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

March 10, 2015

Mr. William R. Gideon, Vice President
Brunswick Steam Electric Plant
P.O. Box 10429
Southport, NC 28461

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 - INTERIM STAFF EVALUATION RELATING TO OVERALL INTEGRATED PLAN IN RESPONSE TO PHASE 1 OF ORDER EA-13-109 (SEVERE ACCIDENT CAPABLE HARDENED VENTS) (TAC NOS. MF4467 AND MF4468)

Dear Mr. Gideon:

By letter dated June 6, 2013, 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" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13143A334). By letter dated June 26, 2014 (ADAMS Accession No. ML14191A687), Duke Energy Progress, Inc. (Duke), submitted its Overall Integrated Plan (OIP) for Brunswick Steam Electric Plant, Units 1 and 2, (BSEP) in response to Phase 1 of Order EA-13-109. By letter dated December 17, 2014 (ADAMS Accession No. ML14364A029), Duke submitted its first six-month status report for BSEP in response to Order EA-13-109. Any changes to the compliance method described in the OIP dated June 26, 2014, will be reviewed as part of the ongoing audit process.

Duke's OIP for BSEP appears consistent with the guidance found in Nuclear Energy Institute (NEI) 13-02, Revision 0, as endorsed, in part, by the NRC's Japan Lessons-Learned Project Directorate (JLD) Interim Staff Guidance (ISG) JLD-ISG-2013-02, as an acceptable means for implementing the requirements of Phase 1 of Order EA-13-109. This conclusion is based on satisfactory resolution of the open items detailed in the enclosed Interim Staff Evaluation. This evaluation only addressed consistency with the guidance. Any plant modifications will need to be conducted in accordance with the plant engineering change processes and be consistent with the plant's licensing basis.

If you have any questions, please contact Charles Norton, Project Manager, at 301-415-7818 or at Charles.Norton@nrc.gov.

Sincerely,

Mandy K Halter

Mandy K. Halter, Acting Chief
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure:
Interim Staff Evaluation

cc w/ encl: Distribution via Listserv

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

INTERIM STAFF EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ORDER EA-13-109 PHASE 1, MODIFYING LICENSES

WITH REGARD TO RELIABLE HARDENED

CONTAINMENT VENTS CAPABLE OF OPERATION UNDER

SEVERE ACCIDENT CONDITIONS

DUKE ENERGY PROGRESS, INC.

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 and 50-324

1.0 INTRODUCTION

By letter dated June 6, 2013, the U.S. Nuclear Regulatory Commission (NRC, or Commission) issued Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions" [Reference 1]. The order requires licensees to implement its requirements in two phases. In Phase 1, licensees of boiling-water reactors (BWRs) with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the wetwell (WW) during severe accident (SA) conditions. In Phase 2, licensees of BWRs with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the drywell under severe accident conditions, or, alternatively, those licensees shall 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.[1]

The purpose of the staff's review, as documented in this interim staff evaluation (ISE) is to provide an interim evaluation of the Overall Integrated Plan (OIP) for Phase 1 of Order EA-13-109. Phase 1 of Order EA-13-109 requires that BWRs with Mark I and Mark II containments design and install a severe accident capable hardened containment vent system (HCVS) that provides venting capability from the wetwell during severe accident conditions, using a vent path from the containment wetwell to remove decay heat, vent the containment

[1] This ISE only addresses the licensee's plans for implementing Phase 1 of Order EA-13-109. While the licensee's OIP makes reference to Phase 2 issues, those issues are not being considered in this evaluation. Issues related to Phase 2 of Order EA-13-109 will be considered in a separate ISE at a later date.

Enclosure

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).

By letter dated June 26, 2014 [Reference 2], Duke Energy Progress, Inc. (Duke, the licensee) provided the OIP for Brunswick Steam Electric Plant, Units 1 and 2 (BSEP, Brunswick) for compliance with Phase 1 of Order EA-13-109. The OIP describes the licensee's currently proposed modifications to systems, structures, and components, new and revised guidance, and strategies that it intends to implement in order to comply with the requirements of Phase 1 of Order EA-13-109.

2.0 REGULATORY EVALUATION

Following the events at the Fukushima Dai-ichi nuclear power plant on March 11, 2011, the NRC established a senior-level agency task force referred to as the Near-Term Task Force (NTTF). The NTTF was tasked with conducting a systematic and methodical review of the NRC regulations and processes and determining if the agency should make improvements to these programs in light of the events at Fukushima Dai-ichi. As a result of this review, the NTTF developed a set of recommendations, documented in SECY-11-0093, "The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi," dated July 12, 2011 [Reference 3]. These recommendations were enhanced by the NRC staff following interactions with stakeholders. Documentation of the NRC staff's efforts is contained in the Commission's Staff Requirements Memorandum (SRM) for SECY-11-0124, "Recommended Actions to be Taken without Delay from the Near-Term Task Force Report," dated September 9, 2011 [Reference 4] and SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011 [Reference 5].

As directed by the Commission's SRM for SECY-11-0093 [Reference 6], the NRC staff reviewed the NTTF recommendations within the context of the NRC's existing regulatory framework and considered the various regulatory vehicles available to the NRC to implement the recommendations. SECY-11-0124 and SECY-11-0137 established the NRC staff's prioritization of the recommendations based upon the potential safety enhancements.

On February 17, 2012, the NRC staff provided SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami" [Reference 7], to the Commission, including the proposed order to implement the installation of a reliable HCVS for Mark I and Mark II containments. As directed by SRM-SECY-12-0025 [Reference 8], the NRC staff issued Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents" [Reference 9], which required licensees to install a reliable HCVS for Mark I and Mark II containments.

While developing the requirements for Order EA-12-050, the NRC acknowledged that questions remained about maintaining containment integrity and limiting the release of radioactive materials if the venting systems were used during severe accident conditions. The NRC staff presented options to address these issues for Commission consideration in SECY-12-0157, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments" [Reference 10]. In the SRM for SECY-12-0157 [Reference 11], the Commission directed the staff to issue a modification to Order EA-12-050, requiring licensees with Mark I and Mark II containments to "upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions." The NRC staff held a series of public meetings following issuance of SRM SECY-12-0157 to engage stakeholders on revising the order. Accordingly, by letter dated June 6, 2013, the NRC issued Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Performing under Severe Accident Conditions."

Order EA-13-109, Attachment 2, requires that BWRs with Mark I and Mark II containments have a reliable, severe-accident capable HCVS. This requirement shall be implemented in two phases. In Phase 1, licensees of BWRs with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the wetwell during severe accident conditions. Severe accident conditions include the elevated temperatures, pressures, radiation levels, and combustible gas concentrations, such as hydrogen and carbon monoxide, associated with accidents involving extensive core damage, including accidents involving a breach of the reactor vessel by molten core debris. In Phase 2, licensees of BWRs with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the drywell under severe accident conditions, or, alternatively, those licensees shall 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.

On November 12, 2013, the Nuclear Energy Institute (NEI) issued NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0 [Reference 12] to provide guidance to assist nuclear power reactor licensees with the identification of measures needed to comply with the requirements of Phase 1 of the HCVS order. On November 14, 2013, the NRC staff issued Japan Lessons-Learned Project Directorate (JLD) interim staff guidance (ISG) JLD-ISG-2013-02, "Compliance with Order EA-13-109, 'Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Performing under Severe Accident Conditions'" [Reference 13], endorsing, in part, NEI 13-02, Revision 0, as an acceptable means of meeting the requirements of Phase 1 of Order EA-13-109, and published a notice of its availability in the *Federal Register* (FR) [78 FR 70356]. Licensees are free to propose alternate methods for complying with the requirements of Phase 1 of Order EA-13-109.

By letter dated May, 27, 2014 [Reference 14], the NRC notified all BWR Mark I and Mark II Licensees that the staff will be conducting audits of the implementation of Order EA-13-109. This letter described the audit process to be used by the staff in its review of the information contained in licensee's submittals in response to Phase 1 of Order EA-13-109.

3.0 TECHNICAL EVALUATION

BSEP, Units 1 and 2, are General Electric BWRs with Mark I primary containment systems and independent reactor buildings. To implement Phase 1 (HCVS) of Order EA-13-109 the licensee plans to upgrade the existing HCVS on each unit. The existing HCVS wetwell vent is routed from the suppression pool to a point above the top of the reactor building. There is no HCVS component sharing between units. The upgrade of HCVS on each unit includes: the addition of unit specific HCVS remote operations panels, electrical power supply upgrades, pneumatic valve operation motive force upgrades, and instrumentation upgrades. The upgrades also include evaluations of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment. In addition the licensee intends to implement programmatic changes in the following areas: procedures, training, drills and maintenance.

3.1 GENERAL INTEGRATED PLAN ELEMENTS AND ASSUMPTIONS

3.1.1 Evaluation of Extreme External Hazards

Extreme external hazards for BSEP were evaluated in the BSEP OIP in response to Order EA-12-049 (Mitigation Strategies) [Reference 15]. In the BSEP ISE relating to the Mitigation Strategies OIP [Reference 16], the NRC staff documented an analysis of Duke's extreme external hazards evaluation. The following extreme external hazards screened in: Seismic, External Flooding, Extreme Cold - Ice only, High Wind, and Extreme High Temperature. Extreme Cold, except for Ice, screened out. The BSEP OIP for Order EA-13-109 evaluates external hazards consistent with the BSEP Mitigation Strategies OIP. Based on BSEP not excluding any external hazard from consideration, and consistency with the Mitigation Strategies ISE, the NRC staff determined that Duke appears to have identified the appropriate external hazards for consideration in the design of the HVCS.

3.1.2 Assumptions

On page 4 of the BSEP OIP, Duke adopted a set of generic assumptions associated with Order EA-13-109 Phase 1 actions. The staff determined that the set of generic assumptions appear to establish a baseline for HCVS evaluation consistent with the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02.

The staff reviewed the BSEP plant-specific assumptions:

BSEP -1. 24/48VDC load stripping is accomplished prior to vessel breach (if any).

BSEP -2. FLEX generators will be aligned to repower the 24/48VDC battery charger and recharge the batteries to support sustained operation of the HCVS post 24 hours.

BSEP -3. A connection to supply supplemental N2 via the FLEX pneumatic makeup connection is established prior to vessel breach (if any). Portable N2 bottles are stored in the FLEX building to supplement the N2 backup system after 24 hours.

BSEP -4. The computer rooms located near the MCR are inside the MCR boundary and are protected from hazards similarly to the MCR and are acceptable for HCVS actions during a severe accident.

The staff determined that the plant specific assumptions for BSEP do not appear to create any deviations from the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02.

3.1.3 Compliance Timelines and Deviations

Page 4 of the OIP states the following:

> Compliance will be attained for Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2 with no known deviations to the guidelines in JLD-ISG-2013-02 and NEI 13-02 for each phase as follows:
>
> - Unit 1, Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for 1st Quarter of 2018.
> - Unit 2, Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for 1st Quarter of 2017.
> - Unit 1, Phase 2 (drywell): later
> - Unit 2, Phase 2 (drywell): later
>
> If deviations are identified at a later date, then the deviations will be communicated in a future 6 month update following identification.

BSEP's implementation schedule complies with the requirements of the order and at this time, neither Duke nor the staff has identified any deviations. Therefore, the staff concludes that it appears BSEP will attain compliance with Phase 1 of Order EA-13-109 with no known deviations to the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02.

<u>Summary, Section 3.1:</u>

The licensee's described approach to General Integrated Plan Elements and Assumptions, if implemented, as described in Section 3.1, and assuming acceptable resolution of any open items identified here or as a result of licensee alterations to their proposed plans, appears to be consistent with the guidance found 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.

3.2 BOUNDARY CONDITIONS FOR WETWELL VENT

3.2.1 Sequence of Events (SOE)

Order EA-13-109, Sections 1.1.1, 1.1.2, and 1.1.3, state that:

> 1.1.1 The HCVS shall be designed to minimize the reliance on operator actions.
>
> 1.1.2 The HCVS shall be designed to minimize plant operators' exposure to occupational hazards, such as extreme heat stress, while operating the

HCVS system.

1.1.3 The HCVS shall also be designed to account for radiological conditions that would impede personnel actions needed for event response.

Page 7 of the OIP states the following:

> The operation of the HCVS will be designed to minimize the reliance on operator actions in response to hazards listed in Part 1 [of the OIP]. Immediate operator actions will be completed by plant personnel and will include the capability for remote-manual initiation from the HCVS control station. A list of the remote manual actions performed by plant personnel to open the HCVS vent path can be found in the following table (2-1 [from the OIP]). A HCVS Extended Loss of AC Power (ELAP) Failure Evaluation table, which shows alternate actions that can be performed, is included in Attachment 4 [of the OIP].

The NRC staff reviewed the Remote Manual Actions (Table 2-1 of the OIP) and concluded that these actions appear to consider minimizing the reliance on operator actions. The actions appear consistent with the types of actions described in the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02. The NRC staff reviewed the Wetwell HCVS Failure Evaluation Table (Attachment 4 of the OIP) and determined that the actions described appear to adequately address all the failure modes listed in the guidance provided by NEI 13-02, which include: loss of normal ac power, long-term loss of batteries, loss of normal pneumatic supply, loss of alternate pneumatic supply, and solenoid operated valve (SOV) failure. Design details not available at this time include the location of the supplemental nitrogen bottle connection (licensee identified) and an evaluation of the location of the mitigation strategies diesel generators for accessibility under severe accident conditions (licensee identified); therefore, the staff has not completed its review.

The staff reviewed the three cases contained in the SOE timeline [Attachment 2 of the OIP] and determined that the three cases appropriately bound the conditions for which the HCVS is required. These cases include: case 1, successful mitigation strategies implementation with no failure of reactor core isolation cooling (RCIC); case 2, late failure of RCIC leading to core damage; and case 3, failure of RCIC to inject at the start of the event. The timelines accurately reflect the progression of events as described in the BSEP Mitigation Strategies OIP [Reference 17], SECY-12-0157 [Reference 10], and State-of-the-Art Reactor Consequence Analyses (SOARCA) [Reference 18].

The NRC staff reviewed the licensee discussion of time constraints on page 8 of the OIP and confirmed that the time constraints identified appear to be appropriately derived from the time lines developed in Attachment 2 of the OIP, consistent with the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02. The time constraints establish when the HCVS must be initiated and when supplemental compressed gas for motive power and supplemental electrical power (FLEX) must be supplied. Design details not available at this time include the time it takes for the suppression pool to reach the heat capacity temperature limit during the case 1 scenario (licensee identified); therefore, the staff has not completed its review. Based on the information provided in the licensee's submittal, the time constraints specified appear to be reasonably achievable, subject to the open items specified below.

The NRC staff reviewed the discussion of radiological and temperature constraints on page 9 of the OIP. Duke has identified that after the location of the remote operating station (ROS) is determined, evaluations of temperature and radiological conditions are needed to ensure that operating personnel can safely access and operate controls and support equipment. Due to the unavailability of this design information at this time, the staff has not completed its review.

Open Item: Make available for NRC staff audit confirmation of the time it take the suppression pool to reach the heat capacity temperature limit during ELAP with RCIC in operation.

Open Item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

3.2.2 Vent Characteristics

3.2.2.1 Vent Size and Basis

Order EA-13-109, Section 1.2.1, states that:

> 1.2.1 The HCVS shall have the capacity to vent the steam/energy equivalent of one (1) percent of licensed/rated thermal power (unless a lower valve is justified by analyses), and be able to restore and then maintain containment pressure below the primary containment design pressure and the primary containment pressure limit.

Page 12 of the OIP states the following:

> The HCVS wetwell path is designed for venting steam/energy at a nominal capacity of 1% or greater of 2923 MWt [Megawatt thermal] thermal power (Current Licensed Thermal Power) at a pressure of 62 psig. This pressure is the lower of the containment design pressure (62 psig) and the PCPL value (70 psig). The size of the existing wetwell portion of the HCVS is $\geq$ 8 inches in diameter. The detailed design will confirm the vent has adequate capacity to meet or exceed the Order criteria at the containment design pressure (62 psig).

The BSEP OIP describes a vent sized to meet or exceed one percent or greater current licensed thermal power at the design pressure. An analysis that demonstrates 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 pressure limit is not available at this time; therefore, the staff has not completed its review.
Open Item: 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 below the primary containment design pressure and the primary containment pressure limit.

3.2.2.2 Vent Capacity

Order EA-13-109, Section 1.2.1, states that:

> 1.2.1 The HCVS shall have the capacity to vent the steam/energy equivalent of one (1) percent of licensed/rated thermal power (unless a lower value is justified by analyses), and be able to restore and then maintain containment pressure below the primary containment design pressure and the primary containment pressure limit.

Page 12 of the OIP states the following:

> The 1% value at BSEP assumes that the suppression pool pressure suppression capacity is sufficient to absorb the decay heat generated during the first 3 hours. The vent would then be able to prevent containment pressure from increasing above the containment design pressure. As part of the detailed design, the duration of suppression pool decay heat absorption capability will be confirmed.

The BSEP OIP assumes that until decay heat is less than the one percent capacity of the proposed HCVS, the suppression pool must absorb the decay heat generated until the HCVS is able to restore and maintain primary containment pressure below the primary containment design pressure and the primary containment pressure limit. An analysis confirming 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 below the primary containment design pressure and the primary containment pressure limit is not available at this time; therefore, the staff has not completed its review.

Open Item: 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 below the primary containment design pressure and the primary containment pressure limit.

3.2.2.3 Vent Path and Discharge

Order EA-13-109, Sections 1.1.4 and 1.2.2 state that:

> 1.1.4 The HCVS controls and indications shall be accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of ac power, and inadequate containment cooling.
>
> 1.2.2 The HCVS shall discharge the effluent to a release point above main plant structures.

Page 12 of the OIP states the following:

> The existing HCVS vent path at BSEP consists of a wetwell vent on each unit. The wetwell vent exits the Primary Containment through the wetwell purge exhaust piping and associated inboard wetwell purge exhaust valve. Between the inboard and outboard wetwell purge exhaust valves, the wetwell vent isolation valve is installed. Downstream of the wetwell vent isolation valve, the vent piping exits the Reactor Building through the west wall and into the space between the Reactor Building and Turbine Building. The vent traverses up the exterior of the building and re-enters the Reactor Building through the metal siding on the refuel floor, then rises along the west side where it exits the Reactor Building through the roof. All effluents are exhausted above each unit's Reactor Building.
>
> The HCVS discharge path will be routed to a point above any adjacent structure. This discharge point is just above that unit's Reactor Building such that the release point will vent away from emergency ventilation system intake and exhaust openings, main control room location, location of HCVS portable equipment, access routes required following a ELAP and BDBEE [beyond-design-basis external event], and emergency response facilities; however, these must be considered in conjunctions with other design criteria (e.g. flow capacity) and pipe routing limitations, to the degree practical.
>
> The detailed design will address missile protection from external events as defined by NEI 12-06 for the outside portions of the vent pipe (Ref. HCVS-FAQ [frequently asked Question]-04 [of the OIP].

The BSEP OIP describes the routing and discharge point of the HCVS that, pending resolution of open items, appear consistent with the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the seismic and tornado missile final design criteria for the HCVS stack (licensee identified), and 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions; therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.

Open Item: 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.

3.2.2.4 Power and Pneumatic Supply Sources

Order EA-13-109, Sections 1.2.5 and 1.2.6 state that:

> 1.2.5 The HCVS shall, in addition to meeting the requirements of 1.2.4, be capable of manual operation (e.g., reach-rod with hand wheel or manual operation of pneumatic supply valves from a shielded location), which is accessible to plant operators during sustained operations.
>
> 1.2.6 The HCVS shall be capable of operating with dedicated and permanently installed equipment for at least 24 hours following the loss of normal power or loss of normal pneumatic supplies to air operated components during an extended loss of ac power.

Page 12 of the OIP states the following:

> All electrical power required for operation of HCVS components will be routed through two 48VDC to 120VAC inverters, one for each electrical division. These inverters will be sized at 1.5 kW each and will convert DC power from the installed 24/48VDC batteries into AC power for the end users (instruments, solenoid valves, etc.). Battery power will be provided by the existing 24/48VDC batteries. Electrical equipment required to support operation and monitoring of the HCVS for 24 hours will be permanently installed on EL. 23'-0" and 49'-0" of the Control Building. At 24 hours, FLEX generators will be available to repower the 24/48VDC battery charger and recharge the batteries. Battery voltage status is indicated on the face of the inverters so that operators will be able to monitor the status of the 24/48VDC batteries.
>
> Pneumatic power for the HCVS valve actuators is normally provided by the non-interruptible instrument air system (for the Reactor Building) and the pneumatic nitrogen system (for the Drywell) with backup nitrogen provided from the nitrogen backup system. Following an ELAP event, and the loss of non-interruptible instrument air and pneumatic nitrogen, the nitrogen backup system automatically provides operating pneumatics to the SRV [safety-relief valves] accumulators and hardened wetwell vent valves. Therefore, for the first 24 hours post-ELAP initiation, pneumatic force will be supplied from the existing nitrogen backup system bottle racks located on the EL. 50'-0" of the Reactor Building. These

installed bottles (capacity is being added as required) will supply the required motive force to those HCVS valves needed to maintain flow through the HCVS effluent piping.

1. The HCVS flow path valves are air-operated valves (AOV) with air-to-open and spring-to-close actuators. Opening the valves from the primary control station requires energizing an AC-powered solenoid-operated valve (SOV) and providing motive air/gas. The systems described above will provide a permanently installed power source and motive air/gas supply adequate for the first 24 hours. Beyond the first 24 hours, FLEX generators will be used to maintain battery power to the HCVS components. The initial stored motive air/gas will allow for a minimum of thirteen valve operating cycles for the HCVS valves for the first 24-hours. The location of the FLEX generators and supplemental nitrogen bottles and their connections will be evaluated for use during a severe accident.

2. The Remote Operating Station will provide valves that supply pneumatics to the HCVS flow path valve actuators so that these valves may be opened without power to the valve actuator solenoids. This will provide a diverse method of valve operation improving system reliability.

3. An assessment of temperature and radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the Remote Operating Station based on time constraints listed in Attachment 2 [of the OIP].

4. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during a ELAP (electric power, N2/air) will be located in areas reasonably protected from defined hazards listed in Part 1 of this report [of the OIP].

5. All valves required to open the flow path will be designed for remote manual operation following an ELAP, such that the primary means of valve manipulation does not rely on use of a hand wheel, reach-rod or similar means that requires close proximity to the valve (Ref. HCVS-FAQ-03). Any supplemental connections will be pre-engineered to minimize manpower resources and address environmental concerns. Required portable equipment will be reasonably protected from screened in hazards listed in Part 1 of this OIP.

6. Access to the locations described above will not require temporary ladders or scaffolding.

7. Following the initial 24 hour period, additional motive force will be supplied from nitrogen bottles that will be staged at a gas cylinder rack located such that radiological impacts are not a concern.

The BSEP OIP describes HCVS system features, such as sufficient battery and pneumatic capacity for the first 24 hours with recharge capability beyond 24 hours and a method to operate HCVS valves without reliance on electrical power that, pending resolution of open items, appear to make the system reliable consistent with the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02. Specific design details not available at this time include: a determination of the ROS location (licensee identified), the final sizing evaluation of the nitrogen back up system and replacement bottle storage location (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation, and an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate all controls and support equipment (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.

Open Item: 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.

3.2.2.5 Location of Control Panels

Order EA-13-109, Sections 1.1.1, 1.1.2, 1.1.3, 1.1.4 state that:

1.1.1 The HCVS shall be designed to minimize the reliance on operator actions.

1.1.2 The HCVS shall be designed to minimize plant operators' exposure to occupational hazards, such as extreme heat stress, while operating the HCVS system.

1.1.3 The HCVS shall also be designed to account for radiological conditions that would impede personnel actions needed for event response.

1.1.4 The HCVS controls and indications shall be accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of ac power, and inadequate containment cooling.

Order EA-13-109, Sections 1.2.4 and 1.2.5 state that:

> 1.2.4 The HCVS shall be designed to be manually operated during sustained operations from a control panel located in the main control room or a remote but readily accessible location.
>
> 1.2.5 The HCVS shall, in addition to meeting the requirements of 1.2.4, be capable of manual operation (e.g., reach-rod with hand wheel or manual operation of pneumatic supply valves from a shielded location), which is accessible to plant operators during sustained operations.

Page 13 of the OIP states the following:

> The BSEP wetwell HCVS will allow initiating and then operating and monitoring from a control panel located in the main control room (MCR) and will meet the requirements of Order element 1.2.4. The MCR functions as the normal control point for Plant Emergency Response actions and is a readily accessible location with no further evaluation required. Control Room dose associated with HCVS operation conforms to GDC [General design Criterion] 19/Alternative Source Term (AST). Additionally, to meet the intent for a secondary control location of section 1.2.5 of the Order, a readily accessible alternate location, called the Remote Operating Station (ROS), will also be incorporated into the HCVS design as described in NEI 13-02 section 4.2.2.1.2.1. Means to manually operate the wetwell vent will be provided at the ROS.
>
> The proposed location for the ROS is in the southeast corner of the RB [reactor building] 50'-0" for Unit 1, and the northeast corner of the RB 50'-0" elevation for Unit 2. The ROS will be located within the RB, in an area shielded from the HCVS vent pipe, with a direct egress path to the MCR. Refer to the sketches provided in Attachment 3 for the BSEP site layout. The controls available at the ROS location will be accessible and functional under a range of plant conditions, including severe accident conditions with due consideration to source term and dose impact on operator exposure, extended loss of AC power (ELAP), inadequate containment cooling, and loss of reactor building ventilation. As part of the detailed design, an evaluation will be performed to determine accessibility to the location, habitability, staffing sufficiency, and communication capability with vent-use decision makers.

The BSEP OIP describes HCVS control locations that, pending resolution of open items, appear to be consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: a determination of the ROS location (licensee identified), an assessment of communication between remote operation locations and HCVS operational decision makers, an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment, and an evaluation that demonstrates that controls and indications are accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of ac power, and inadequate containment cooling; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: 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.

Open Item: 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.

3.2.2.6 Hydrogen

Order EA-13-109, Sections 1.2.10, 1.2.11, and 1.2.12 state that:

> 1.2.10 The HCVS shall be designed to withstand and remain functional during severe accident conditions, including containment pressure, temperature, and radiation while venting steam, hydrogen, and other non-condensable gases and aerosols. The design is not required to exceed the current capability of the limiting containment components.
>
> 1.2.11 The HCVS shall be designed and operated to ensure the flammability limits of gases passing through the system are not reached; otherwise, the system shall be designed to withstand dynamic loading resulting from hydrogen deflagration and detonation.
>
> 1.2.12 The HCVS shall be designed to minimize the potential for hydrogen gas migration and ingress into the reactor building or other buildings.

Page 14 of the OIP states the following:

> As is required by EA-13-109, Section 1.2.11, the HCVS must be designed such that it is able to either provide assurance that oxygen cannot enter and mix with flammable gas in the HCVS (so as to form a combustible gas mixture), or it must be able to accommodate the dynamic loading resulting from a combustible gas detonation. Several configurations are available which will support the former (e.g., purge, mechanical isolation from outside air, etc.) or the latter (design of potentially affected portions of the system to withstand a detonation relative to pipe stress and support structures).
>
> Options to address the control of flammable gases are still being evaluated.

The BSEP OIP does not provide design details for hydrogen or flammable gas control including: a description of the final design of the HCVS to address hydrogen detonation and deflagration (licensee identified), and 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; therefore, the staff has not completed its review.

Open Item: Provide a description of the final design of the HCVS to address hydrogen detonation/deflagration.

Open Item: 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.

3.2.2.7 Unintended Cross Flow of Vented Fluids

Order EA-13-109, Sections 1.2.3 and 1.2.12, state that:

> 1.2.3 The HCVS shall include design features to minimize unintended cross flow of vented fluids within a unit and between units on the site.
>
> 1.2.12 The HCVS shall be designed to minimize the potential for hydrogen gas migration and ingress into the reactor building or other buildings.

Page 14 of the OIP states the following:

> The HCVS utilizes Containment Atmospheric Control (CAC) system valves CAC-V7 and CAC-V216 for containment isolation. CAC-V7 and CAC-V216 are AOVs and they are air-to-open and spring-to-shut. An SOV must be energized to allow the motive air to open the valve from the MCR location. CAC-V7 and CAC-V216 have a safety related function to maintain the containment pressure boundary during a design basis accident and are tested as required by 10CFR50, Appendix J. Although these valves are shared between the CAC and the HCVS, separate control circuits are provided to each valve. Specifically, the CAC control circuit will be used during all "design basis" operating modes including all design basis transients and accidents.
>
> Cross flow potential exists between the HCVS and the Standby Gas Treatment System (SBGT). CAC system valves CAC-V8 and CAC-V172 function as boundary valves with the SBGT system. Valves CAC-V8 and V172 are containment isolation valves with a safety related function to maintain the containment pressure boundary during a design basis accident. These valves are tested, and will continue to be tested, for leakage under 10CFR50 Appendix J as part of the containment boundary IAW HCVS-FAQ-05. See Sketch 1 of Attachment 3 [of the OIP] for a P&ID diagram of the system.

The BSEP OIP describes design features that appear to limit the potential for unintended cross flow to systems adjoining HCVS and thus prevent unintended cross flow of vented fluids within a unit and between units.

3.2.2.8 Prevention of Inadvertent Actuation

Order EA-13-109, Section 1.2.7 states that:

> 1.2.7 The HCVS shall include means to prevent inadvertent actuation.

Page 14 of the OIP states the following:

> EOP/ERG [emergency operating procedure/emergency response guideline] operating procedures provide guidance that the HCVS is not to be used to defeat containment integrity during any design basis transients and accident. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error such that any credited containment accident pressure (CAP) that would provide net positive suction head to the emergency core cooling system (ECCS) pumps will be available (inclusive of a design basis loss-of-coolant accident (DBLOCA)). As part of BSEP's 120 percent power uprate, a 5 psig credit for containment overpressure was established for evaluating low pressure ECCS pumps NPSH [net-positive suction head] (Ref. 31, Section 6.3.2.2.5). However the ECCS pumps will not have power available because of the starting boundary conditions of an ELAP.
>
> - The features that prevent inadvertent actuation are key lock switches at the primary control station and locked closed valves at the ROS. Procedures also provide clear guidance to not circumvent containment integrity by opening CAC purge exhaust and HCVS wetwell vent valves during any design basis transient or accident.

The BSEP OIP provides a description of methods to prevent inadvertent HCVS initiation that includes key lock switches, locked closed valves, and procedural guidance. This appears to be consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02.

3.2.2.9 Component Qualifications

Order EA-13-109, Section 2.1 states that:

> 2.1 The HCVS vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant. Items in this path include piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication components.

Page 15 of the OIP states the following:

> HCVS components downstream of the second containment isolation valve, not routed in seismically qualified structures, will be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. HCVS components that directly interface with the pressure boundary will be considered safety related, as the existing system is safety related. The containment system limits the leakage or release of radioactive materials to the environment to prevent offsite exposures from exceeding the guidelines of 10CFR100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material.
>
> Likewise, any electrical or controls component which interfaces with Class 1 E power sources will be considered safety related up to and including appropriate isolation devices such as fuses or breakers, as their failure could adversely impact containment isolation and/or a safety-related power source. The remaining components will be considered Augmented Quality. Newly installed piping and valves will be seismically qualified to handle the forces associated with the seismic margin earthquake (SME) back to their isolation boundaries. Electrical and controls components will be seismically qualified and will include the ability to handle harsh environmental conditions (although they will not be considered part of the site Environmental Qualification (EQ) program).
>
> HCVS instrumentation performance (e.g., accuracy and precision) need not exceed that of similar plant installed equipment. Additionally, radiation monitoring instrumentation accuracy and range will be sufficient to confirm flow of radionuclides through the HCVS.
>
> The HCVS instruments, including valve position indication, vent pipe temperature instrumentation, radiation monitoring, and support system monitoring, will be qualified by using one or more of the three methods described in the ISG, which includes:
>
> 1. Purchase of instruments and supporting components with known operating principles from manufacturers with commercial quality assurance programs (e.g., ISO9001) where the procurement specifications include the applicable seismic requirements, design requirements, and applicable testing.
>
> 2. Demonstration of seismic reliability via methods that predict performance described in IEEE [Institute of Electrical and Electronics Engineers] 344.
>
> 3. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	Qualification Method*
HCVS Process Temperature	ISO9001 / IEEE 344/ Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344/ Demonstration
HCVS Process Valve Position	ISO9001 / IEEE 344/ Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344/ Demonstration
HCVS Electrical Power Supply Availability	ISO9001 / IEEE 344/ Demonstration

* The specific qualification method(s) used for each required HCVS instrument will be reported in future 6 month status reports.

The BSEP OIP describes component qualification methods that, pending resolution of open items, appear to be consistent with the design-basis of the plant and the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02, with 2 exceptions: (1) BSEP does not specify IEEE 344-2004 for the seismic qualification standard for instrumentation as specified in NEI 13-02, and (2) BSEP does not provide for monitoring HCVS system pressure as specified in NEI 13-02 section 4.2.4.4.1. Specific details not available at this time include: information regarding specific containment instrumentation, which will be used by operators to make containment venting decisions, 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions, and design details that confirm existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during BDBEE and severe accident wetwell venting; therefore, the NRC staff has not completed its review.

Open Item: Clarify whether the seismic reliability demonstration of instruments, including valve position indication, vent pipe temperature instrumentation, radiation monitoring, and support system monitoring will be via performance described in IEEE 344-2004 methods or provide justification for using a different revision of the standard.

Open Item: Make available for NRC staff audit a justification for not monitoring HCVS system pressure as described in NEI 13-02.

Open Item: Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.

Open Item: 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.

Open Item: 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.

3.2.2.10 Monitoring of HCVS

Order EA-13-109, Sections 1.1.4, 1.2.8, and 1.2.9 state that:

1.1.4 The HCVS controls and indications shall be accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of AC power, and inadequate containment cooling.

1.2.8 The HCVS shall include means to monitor the status of the vent system (e.g., valve position indication) from the control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of ac power.

1.2.9 The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication from the control panel required by 1.2.4 and shall be designed for sustained operation during an extended loss of ac power.

Page 16 of the OIP states the following:

The BSEP wetwell HCVS will be capable of being manually operated during sustained operations from a control panel located in the main control room (MCR) and will meet the requirements of Order element 1.2.4. The MCR is a readily accessible location with no further evaluation required. Control Room dose associated with HCVS operation conforms to GDC 19/Alternative Source Term (AST). Additionally, to meet the intent for a secondary control location of section 1.2.5 of the Order, a readily accessible Remote Operating Station (ROS) will also be incorporated into the HCVS design as described in NEI 13-02 section 4.2.2.1.2.1. The controls and indications at the ROS location will be accessible and functional under a range of plant conditions, including severe accident conditions with due consideration to source term and dose impact on operator exposure, extended loss of AC power (ELAP), and inadequate containment cooling. An evaluation will be performed to determine accessibility to the location, habitability, staffing sufficiency, and communication capability with Vent-use decision makers.

The HCVS will include indications for HCVS valve position, vent pipe temperature and effluent radiation levels in the MCR, as well as information on

> the status of supporting systems, such as battery voltage and pneumatic supply pressure. Indication of pneumatic supply pressure is available from the MCR, while battery voltage will be indicated on the inverter installed in the unit specific computer room. The wetwell HCVS will also include containment temperature, pressure, and wetwell level indication in the MCR to monitor vent operation. This monitoring instrumentation provides the indication from the MCR as per Requirement 1.2.4. The wetwell HCVS and required containment instrumentation will be supplied by existing 24/48VDC batteries.

The BSEP OIP provides a description of HCVS monitoring that, pending resolution of open items, appears to be consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Specific details not available at this time include: descriptions of all instrumentation and controls (existing and planned) including qualification methods, evaluations of the environmental and radiological effects on HCVS controls and indications, and an evaluation of environmental and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment; therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.

Open Item: 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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.

Open Item: 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.

3.2.2.11 Component Reliable and Rugged Performance

Order EA-13-109, Section 2.2 states that:

> 2.2 All other HCVS components shall be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. These items include electrical power supply, valve actuator pneumatic supply and instrumentation (local and remote) components.

Page 16 of the OIP states the following:

> The HCVS downstream of the second containment isolation valve, including piping and supports, electrical power supply, valve actuator pneumatic supply, and instrumentation (local and remote) components, will be designed/analyzed to

conform to the requirements consistent with the applicable design codes (e.g., Non-safety, Cat 1, SS and 300# ASME or B31.1, NEMA 4, etc.) for the plant and to ensure functionality following a design basis earthquake.

Additional modifications required to meet the Order will be reliably functional at the temperature, pressure, and radiation levels consistent with the vent pipe conditions for sustained operations. The instrumentation/power supplies/cables/connections (components) will be qualified for temperature, pressure, radiation level, total integrated dose radiation for the HCVS vent pipe and HCVS ROS location.

Conduit design will be installed to Seismic Class 1 criteria. Both existing and the requirement for new barriers will be evaluated to provide a level of protection from missiles when equipment is located outside of seismically qualified structures. Augmented quality requirements, will be applied to the components installed in response to this Order.

If the instruments are purchased as commercial-grade equipment, they will be qualified to operate under severe accident environment as required by NRC Order EA-13-109 and the guidance of NEI 13-02. The equipment will be qualified seismically (IEEE 344), environmentally (IEEE 323), and EMI/RFI (per RG 1.180). These qualifications will be bounding conditions for BSEP.

For the instruments required after a potential seismic event, the following methods will be used to verify that the design and installation is reliable / rugged and thus capable of ensuring HCVS functionality following a seismic event. Applicable instruments are rated by the manufacturer (or otherwise tested) for seismic impact at levels commensurate with those of postulated severe accident event conditions in the area of instrument component use using one or more of the following methods:

- demonstration of seismic motion will be consistent with that of existing design basis loads at the installed location;
- substantial history of operational reliability in environments with significant vibration with a design envelope inclusive of the effects of seismic motion imparted to the instruments proposed at the location;
- adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344, *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations,* (Ref. 27 [of the OIP]) or a substantially similar industrial standard;
- demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
- seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

The BSEP OIP provides descriptions for component reliable and rugged performance that, pending resolution of open items, appear to be consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Specific design details not available at this time include a description of the final ROS location and the seismic and tornado missile final design criteria for the HCVS stack; therefore, the NRC staff has not completed its review.

Open Item: Clarify whether the seismic reliability demonstration of instruments, including valve position indication, vent pipe temperature instrumentation, radiation monitoring, and support system monitoring will be via performance described in IEEE 344-2004 methods or provide justification for using a different revision of the standard.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.

3.2.3 Beyond-Design-Basis External Event Venting

3.2.3.1 First 24-Hour Coping

Order EA-13-109, Section 1.2.6 states that:

> 1.2.6 The HCVS shall be capable of operating with dedicated and permanently installed equipment for at least 24 hours following the loss of normal power or loss of normal pneumatic supplies to air operated components during an extended loss of AC power.

Page 18 of the OIP states the following:

> The operation of the HCVS will be designed to minimize the reliance on operator actions for response to a ELAP and BDBEE hazards identified in part 1 of this OIP. Immediate operator actions can be completed by Operators from the station battery rooms, the process computer rooms, and the MCR or ROS. The operator actions required to open a vent path are as described in table 2-1 [of the OIP].
>
> Remote-manual is defined in this report [the OIP] as a non-automatic power operation of a component and does not require the operator to be at or in close proximity to the component. No other operator actions are required to initiate venting under the guiding procedural protocol.
>
> The HCVS will be designed to allow initiation, control, and monitoring of venting from the MCR. In addition, the HCVS valves can be operated from an installed ROS as part of the response to EA-13-109. Both locations minimize plant operators' exposure to adverse temperature and radiological conditions and are protected from hazards assumed in Part 1 of this report.

Permanently installed power and motive air/gas capability will be available to support operation and monitoring of the HCVS for 24 hours. Power will be provided by the existing 24/48VDC batteries for a minimum of 24 hours before FLEX generators will be required to be functional for HCVS support. Pneumatics will be provided by the installed safety-related nitrogen backup system for a minimum of 24 hours before additional nitrogen makeup is required.

System control:

- Active: Primary Containment Isolation Valves (PCIVs) are operated in accordance with EOPs/SOPs [standard operating procedures] to control containment pressure. The HCVS will be designed for a minimum of 13 open/close cycles of the vent valve over the first 24 hours following an ELAP without the use of portable equipment. Anticipatory venting will be permitted in the revised EPGs and associated implementing EOPs. Operator actions required for HCVS vent operation during an ELAP are described in Table 2-1 [of the OIP].

- Passive: Inadvertent actuation protection is provided by key lock switches located in the MCR and locked valves at the ROS. The HCVS isolation valve is key-locked and closed. Actuation of the HCVS vent path valves from the ROS will require manual operation of normally locked closed isolation valves.

The BSEP OIP describes a first 24 hour BDBEE coping strategy that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include the final location of the ROS (licensee identified) and an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

3.2.3.2 Greater Than 24-Hour Coping

Order EA-13-109, Section 1.2.4 states that:

> 1.2.4 The HCVS shall be designed to be manually operated during sustained operations from a control panel located in the main control room or a remote but readily accessible location.

Page 19 of the OIP states the following:

> After a maximum of 24 hours, available personnel will be able to connect supplemental electrical power and nitrogen to the HCVS. Connections for

> supplementing electrical power and motive force required for HCVS will be located in accessible areas with reasonable protection per NEI 12-06 that minimize personnel exposure to adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources. Sufficient portable nitrogen bottles will be staged to support sustained operations for up to 7-days following the ELAP event. After 24 hours, FLEX generators will repower the 24/48VDC battery chargers and recharge the 24/48VDC batteries supplying HCVS equipment and components
> .
> These actions provide long term support for HCVS operation for the period beyond 24 hours to 7 days (sustained operation time period) because on-site and off-site personnel and resources will have access to the unit(s) to provide needed action and supplies.

The BSEP OIP describes a greater than 24 hour BDBEE coping strategy that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the final location of the ROS (licensee identified), an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation (licensee identified), and documentation of the HCVS nitrogen pneumatic system design including sizing and location (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX loading calculation.

Open item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

3.2.4 Severe Accident Event Venting

3.2.4.1 First 24 Hour Coping

Order EA-13-109, Section 1.2.6 states that:

> 1.2.6 The HCVS shall be capable of operating with dedicated and permanently installed equipment for at least 24 hours following the loss of normal power or loss of normal pneumatic supplies to air operated components during an extended loss of AC power.

Page 22 of the OIP states the following:

> The operation of the HCVS will be designed to minimize the reliance on operator actions for response to an ELAP and severe accident events. Severe accident event assumes that specific core cooling actions from the FLEX strategies identified in the response to Order EA-12-049 were not successfully initiated. Access to the reactor building will be restricted as determined by the RPV water level and core damage conditions. Immediate actions will be completed by Operators in the Main Control Room (MCR) or at the HCVS Remote Operating Station (ROS). The operator actions required to open a vent path were previously listed in the BDBEE Venting Part 2 section of this report (Table 2-1 [of the OIP]).
>
> Permanently installed power and motive air/gas capable will be available to support operation and monitoring of the HCVS for 24 hours. Specifics are the same as for BDBEE Venting Part 2 [of the OIP].
>
> System control:
>
> i. Active: Same as for BDBEE Venting Part 2 [of the OIP].
> ii. Passive: Same as for BDBEE Venting Part 2 [of the OIP].

The BSEP OIP describes a first 24 hour severe accident coping strategy that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include the final location of the ROS (licensee identified), and an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified) therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

3.2.4.2 Greater Than 24 Hour Coping

Order EA-13-109, Section 1.2.4 and 1.2.8 state that:

> 1.2.4 The HCVS shall be designed to be manually operated during sustained operations from a control panel located in the main control room or a remote but readily accessible location.
>
> 1.2.8 The HCVS shall include means to monitor the status of the vent system (e.g., valve position indication) from control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of ac power.

Page 23 of the OIP states the following:

> The same as identified BDBEE Venting Part 2 [of the OIP].

The BSEP OIP describes a greater than 24 hour severe accident coping that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the final location of the ROS (licensee identified), an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation (licensee identified), and documentation of the HCVS nitrogen pneumatic system design including sizing and location (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.

Open item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

3.2.5 Support Equipment Functions

3.2.5.1 BDBEE

Order EA-13-109, Sections 1.2.8 and 1.2.9 state that:

> 1.2.8 The HCVS shall include means to monitor the status of the vent system (e.g., valve position indication) from control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of ac power.
>
> 1.2.9 The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication from the control panel required by 1.2.4 and shall be designed for sustained operation during an extended loss of ac power.

Page 24 of the OIP states the following:

> Containment integrity is initially maintained by permanently installed equipment. All containment venting functions will be performed from the MCR or ROS.

> Venting will require support from DC power as well as pneumatic systems as detailed in the response to Order EA-12-049. Existing 24/48VDC batteries will provide sufficient electrical power for HCVS operation for 24 hours. Before battery power is depleted, FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the 24/48VDC batteries and maintain DC bus voltage after 24 hours. The nitrogen backup system will provide sufficient motive force for all HCVS valve operation for the first 24 hours and will provide for multiple operations of the hardened wetwell vent valve. Post 24 hours, portable nitrogen bottles will be aligned to supplement the nitrogen backup system. Portable nitrogen bottles will be located in an area that is accessible to operators and protected from severe natural phenomena.

The BSEP OIP describes BDBEE supporting equipment functions that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the final location of the ROS (licensee identified), an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation (licensee identified), and documentation of the HCVS nitrogen pneumatic system design including sizing and location (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.

Open item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

3.2.5.2 Severe Accident Venting

Order EA-13-109, Sections 1.2.8 and 1.2.9 state that:

> 1.2.8 The HCVS shall include means to monitor the status of the vent system (e.g., valve position indication) from control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of ac power.
>
> 1.2.9 The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication from the control panel required by 1.2.4 and shall be designed for sustained operation during an extended loss of ac power.

Page 24 of the OIP states the following:

> The same support functions that are used in the BDBEE scenario would be used for severe accident venting. Existing 24/48VDC batteries will provide sufficient electrical power for HCVS operation for 24 hours. At 24 hours, FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the 24/48VDC batteries and maintain DC bus voltage.
>
> The nitrogen backup system will provide sufficient motive force for all HCVS valve operation for the first 24 hours. Post 24 hours, portable nitrogen bottles will be aligned to supplement the nitrogen backup system. Portable nitrogen bottles will be located in an area that is accessible to operators and protected from severe natural phenomena.

The BSEP OIP describes support equipment functions for severe accident venting that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the final location of the ROS (licensee identified), an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation (licensee identified), and documentation of the HCVS nitrogen pneumatic system design including sizing and location (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.

Open item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

3.2.6 Venting Portable Equipment Deployment

Order EA-13-109, Section 3.1 states that:

> 3.1 The licensee shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during an extended loss of AC power.

Page 26 of the OIP states the following:

> Deployment pathways for compliance with Order EA-12-049 are acceptable without further evaluation needed except in areas around the Reactor Building or in the vicinity of the HCVS piping. Deployment in the areas around the Reactor Building or in the vicinity of the HCVS piping will allow access, operation and replenishment of consumables with the consideration that there is potential reactor core damage and HCVS operation.

The BSEP OIP describes venting portable equipment deployment that, pending resolution of open items, appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. Design details not available at this time include: the final location of the ROS (licensee identified), an assessment of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified), documentation of HCVS incorporation into the FLEX diesel generator loading calculation (licensee identified), and documentation of the HCVS nitrogen pneumatic system design including sizing and location (licensee identified); therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit a description of the final ROS location.

Open Item: 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.

Open Item: Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.

Open item: Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.

<u>Summary, Section 3.2:</u>

The licensee's approach to Boundary Conditions for Wetwell Vent, if implemented as described in Section 3.2, and assuming acceptable resolution of any open items identified here or as a result of licensee alterations to their proposed plans, appears to be consistent with the guidance found 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.

3.3 BOUNDARY CONDITIONS FOR DRYWELL VENT

<u>Summary, Section 3.3:</u>

The Drywell Vent will be evaluated during Phase 2 of Order EA-13-109. The ISG for Phase 2 will be provided by April 30, 2015. Licensees will submit an updated OIP to address Phase 2 of Order EA-13-109 by December 31, 2015.

3.4 PROGRAMMATIC CONTROLS, TRAINING, DRILLS AND MAINTENANCE

3.4.1 Programmatic Controls

Order EA-13-109, Sections 3.1 and 3.2, state that:

> 3.1 The licensee shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during an extended loss of ac power.
>
> 3.2 The licensee shall train appropriate personnel in the use of the HCVS. The training curricula shall include system operations when normal and backup power is available, and during an extended loss of ac power.

Page 30 of the OIP states the following:

> *Program Controls:*
>
> The HCVS venting actions will include:
>
> - Site procedures and programs are being developed in accordance with NEI 13-02 to address use and storage of portable equipment relative to the Severe Accident defined in NRC Order EA-13-109 and the hazards applicable to the site per Part 1 of this OIP.
> - Routes for transporting portable equipment from storage location(s) to deployment areas will be developed as the response details are identified and finalized. The identified paths and deployment areas will be accessible during all modes of operation and during Severe Accidents.
>
> *Procedures:*
>
> Procedures will be established for system operations when normal and backup power is available, and during ELAP conditions.
>
> The HCVS procedures will be developed and implemented following the plant's process for initiating or revising procedures and contain the following details:
>
> - appropriate conditions and criteria for use of the HCVS
> - when and how to place the HCVS in operation,
> - the location of system components,
> - instrumentation available,
> - normal and backup power supplies,
> - directions for sustained operation, including the storage location of portable equipment,
> - training on operating the portable equipment, and
> - testing of portable equipment

- precautions that use of the vent may impact NPSH (CAP) available to the ECCS pumps.

Licensees will establish provisions for out-of-service requirements of the HCVS and compensatory measures. Programmatic controls will be implemented to document and control the following:

The provisions for out-of-service requirements for HCVS functionality are applicable in Modes 1, 2 and 3.

- If for up to 90 consecutive days, the primary or alternate means of HCVS operation are nonfunctional, no compensatory actions are necessary.
- If for up to 30 days, the primary and alternate means of HCVS operation are non-functional, no compensatory actions are necessary.
- If the out of service times exceed 30 or 90 days as described above, the following actions will be performed:
    - The condition will be entered into the corrective action system
    - The HCVS functionality will be restored in a manner consistent with plant procedures,
    - A cause assessment will be performed to prevent future loss of function for similar causes.
    - Initiate action to implement appropriate compensatory actions

The BSEP OIP describes programmatic controls that, pending resolution of open items, appear to be consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. The provisions for out-of-service requirements appear to reflect consideration of the probability of an ELAP requiring severe accident venting and the consequences of a failure to vent under such conditions. The specific site controlling document for HCVS out of service and compensatory measures is not available at this time; therefore, the staff has not completed its review.

Open Item: Make available for NRC staff audit the site specific controlling document for HCVS out of service and compensatory measures.

3.4.2 Training

Order EA-13-109, Section 3.2 states that:

> 3.2 The licensee shall train appropriate personnel in the use of the HCVS. The training curricula shall include system operations when normal and backup power is available, and during an extended loss of ac power.

Page 31 of the OIP states the following:

> Personnel expected to perform direct execution of the HVCS will receive necessary training in the use of plant procedures for system operations when normal and backup power is available and during ELAP conditions. The training will be refreshed on a periodic basis and as any changes occur to the HCVS.

> Training content and frequency will be established using the Systematic Approach to Training (SAT) process.
>
> In addition, (Ref. NEI 12-06) all personnel on-site will be available to supplement trained personnel.

The BSEP OIP describes HCVS training requirements that appear to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02. The SAT process has been accepted by the NRC as appropriate for developing training for nuclear plant personnel.

3.4.3 Drills

Order EA-13-109, Section 3.1 states that:

> 3.1 The licensee shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during an extended loss of ac power.

Page 31 of the OIP states the following:

> The site will utilize the guidance provided in NEI 13-06 and 14-01 for guidance related to drills, tabletops, or exercises for HCVS operation. In addition, the site will integrate these requirements with compliance to any rulemaking resulting from the NTTF Recommendations 8 and 9.

The BSEP OIP describes an approach to drills that appear to be in accordance with NEI 13-06, "Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents" and Events and NEI 14-01, "Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents." This approach appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02.

3.4.4 Maintenance

Order EA-13-109, Section 1.2.13 states that:

> 1.2.13 The HCVS shall include features and provisions for the operation, testing, inspection and maintenance adequate to ensure that reliable function and capability are maintained.

Page 32 of the OIP states the following:

> The site will utilize the standard EPRI [Electric Power Research Institute] industry PM process (similar to the Preventive Maintenance Basis Database) for establishing the maintenance calibration and testing actions for HCVS components. The control program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

BSEP will implement the following operation, testing and inspection requirements for the HCVS to ensure reliable operation of the system.

Table 4-1 [of the OIP]: Testing and Inspection Requirements

Description	Frequency
Cycle the HCVS valves and the interfacing system valves not used to maintain containment integrity during operations.	Once per operating cycle
Perform visual inspections and a walk down of HCVS components[.]	Once per operating cycle
Test and calibrate the HCVS radiation monitors.	Once per operating cycle
Leak test the HCVS.	(1) Prior to first declaring the system functional; (2) Once every three operating cycles thereafter; and (3) Post-maintenance test after restoration of any breach of system boundary within the buildings
Validate the HCVS operating procedures by conducting an open/close test of the HCVS control logic from its control panel and ensuring that all interfacing system valves move to their proper (intended) positions.	Once per every other operating cycle

The BSEP OIP describes an approach to maintenance that appears to be in accordance with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02.

Summary, Section 3.4:

The licensee's approach to Programmatic Controls Training, Drills and Maintenance, if implemented as described in Section 3.4, and assuming acceptable resolution of any open items identified here or as a result of licensee alterations to their proposed plans, appears to be consistent with the guidance found 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.

4.0 OPEN ITEMS

This section contains a summary of the open items identified to date as part of the technical evaluation. Open items, whether NRC or licensee identified, are topics for which there is insufficient information to fully resolve the issue, for which the NRC staff requires clarification to ensure the issue is on a path to resolution, or for which the actions to resolve the issue are not yet complete. The intent behind designating an issue as an open item is to highlight items that the staff intends to review further. The NRC staff has reviewed the licensee OIP for consistency with NRC policy and technical accuracy. NRC and licensee identified open items have been identified in Section 3.0 and are listed in the table below.

List of Open items

Open Item	Action	Comment
1.	Make available for NRC staff audit the site specific controlling document for HCVS out of service and compensatory measures.	Section 3.4.1
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 below the primary containment design pressure and the primary containment pressure limit.	Section 3.2.2.1 Section 3.2.2.2
3.	Make available for NRC staff audit confirmation of the time it take the suppression pool to reach the heat capacity temperature limit during ELAP with RCIC in operation.	Section 3.2.1
4.	Make available for NRC staff audit a description of the final ROS location.	Section 3.2.1 Section 3.2.2.4 Section 3.2.2.5 Section 3.2.2.11 Section 3.2.3.1 Section 3.2.3.2 Section 3.2.4.1 Section 3.2.4.2 Section 3.2.5.1 Section 3.2.5.2 Section 3.2.6
5.	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.	Section 3.2.2.5
6.	Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	Section 3.2.2.6
7.	Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.	Section 3.2.2.3 Section 3.2.2.11
8.	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	Section 3.2.1 Section 3.2.2.4 Section 3.2.3.2 Section 3.2.4.2 Section 3.2.5.1 Section 3.2.5.2 Section 3.2.6

9.	Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.	Section 3.2.2.4 Section 3.2.3.2 Section 3.2.4.2 Section 3.2.5.1 Section 3.2.5.2 Section 3.2.6
10.	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.	Section 3.2.1 Section 3.2.2.4 Section 3.2.2.5 Section 3.2.2.10 Section 3.2.3.1 Section 3.2.3.2 Section 3.2.4.1 Section 3.2.4.2 Section 3.2.5.1 Section 3.2.5.2 Section 3.2.6
11.	Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	Section 3.2.2.9 Section 3.2.2.10
12.	Clarify whether the seismic reliability demonstration of instruments, including valve position indication, vent pipe temperature instrumentation, radiation monitoring, and support system monitoring will via methods that predict performance described in IEEE 344-2004 or provide justification for using a different revision of the standard.	Section 3.2.2.9 Section 3.2.2.11
13.	Make available for NRC staff audit a justification for not monitoring HCVS system pressure as described in NEI 13-02.	Section 3.2.2.9
14.	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, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.	Section 3.2.2.3 Section 3.2.2.5 Section 3.2.2.9 Section 3.2.2.10
15.	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.	Section 3.2.2.9
16.	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.	Section 3.2.2.6

5.0 SUMMARY

As required by Order EA-13-109, the licensee is developing, and will implement and maintain, guidance and strategies for installing hardened containment vents capable of operation under severe accident conditions. These new requirements provide a greater mitigation capability consistent with the overall defense-in-depth philosophy, and, therefore, greater assurance that the challenges posed by beyond-design-basis external events and severe accidents to BWRs with Mark I and II containments do not pose an undue risk to public health and safety.

The NRC staff after reviewing the licensee's OIP for additional defense-in-depth measures finds that, assuming acceptable resolution of open items, the proposed measures, appear consistent with the guidance found in NEI 13-02, endorsed, in part, by JLD-ISG-2013-02 as an acceptable means for implementing phase 1 requirements of Order EA-13-109.

6.0 REFERENCES

1. Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," June 6, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13143A321).

2. Letter from Duke to NRC, Brunswick, Unit 1 and 2, Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions Phase 1 (Order EA-13-109)," dated June 26, 2014 (ADAMS Accession No. ML14191A687).

3. SECY-11-0093, "The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi", (ADAMS Accession No. ML111861807).

4. SRM-SECY-11-0124, "Recommended Actions to be taken Without Delay from the Near-Term Task Force Report", (ADAMS Accession No. ML112911571).

5. SRM-SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned", (ADAMS Accession No. ML113490055).

6. SRM-SECY-11-0093, "Staff Requirements – SECY-11-0093 – Near-Term Report and Recommendations for Agency Actions following the Events in Japan," August 19, 2011 (ADAMS Accession No. ML112310021).

7. SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," February 17, 2012 (ADAMS Accession No. ML12039A103).

8. SRM-SECY-12-0025, "Staff Requirements – SECY-12-0025 - Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," March 9, 2012 (ADAMS Accession No. ML120690347).

9. Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," March 9, 2012 (ADAMS Accession No. ML12054A694).

10. SECY-12-0157, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments", November 26, 2012 (ADAMS Accession No. ML12325A704).

11. SRM-SECY-12-0157, "Staff Requirements - SECY-12-0157, "Consideration Of Additional Requirements For Containment Venting Systems For Boiling Water Reactors With Mark I And Mark II Containments", March 19, 2013 (ADAMS Accession No. ML13078A017).

12. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0, November 12, 2013 (ADAMS Accession No. ML13316A853).

13. JLD-ISG-2013-02, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," November 14, 2013 (ADAMS Accession No. ML13304B836).

14. Nuclear Regulatory Commission Audits Of Licensee Responses To Phase 1 of Order EA-13-109 to Modify Licenses With Regard To Reliable Hardened Containment Vents Capable Of Operation Under Severe Accident Conditions (ADAMS Accession No. ML14126A545).

15. Order EA-12-049, "Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012 (ADAMS Accession No. ML12054A735).

16. Brunswick Steam Electric Plant Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (ADAMS Accession No. ML13220A090).

17. Letter from Duke to NRC, Brunswick, Units 1 and 2 - Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 28, 2013 (ADAMS Accession No. ML13071A559).

18. NUREG-1935, State-of-the-Art Reactor Consequence Analyses (SOARCA) Report (ADAMS Accession No. ML12332A058).

Principal Contributors: Bruce Heida
Brian Lee
Brett Titus
Jerome Bettle
Nageswara Karipineni
Khoi Nguyen
Steve Wyman
Charles Norton

Date: March 10, 2015

If you have any questions, please contact Charles Norton, Project Manager, at 301-415-7818 or at Charles.Norton@nrc.gov.

Sincerely,

/RA/

Mandy K. Halter, Acting Chief
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure:
Interim Staff Evaluation

cc w/ encl: Distribution via Listserv

DISTRIBUTION
PUBLIC
JOMB R/F
RidsNrrDorlLpl2-2Resource
RidsNrrPMBrunswickResource
RidsNrrLASLentResource
RidsAcrsAcnw_MailCTR Resource
RidsOGCMailCenter
RidsRgn2MailCenter Resource
PBamford, NRR
CNorton, NRR
WReckley, NRR/JLD

ADAMS Accession No.: ML15049A266

OFFICE	NRR/JLD/JOMB/PM	NRR/JLD/LA	NRR/DORL/LPL2-2/PM	NRR/JLD/JOMB/PM
NAME	CNorton	SLent	AHon	PBamford
DATE	02/21/15	02/23/15	02/25/15	02/25/15
OFFICE	NRR/JLD/JCBB/BC	NRR/JLD/JERB/BC	NRR/JLD/JOMB/BC (A)	
NAME	SBailey	BPham	MHalter	
DATE	02/26/15	02/26/15	03/10/15	

OFFICIAL RECORD COPY