ML15170A333, ML15358A043, ML16187A261, ML16362A211, ML17180A217, and ML17353A668, 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 Duane Arnold by letters dated February 11, 2015 (ADAMS Accession No. ML15006A319), and September 13, 2016 (ADAMS Accession No. ML16248A001), respectively. When developing the ISEs, the staff identified open items where the staff needed additional information to determine whether the licensee's plans would adequately meet the requirements of Order EA-13-109.

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 as they come into 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 teleconferences with the licensee on June 29, 2017, and February 8, 2018, respectively. 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,



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

Docket No. 50-331

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

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

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 Condition," 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 25, 2014 (ADAMS Accession No. ML14182A423), NextEra Energy Duane Arnold, LLC (NextEra, the licensee) submitted its Phase 1 OIP for Duane Arnold Energy Center (DAEC, Duane Arnold). By letters dated December 10, 2014, June 18, 2015, December 22, 2015 (which included the combined Phase 1 and Phase 2 OIP), June 30, 2016, December 22, 2016, June 29, 2017, and December 19, 2017 (ADAMS Accession Nos. ML14349A324, ML15170A333, ML15358A043, ML16187A261, ML16362A211, ML17180A217, and ML17353A668, 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 Duane Arnold by letters dated February 11, 2015 (ADAMS Accession No. ML15006A319), and September 13, 2016 (ADAMS Accession No. ML16248A001), respectively. When developing the ISEs, the staff identified open items where the staff needed additional information to determine whether the licensee's plans would adequately meet the requirements of Order EA-13-109.

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 teleconferences with the licensee on June 29, 2017 and February 8, 2018. The purpose of the 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 these audit calls, 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 and 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 Duane Arnold. The open items are taken from the Phase 1 and Phase 2 ISEs issued on February 11, 2015, and September 13, 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 Duane Arnold, 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 FIPs, 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	Kevin Roche	NRR/DLP
Technical Support – I&C	Steve Wyman	NRR/DLP
Technical Support – Dose	John Parillo	NRR/DRA

Table 2 – Audit Documents Reviewed

Design Change Package EC – 281991, Revision 22
EVAL-16-M18, "Reactor Building Environmental Analysis for FLEX," Revision 0
CAL-M15-013, "Duane Arnold Energy Center Hardened Containment Vent System Pipe Sizing Analysis," Revision 0
CAL-M15-014, "Nitrogen Supply for the Hardened Vent," Revision 0
Procedure SEP 301.3 – Torus Vent Via Hardpipe Vent
EVAL-16-C01, "Reasonable Assurance of Protection for HCVS Piping from Failure of Reactor Building Stair #6 Masonary Walls above Elevation 855'," Revision 0
CAL-R15-002, "Duane Arnold Energy Center Hardened Containment Vent System Dose Assessment," Revision 0
CAL-M15-004, "Hardened Containment Vent System (HCVS) Valve MEDP Evaluation," Revision 0
CAL-M15-003, "Piping Stress Analysis for Hardened Containment Vent System," Revision 0
CAL-E15-002, "125VDC HCVS Battery Charger Sizing and Voltage Drop Calculation," Revision 0
CAL-E13-001, "FLEX Electrical Equipment Sizing," Revision 0
EVAL-16-M01, "Determination of Suppression Pool Volume at Specific Water Levels to Support Severe Accident Water Management (SAWM) Strategies," Revision 0
CAL-M17-001, "Severe Accident Water Addition Piping Analysis, 4" GBB-4 and GBD-70," Revision NI
CAL-M15-014, "Nitrogen Supply for the Hardened Vent," Revision 0
BWROG-TP-008, "Severe Accident Water Addition Timing"
BWROG-TP-011, "Severe Accident Water Management Supporting Evaluations"

Duane Arnold Energy Center
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 documentation of licensee confirmation that secondary containment leakage is acceptable without an installed rupture disk or that an appropriate rupture disk, including procedures for rupture during HCVS operation is included in the HCVS design.	The DAEC final design of the HCVS utilizes an installed rupture disk. Procedures for rupturing the disk have been developed for use during beyond design bases conditions. Procedure SEP301.3 is available for NRC review on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee's HCVS design includes the installation of a rupture disk, including procedural guidance for rupture during HCVS operation. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.2]
Phase 1 ISE OI 2 Make available for NRC staff audit analyses demonstrating that HCVS has the capacity to vent the steam/energy equivalent of one 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	DAEC has completed analysis, CAL-M15-013, when demonstrating the HCVS has the capacity to vent the steam/energy equivalent to one percent of licensed thermal power and that the suppression pool and HCVS together are able to absorb and reject decay heat such that following a reactor shutdown from full power containment pressure will be maintained below the primary containment design pressure limit of 53 PSIG [per square inch gauge]. CAL-M15-013 is available for NRC review on the ePortal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee's HCVS design will meet the 1% of rated thermal power requirement while maintaining the drywell below the primary containment pressure limit (PCPL) with the wetwell filled with water (with a margin of 17%). The required flow for 1% rated power (1,912 megawatt thermal (MWT)) is 71,750 lbm/hr. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.1]

below the primary containment design pressure and the primary containment pressure limit.			
Phase 1 ISE OI 3 Make available for NRC staff audit evaluations of tornado missile effects on HCVS components above the protected area of the reactor building.	DAEC has evaluated the potential effects of tornado missiles on HCVS components above the protected area of the reactor building and confirmed that HCVS function will not be impaired. HCVS components located above the protected area of the reactor building are limited to piping components and supports.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. In accordance with the recommendations listed in Boiling Water Reactor Owners Group (BWROG) Report TP-15-005 as detailed in Engineering Change (EC) 281991, with consideration of the DAEC HCVS design details, it has been determined that no additional missile protection is required for the HCVS piping above the 855'-0" elevation. Per Chapter 3.8 of the Updated Final Safety Analysis Report, the Reactor Building (RB) superstructure metal siding is designed for wind loading, but may be blown off the RB by tornado winds. Therefore, tornado load pressures are applied to all piping routed through the RB above the 855'-0" elevation. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.2.2]
Phase 1 ISE OI 4 Make available for NRC staff audit additional detail on the design features that minimize	The DAEC design has been modified since issuance of the ISE. The HCVS system utilizes a dedicated penetration from the torus to HCVS piping with no connecting systems	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 3.1.2.3]

unintended cross flow of vented fluids within a unit, including a one line diagram containing sufficient detail to confirm the description in the OIP.	eliminating the possibility of unintended cross flow.	The licensee's design is consistent with the guidance provided in NEI 13-02 and appears to minimize the unintended cross flow of vented fluids. 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 final DAEC design of the HCVS addresses the potential for hydrogen detonation and deflagration with the use of a nitrogen purge of the HCVS piping that ensures hydrogen and oxygen concentrations within the HCVS system are not susceptible to detonation or deflagration (Option 3 of Appendix H of NEI 13-02). The HCVS system isolation is performed by two primary containment isolation valves (PCIVs) to minimize any potential leakage. Prior to use of the system a partial purge of the system is performed to ensure no hydrogen is directly downstream of the PCIVs at the time of actuation. A full nitrogen purge is performed immediately following each period of venting the torus. Each purge is performed with nitrogen flow at sufficient velocity to limit stratification an ensure turbulent flow to preclude retaining hydrogen in the pipe. The piping is slope upwards from the outboard PCIV to the atmospheric vent discharge to ensure hydrogen will exit the vent through buoyancy. No trapped high points are provided in the piping.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee's design is consistent with Option 3 of the 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	DAEC strategies for hydrogen control are as noted above in response to Open Items 4 and 5. The HCVS system utilizes a dedicated penetration from the torus to HCVS piping with no connecting systems	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 3.1.2.12]

hydrogen gas migration and ingress into the reactor building or other buildings.	and the HCVS piping does not pass through other buildings thus eliminating the potential for migration of hydrogen gas from the HCVS into the reactor building or other buildings. Nitrogen purge of the system prior to use and immediately following isolation of the system prevents detonation or deflagration of hydrogen inside the HCVS Option 3 of NEI 13-02 Appendix H).	The licensee's design is consistent with the industry guidance and appears to minimize the 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 documentation that demonstrates adequate communication between the remote HCVS operation locations and HCVS decision makers during ELAP and severe accident conditions.	DAEC docketed an assessment of communications capabilities under ELAP conditions in NG-12-0430 "Response to NRC 10 CFR 50.54(f) Request for Information Regarding Near-Term Task Force Recommendation 9.3, Emergency Preparedness" (ADAMS Accession No. ML12307A120). NRC staff review of this assessment is documented in an NRC Letter dated June 6, 2013 "Duane Arnold Energy Center Staff Assessment in Response to Recommendation 9.3 of the Near Term Task Force Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident" (ADAMS Accession No. ML13142A320). The NRC staff concluded the communications assessment was reasonable to ensure communications were maintained during an ELAP. The HCVS operating locations are the main control room located in the control building and the Remote Operating Station [ROS] in the 1A3 switchgear room also located in the control building. Severe accident conditions do not have an impact on communications in the control building beyond those defined in the communications assessment for ELAP conditions. HCVS decision makers are	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 3.1.1]

	located in the control room so communication with the operating location in the control room can be made directly with no equipment requirements. Operators at the Remote Operating Station can communicate with HCVS decision makers via a variety of methods including sound powered phones, hand held radios, plant page, or telephone.		
Phase 1 ISE OI 8 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.	DAEC has completed evaluations of temperature and radiological conditions to ensure that operators can safely access and operate controls and support equipment for the HCVS system. HCVS controls and support equipment requiring access by operators are located within the control building to minimize radiological and temperature challenges. EC283904 description and CAL-R15-002 are available for NRC review on the eportal. (See also EVAL-16-M18)	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. Main Control Room temperatures have been addressed as part of the FLEX order and were found to acceptable by the NRC staff. EC 283904 discusses the environmental conditions for the ROS as it relates to personnel habitability and equipment operability. CAL-R15-002 evaluates the radiological conditions in areas where operators are needed for HCVS operation. Radiological conditions result in low operator dose. Based on 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.	Closed [Staff evaluation to be included in SE Sections 3.1.1.2 and 3.1.1.3]

		No follow-up questions.	
Phase 1 ISE OI 9 Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.	DAEC has completed final sizing evaluations for HCVS batteries to ensure the batteries can power HCVS equipment for a minimum of 24 hours. DAEC has completed an evaluation for the battery chargers to confirm they are capable of recharging the HCVS batteries while loaded. A review of the use of FLEX diesel generators to power the HCVS battery chargers has confirmed the load is within the capacity of the FLEX diesel generators. The 480 VAC FLEX diesel generators are equipped with two 50A output breakers and four 125A output breakers. One of the 50A breakers will be connected to the HCVS UPS [uninterruptible power supply] via a 200 foot length cable. The voltage drop across the cable for the assumed 8A UPS load is 1.03 volt which is well within the +10/-12% allowable input voltage range specified by the UPS vendor, and is acceptable. The UPS batteries are adequate for the first 24 hours of HCVS service. The addition of the small load of the HCVS UPS to the FLEX 480 VAC generator after 24 hours is acceptable. EC281991, including CAL-E13-001 and CAL-E15-002 are available for NRC review on the eportal.	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 HCVS batteries/battery chargers. The battery sizing calculation (CAL-E15-002) confirmed that the HCVS batteries have a minimum capacity capable of providing power for 24 hours without recharging, and therefore is adequate. The licensee provided EC 281991, which discusses re-powering of the HCVS battery charger using a FLEX portable DG. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.2.6]
Phase 1 ISE OI 10 Make available for NRC staff audit the final sizing evaluation for pneumatic N2 supply.	DAEC has completed the final sizing evaluation (CAL-M15-014) of pneumatic nitrogen supply that demonstrates adequate capacity is installed for the first 24 hours of an ELAP event. After 24 hours replacement nitrogen bottles can be applied in an accessible location in the control building.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. CAL-M15-014 evaluates the pneumatic design and sizing. The evaluation discusses the	Closed [Staff evaluation to be included in SE Section 3.1.2.6]

	CAL-M15-014 is available for NRC review on the eportal.	required number of nitrogen cylinders needed for vent operation for sustained operation. The number of nitrogen cylinders installed and available are sufficient to operate the HCVS for 24 hours. No follow-up questions.	
Phase 1 ISE OI 11 Make available for NRC staff audit documentation of 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.	As stated in NG-15-0169, Six Month Status Update, due to design changes in vent location and routing, existing containment isolation valves will no longer be used for venting. New vent design will utilize a spare torus penetration with two new primary containment isolation valves and a rupture disk. An evaluation (CAL-M15-014) has been done to ensure the two new containment isolation valves will open under the maximum expected differential pressure during BDBEE [beyond-design-basis external event] and severe accident wet well venting. CAL-M15-014 is available for NRC review on the eportal.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. CAL-M15-014 discusses the valve/actuator information for the PCIVs. The NRC staff verified the actuator can develop greater torque than the PCIV's unseating torque. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.2.1]
Phase 1 ISE OI 12 Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	DAEC has completed evaluations of key instruments and controls necessary to implement NRC Order EA-13-109 including the qualification methods as part of the engineering change package for the HCVS system to ensure the instrumentation and controls are suitable for the application. See EC 281991.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The existing plant instruments required for HCVS (i.e. wetwell level instruments and drywell pressure instruments) meet the requirements of RG 1.97.	Closed [Staff evaluation to be included in SE Section 3.1.2.8]

		EC 281991 provides a list of HCVS instruments and controls and associated qualifications for new HCVS I&C components. The staff's review indicates that the qualification meets the order requirements. No follow-up questions.	
Phase 1 ISE OI 13 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.	DAEC has completed evaluations of key components necessary for HCVS venting to ensure they are capable of performing their intended function under ELAP and severe accident conditions including local temperature, radiation and humidity as part of the engineering change package for the HCVS system. See EC281991.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. EC 281991 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 14 Provide a justification for deviating from the instrumentation seismic qualification guidance specified in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02 as an acceptable means for implementing applicable requirements of Order EA-13-109.	As stated in NG-15-0169, Six Month Status Update, the qualification method used for each HCVS instrument will be to the [Institute of Electrical and Electronics Engineers] IEEE 344-2004 standard or a substantially similar industrial standard and therefore will not be deviating from NEI 13-02 or [Japan Lessons-Learned Division-Interim Staff Guidance] JLD-ISG- 2013-02.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The NRC confirmed the OIP change that now complies with the NEI 13-02 guidance. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 3.1.1.4]

Phase 2 ISE OI 1 Licensee to evaluate the SAWA [severe accident water addition] equipment and controls, as well as ingress and egress paths for the expected severe accident conditions (temperature, humidity, radiation) for the sustained operating period.	Started. During the audit call (2/8/18), the licensee informed the NRC staff that the temperature evaluation addressed in Phase 1 Open Item #8 bounds the SAWA/SAWM operation. The licensee also informed the NRC staff that DAEC is still performing the dose assessment for SAWA/SAWM operation.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee has not completed the dose assessment for operator actions or SAWA/SAWM equipment and controls needed to initiate and operate the HCVS during an ELAP with severe accident conditions. This item will stay open until the licensee completes the dose assessment and provides the NRC staff more information which shows that 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.	Open [Staff evaluation to be included in SE Sections 4.5.1.2 and 4.5.1.3]
Phase 2 ISE OI 2 Licensee to demonstrate that SAWA components and connections external to protected buildings have been protected against the screened-in hazards of Order EA-12-049 for the station.	Complete. As a follow-up to the audit call (2/8/18), the licensee provided a simplified drawing of the SAWA piping.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The NRC staff reviewed SAWA pipe drawing and verified that the SAWA components and connections external to protected buildings have been protected against the screened-in hazards of Order EA-12-049. No follow-up questions.	Closed [Staff evaluation to be included in SE Section 4.1.1.1]
Phase 2 ISE OI 3	Complete.	The NRC staff reviewed the information provided in the 6-	Closed

Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.		month updates and on the ePortal. EVAL-16-M01, "Determination of Suppression Pool Volume at Specific Water Levels to Support Severe Accident Water Management (SAWM) Strategies," Revision 1 provides a basis for OIP Attachment 2.1.C, "SAWA/SAWM Plant-Specific Datum." The available freeboard is defined as the distance between maximum normal wetwell level and the maximum wetwell level instrument range. The freeboard height is 5'-7" which translates to 303,000 gallons. Additional freeboard is represented by the distance from the maximum wetwell level instrument range and the HCVS opening. The additional freeboard volume is 375,119 gallons. The initial SAWA flow rate is 272 gpm [gallons per minute] for 4 hours followed by 55 gpm for a sustained coping period of 7 days. No follow-up questions.	[Staff evaluation to be included in SE Section 4.2]
Phase 2 ISE OI 4 Licensee to demonstrate how the plant is bounded by the reference plant analysis that shows the SAWM strategy is successful in making it unlikely that a drywell vent is needed.	Started.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. The licensee did not provide the NRC staff with any comparison of parameters between the	Open [Staff evaluation to be included in SE Section 4.2.1.1]

		reference plant to those of Duane Arnold. The NRC staff can not verify that it is unlikely the suppression chamber HCVS could become blocked leading to a successful SAWA/SAWM strategy. This item will stay open until the licensee provides the NRC staff more information which concludes that it is unlikely a drywell vent would be required to maintain containment integrity.	
Phase 2 ISE OI 5 Licensee to demonstrate that there is adequate communication between the MCR and the operator at the FLEX pump during severe accident conditions.	Closed During the audit call (2/8/18), the licensee informed the NRC staff that the communication methods are the same as accepted in Order EA-12-049, as stated above in Phase 1 Open Item #7.	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 6 Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions.	Not Started. During the audit call (2/8/18), the licensee informed the NRC staff that the specific flow meter to be used at DAEC has not yet been determined.	The NRC staff reviewed the information provided in the 6-month updates and on the ePortal. Since the licensee has not yet determined the flow meter to be used, no information on the qualification for the expected environmental conditions could be provided to the NRC staff. This item will stay open until the licensee provides the NRC staff more information which determines the accuracy of the flow meter and the environmental qualifications related to the performance of the flow meter in order to meet the intent of Order EA-13-109.	Open [Staff evaluation to be included in SE Sections 4.4.1.3 and 4.5.1.2]

SUBJECT: DUANE ARNOLD ENERGY CENTER - 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. MF4391; EPID L-2014-JLD-0039) DATED March 5, 2018

DISTRIBUTION:

PUBLIC
PBEB R/F
RidsNrrDorlLpl3 Resource
RidsNrrPMDuaneArnold Resource
RidsNrrLaSLent Resource
RidsRgn3MailCenter Resource
TBrown, NRR
RAuluck, NRR
BLee, NRR
RidsACRS_MailCTR Resource

ADAMS Accession No.: ML18057B298

OFFICE	NRR/DLP/PBEB/PM	NRR/DLP/PBMB/LA	NRR/DLP/PBEB/BC	NRR/DLP/PBEB/PM
NAME	RAuluck	SLent	TBrown	RAuluck
DATE	2/28/18	2/27/18	3/5/18	3/5/18

OFFICIAL RECORD COPY