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

March 24, 2015

Mr. John A. Dent Jr.
Site Vice President
Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

SUBJECT: PILGRIM NUCLEAR POWER STATION - INTERIM STAFF EVALUATION RELATING TO OVERALL INTEGRATED PLAN IN RESPONSE TO PHASE 1 OF ORDER EA-13-109 (SEVERE ACCIDENT CAPABLE HARDENED VENTS) (TAC NO. MF4470)

Dear Mr. Dent:

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 30, 2014, Entergy Nuclear Operations, Inc. (Entergy), submitted its Overall Integrated Plan (OIP) for Pilgrim Nuclear Power Station (Pilgrim) in response to Phase 1 of Order EA-13-109 (ADAMS Accession No. ML14188B731). By letter dated December 16, 2014, Entergy submitted its first six-month status report for Pilgrim in response to Order EA-13-109 (ADAMS Accession No. ML14357A121). Any changes to the compliance method will be reviewed as part of the ongoing audit process.

Entergy's OIP for Pilgrim appears consistent with the guidance found in Nuclear Energy Institute 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 plant engineering change processes and consistent with the 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 No. 50-293

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

ENTERGY NUCLEAR OPERATIONS, INC.

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

By letter dated June 6, 2013, the U.S. Nuclear Regulatory Commission (NRC, 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 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 NRC 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

[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

from the containment wetwell to remove decay heat, vent the containment atmosphere (including steam, hydrogen, carbon monoxide, non-condensable gases, aerosols, and fission products), and control containment pressure within acceptable limits. The HCVS shall be designed for those accident conditions (before and after core damage) for which containment venting is relied upon to reduce the probability of containment failure, including accident sequences that result in the loss of active containment heat removal capability or extended loss of alternating current (ac) power (ELAP).

By letter dated June 30, 2014 [Reference 2], Entergy Nuclear Operations, Inc. (Entergy, the licensee) provided the OIP for Pilgrim Nuclear Power Station (PNPS, Pilgrim) 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, "Near-Term Report and Recommendations for Agency Actions Following the Events in Japan," 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

PNPS is a General Electric BWR with a Mark I primary containment system. To implement Phase 1 (HCVS) of Order EA-13-109, the licensee plans to upgrade the hardened wetwell vent (HWV) referenced as a model in Generic Letter (GL) 89-16, "Installation of a Hardened Wetwell

Vent" [Reference 15]. The HWV routs vented gases from the torus to the main plant stack. The upgrade from HWV to HCVS includes: the addition of a HCVS remote operations panel, electrical power supply upgrades, pneumatic valve motive force upgrades, and instrumentation upgrades. The upgrade from HWV to HCVS also includes an evaluation 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 areas of 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 PNPS were evaluated in the PNPS OIP in response to Order EA-12-049 (Mitigation Strategies) [Reference 16]. In the PNPS ISE relating to Mitigation Strategies [Reference 17], NRC staff documented an analysis of Entergy's extreme external hazards evaluation. The following extreme external hazards screened in: Seismic, Snow, Ice and Extreme Cold, High Wind, and Extreme High Temperature. External Flooding screened out. Based on PNPS not excluding any external hazard from consideration, the NRC Staff determined that Entergy appears to have identified the appropriate external hazards for consideration in the design of HVCS.

3.1.2 Assumptions

On page 4 of the PNPS OIP, Entergy adopted a set of generic assumptions associated with Order EA-13-109 Phase 1 actions. The NRC 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 as an acceptable method to implement the requirements of Order EA-13-109.

PNPS reported no plant-specific assumptions. The NRC staff determined that as PNPS appears to be implementing HCVS with no deviations from the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02, and that no plant specific assumptions are required.

3.1.3 Compliance Timeline and Deviations

Page 4 of the OIP states the following:

> Compliance will be attained for Pilgrim Nuclear Power Station (PNPS) with no known deviations to the guidelines in JLD-ISG-2013-02 and NEI 13-02 for each phase as follows:
>
> - 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 Spring 2017.

- Phase 2 (Drywell): by the startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first. Currently scheduled for Spring 2019.

If deviations are identified at a later date, then the deviations will be communicated in a future 6 month update following identification.

PNPS's implementation schedule appears to be in accordance with the requirements of the Order and at this time. Neither Entergy nor the NRC staff has identified any deviations. Therefore, the staff concludes that it appears PNPS 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 as an acceptable method to implement the requirements of Order EA-13-109.

Summary, Section 3.1:

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 as a result of licensee alterations to their proposed plans, appears to be in accordance 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 [of the OIP]. An 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].

Page 9 of the OIP states the following:

> PNPS Venting Strategy (Ref. 4A [of the OIP])
>
> To evaluate the PNPS Strategy for response to Severe Accident conditions, it is necessary to develop a set of bounding cases that demonstrate the actions required and results that can be obtained for this defined set of parameters that envelop the postulated conditions. Since there are an unlimited number of potential scenarios that can result in Severe Accident conditions of core melt, a minimum set of scenarios is defined that bounds the potential variations to the extent possible. These cases define an operating envelope for mitigating the "Extended Loss of AC Power (ELAP)", and the loss of motive force, and the "Loss of normal access to the Ultimate Heat Sink (LUHS)" events and the potential for Severe Accident conditions that includes core damage and RPV breach by molten core debris. These extreme cases may be used to evaluate or bound the many multiple scenarios that may have more complex timelines with intermittent injections to the RPV and temporary or partial repressurizing of the RPV.
>
> Containment Venting is used when required to provide an alternate and effective means for Containment Heat Removal at or before exceeding the Containment Design Temperature of 281°F and to prevent exceeding the Primary Containment Pressure Limit (PCPL) in combination with water injection to the Reactor Pressure Vessel (RPV) for Core Cooling and to remain within the Pressure Suppression Pressure Limits (PSPL) if the RPV cannot be depressurized.

The NRC staff reviewed the Remote Manual Actions (Table 2-1 of the OIP) and concluded that these actions appear to minimize the reliance on operator actions. The actions appear to be consistent with the types of actions described in the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02 as an acceptable means for implementing applicable requirements of Order EA-13-109. 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.

The NRC 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: successful FLEX implementation with no failure of reactor core isolation cooling (RCIC); late failure of RCIC leading to core damage; and failure of RCIC to inject at the start of the event. The timelines accurately reflect the progression of events as described in the PNPS Mitigation Strategies OIP [Reference 18], SECY-12-0157 [Reference 10], and State-of-the-Art Reactor Consequence Analyses [Reference 19].

The NRC staff reviewed the licensee discussion of time constraints on page 10 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. Based on the information provided in the licensee's submittal, the time constraints specified appear to be reasonably achievable, subject to the open item specified below.

The NRC staff reviewed the discussion of radiological and temperature constraints on page 12 of the OIP. Entergy has identified that evaluations of temperature and radiological conditions are needed to ensure that operating personnel can safely access and operate controls and support equipment; therefore, the NRC staff has not completed its review.

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 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 14 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 2,028 MWt [megawatt thermal] thermal power at pressure of 56 psig (Ref. 4D [of the OIP]). This pressure is the lower of the containment design pressure and the (PCPL) value (Ref. 9A [of the OIP]). The size of the Wetwell portion of the HCVS is a minimum of 8 inches in diameter which provides adequate capacity to meet or exceed the Order criteria.

The PNPS OIP describes a vent sized to meet or exceed 1 percent or greater current licensed thermal power. 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 14 of the OIP states the following:

The 1% value at PNPS assumes that the suppression pool pressure suppression capacity is sufficient to absorb the decay heat generated during the first 3 hours (Ref. 4A [of the OIP]). The vent would then be able to prevent containment pressure from increasing above the containment design pressure. The duration of suppression pool decay heat absorption capability has been confirmed to meet this requirement (Ref. 4A [of the OIP]).

The PNPS 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 PCPL. Analyses 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 are 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, Section 1.1.4 states 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.

Order EA-13-109, Section 1.2.2 states that:

> 1.2.2 The HCVS shall discharge the effluent to a release point above main plant structures.

Page 14 of the OIP states the following:

> The existing GL 89-16 Hardened Containment Vent System (HCVS) Torus Vent at PNPS includes an 8" Air-Operated Butterfly Valve AO-5025 capable of venting the Wetwell (Torus) airspace through an 8" branch line between the two Primary Containment Isolation Valves (PCIVs) AO-5042A & B from 20" Torus Penetration X-227. The HCVS Torus Vent flow path via AO-5042B & AO-5025 connects to the 20" discharge line downstream of the Standby Gas Treatment System (SGTS) filter trains, which then discharges to the plant's Main Stack (30") via a buried piping run. The HCVS will continue to use the existing HCVS discharge path to the Main Stack. The SGTS filter trains will be isolated prior to initiating the venting operation (Ref.'s 8A, 8B, 8C [of the OIP]).

The PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. Design details not available at this time include: the seismic and tornado missile final design criteria for the HCVS stack; a description confirming that the HCVS discharges to a point above main plant structures; 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: Provide a description confirming that the HCVS discharges to a point above main plant structures.

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 14 of the OIP states the following:

> The electrical power required for operation of HCVS components will normally be provided by the existing plant 125 VDC [volts direct current] System routed through two converters, one for each electrical division. The converters will supply 24 VDC power to the HCVS instrumentation and controls until 125 VDC Station Battery depletion (approximately 8 hours into the event). The HCVS Dedicated Batteries will then supply 24 VDC power with a minimum capacity capable of providing power for 24 hours without recharging. After 24 hours, power will be available from the 125 VDC Station Batteries, which are charged by FLEX DGs [diesel generators] using portable cable connections and AC transfer switches (Ref. 3A; Att. 3, Sketch 1A [of the OIP]). The battery sizing and impact to the station battery and Fukushima loading calculations will be completed during detailed design.
>
> Pneumatic power is normally provided to vent valves AO-5042B and AO-5025 by the Essential Air System with backup nitrogen provided from installed Backup Nitrogen System supply tanks. A HCVS Backup Nitrogen Station (at the HCVS Local Panel) will be installed with two redundant sets of N2 tanks each capable of providing the pneumatic force to support a minimum of 5 valve operating cycles for the first 24 hours following the event including allowances for system minimum initial conditions and leakage (Ref. 4B [of the OIP]). Provisions for supplying additional nitrogen bottles will be readily available to support sustained operation for an unlimited period.
>
> 1. The HCVS flow path valves are air-operated valves (AOV) that are air-to-open and spring-to-shut. To open each AOV from the Main Control Room (MCR) requires energizing one DC powered solenoid operated valve (SOV) via a control switch to supply motive nitrogen gas. SV-5025 is keylocked and SV-5042B requires a jumper to defeat a containment isolation signal (Ref's. 5A, 5B [of the OIP]). Initially, the 125 VDC Station Batteries will be relied upon to operate the vent valves until depletion, at which time the HCVS Dedicated Batteries will be relied upon for continued operation. If necessary, to open each vent valve from the HCVS Local Panel requires manipulation of

manual valves to supply motive nitrogen gas through the vent port of the solenoid valve (energizing or repositioning of solenoid valves is not required).

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

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

4. 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. 1 P [of the OIP]). Any supplemental connections will be pre-engineered to minimize man-power resources and address environmental concerns. Required portable equipment will be reasonably protected from screened in hazards listed in Part 1 of this OIP.

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

6. Following the initial 24 hour period, additional nitrogen bottles will be staged at a gas cylinder rack located in a readily accessible Reactor Building location such that radiological impacts are not an issue.

The PNPS OIP describes system features such as a dedicated battery and pneumatic supply that, pending resolution of open items, appear to make the system reliable. Specific design details not available at this time include: the final sizing evaluations for HCVS pneumatic supply, the final sizing for HCVS battery/battery charger including documentation of incorporating HCVS electrical sources into the FLEX DG loading calculations, and documentation of an evaluation of temperature 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 documentation of the HCVS nitrogen pneumatic system design including sizing and location.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG 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, and 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 15 of the OIP states the following:

> The HCVS design allows initiating and then operating and monitoring the HCVS from the MCR and the HCVS Local Panel, which minimizes plant operators' exposure to adverse temperature and radiological conditions. The MCR location is protected from adverse natural phenomena and is the normal control point for Plant Emergency Response actions.
>
> The HCVS Local Panel will be located on Reactor Building elevation 23' outside of the TIP Room (Att. 3, Sketch 3A & 3B [of the OIP]), which contains vent valves AO-5042B and AO-5025. The HCVS Local Panel location will be evaluated during detailed design to determine the anticipated environmental conditions during a Severe Accident and identify the need for additional shielding.

The PNPS OIP describes two HCVS control locations. Entergy states that the control room is protected from normal adverse phenomena. However, design details are not available at this time, including: 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 confirmation that components located at the HCVS local panel are capable of performing their functions during ELAP and severe accident conditions. Therefore, the NRC staff has not completed its review.

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 15 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.
>
> PNPS has determined that the most viable and sensible approach to accommodate Hydrogen (H2) gas generation due to core overheating events is

to ensure that the H2 is vented from Primary Containment as a steam-diluted mixture via the HCVS vent path. Once initiated, Containment Venting provides a continuous vent flow path until an alternate method of Containment Heat Removal has been established and is functioning at a sufficient rate to provide all further Heat Removal. The HCVS Wetwell Vent pipeline from the Torus to the Main Stack will remain steam inerted; thus preventing accumulation of detonable gases or the infiltration of oxygen into the HCVS vent pipeline at all times that it is in use.

Considering the overall objective of maintaining continuous core cooling and precluding or preventing additional core damage and the resulting release of radioactive products, there are no instances where an established Containment Venting Strategy is intermittently stopped until alternative Heat Removal is established, with due consideration that full cycling (Open-Closed-Open) of an operating Containment Vent may result in Condensation Water Hammer and/or Deflagration of Combustible Gases in the Vent System, resulting in a more deteriorated overall condition and negative consequences for the principal objectives of protecting Containment, maintaining Core Cooling, and minimizing the release of radioactive material. If needed, the vent flow rate may be reduced by controlled throttling of the HCVS System valves, using Containment Temperature & Pressure and Vent Mass Flow indications for guidance. This would not be needed until at least several days into a successful FLEX injection and venting strategy.

PNPS describes a method to ensure that the flammability limits of gases passing through the system are not reached which appears to be in accordance with the Order requirement. The NRC staff will readdress this issue if PNPS changes the HCVS operating strategy to include HCVS vent cycling. A description of the strategies for hydrogen control that minimize the potential for hydrogen gas migration and ingress into the reactor building or other buildings is not available at this time; therefore, the staff has not completed its review.

Open Item: Provide a description of the strategies for hydrogen control that minimize 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, Section 1.2.3 states 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.

Order EA-13-109, Section 1.2.12 states that:

> 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 16 of the OIP states the following:

> The HCVS vent valves are PCIVs for containment isolation. These containment isolation valves are AOVs that are air-to-open and spring-to-shut. An SOV must be energized to allow the motive air to open the valve. AO-5042B receives a containment isolation signal automatically de-energizing the SOV causing the AOV to shut. AO-5025 is only used for emergency venting and not during normal plant operation; therefore, it does not receive a containment isolation signal. In a beyond design basis event, steps to manually override the containment isolation function have been incorporated into operating procedures to allow for operation of the HCVS.
>
> The cross flow potential experienced upstream of AO-5025 is with normally closed, fail closed PCIVs that are subjected to Appendix J testing; therefore, these are considered acceptable for minimizing cross flow between the HCVS and buildings/other systems (Ref's. 1E, 1R [of the OIP]).
>
> Cross flow potential exists downstream of AO-5025 at the outlet of the Standby Gas Treatment System (SGTS). The cross flow potential at this location is minimized by isolating the discharge of the SGTS. There are two options being reviewed for isolation of SGTS discharge including (a) replace existing outlet valves AO-N-108 and AO-N-112 with new butterfly valves or (b) install a new valve in the common piping downstream of AO-N-108 and AO-N-112. Regardless of the chosen option, the isolation valve will meet the required HCVS design conditions/leakage requirements and will be manually operated local to the valve.
>
> This is accomplished using manual actuator overrides local to the valves in the Reactor Building, Elevation 51' (Ref. 4C, 6A [of the OIP]).
>
> There is no cross flow potential for the other systems that also discharge to the Main Stack. The potential for unintended cross flow and hydrogen migration is precluded for systems that have open-ended vertical exhaust piping in the vertical base section of the Main Stack (Ref. 4C, 6A [of the OIP]).

The PNPS OIP describes methods to minimize unintended cross flow within the unit that include: failed closed PCIVs, valve testing in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," modifications and manual actions to address gas migration through the HCVS interface with SBGT, and flow dynamics to prevent back flow through other systems exhausting to the main stack. Details not available at this time include: the final method to isolate HCVS from SBGT, all interfacing discharges to the plant stack, and control of all penetrations to the HCVS envelope; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit descriptions of design details that minimize unintended cross flow of vented fluids within a unit including: the final method to isolate HCVS from SBGT, all interfacing discharges to the plant stack, and control of all penetrations to the HCVS envelope.

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 16 of the OIP states the following:

> EOP/ERG [emergency operating procedure/emergency response guideline] operating procedures provide clear guidance that the HCVS is not to be used to defeat containment integrity during any design basis transients and accident. In addition, the HCVS is designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error. PNPS does credit CAP [containment accident pressure] to provide adequate Net Positive Suction Head (NPSH) to the Emergency Core Cooling System (ECCS) Pumps for the Design Basis Loss of Coolant Accident (Ref. 1CC, Section 14.5.3 [of the OIP]).
>
> - The primary feature that prevents inadvertent actuation from the MCR are two PCIVs in series powered from different divisions with the downstream vent valve A0-5025 equipped with a keylock switch (Ref. 5A [of the OIP]). The upstream vent valve A0-50428 requires installation of a jumper to defeat the containment isolation signal (Ref. 5B [of the OIP]). Procedures also provide clear guidance to not circumvent containment integrity by simultaneously opening Torus and Drywell Vent Valves during any design basis transient or accident.
>
> - The primary feature that prevents inadvertent actuation at the HCVS Local Panel is locked open solenoid vent valves which prevent pressurization of the valve actuators should the nitrogen supply valves be inadvertently opened (Ref's. 7B, 7C [of the OIP]).

The PNPS OIP provides a description of methods to prevent inadvertent HCVS actuation that includes: key lock switches, valves in series that are air-to-open spring-to-shut and procedural guidance. This appears to be in accordance 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.

3.2.2.9 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 17 of the OIP states the following:

> The HCVS components downstream of the second containment isolation valve and components that interface with the HCVS are routed in seismically qualified structures. HCVS components that directly interface with the pressure boundary will be 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 control components which interface with Class 1E power sources will be considered safety related, as their failure could adversely impact containment isolation and/or a safety-related power source. The remaining components will be considered Augmented Quality. 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 process instrumentation, radiation monitoring, and support system monitoring, will be qualified by using one of the three methods described in the ISG, which includes:
>
> Purchase of instruments and supporting components with known operating principles from manufacturers with commercial quality assurance programs e.g., IS09001) where the procurement specifications include the applicable seismic requirements, design requirements, and applicable testing.
>
> 1. Demonstration of seismic reliability via methods that predict performance described in IEEE [Institute of Electrical and Electronics Engineers] 344-2004
> 2. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	Qualification Method*
HCVS Effluent Temperature	ISO9001 / IEEE 344-2004 / Demonstration
HCVS System Pressure	ISO9001 / IEEE 344-2004 / Demonstration
HCVS System Flow	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Battery Capacity	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344-2004 / Demonstration
Drywell Pressure	Existing instruments / pre-qualified
Wetwell pressure	Existing instruments / pre-qualified
Wetwell level	Existing instruments / pre-qualified
Wetwell temperature	Existing instruments / pre-qualified
Reactor Pressure	Existing instruments / pre-qualified
HCVS Valve Position Limit Switches	Existing instruments / pre-qualified

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

The PNPS OIP describes component qualification methods that, pending resolution of open items, appear to be in accordance 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. Specific details not available at this time include: information regarding the pre-qualification methods of existing 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 that existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during beyond-design-basis external event (BDBEE) and severe accident wetwell venting. Therefore, the NRC 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 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, Section 1.1.4 states 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.

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 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 18 of the OIP states the following:

> The PNPS Wetwell HCVS will be capable of being manually operated during sustained operations from a control panel located in the MCR and will meet the requirements of Order Element 1.2.4 (Ref.1E [of the OIP]). The MCR is a readily accessible location with no further evaluation required. Control Room dose associated with HCVS operation conforms to GDC [General Design Criterion] 19/Alternate Source Term (AST). Additionally, to meet the intent for a secondary control location of Order Element 1.2.5 (Ref. 1E [of the OIP]), a readily accessible HCVS Local Panel will also be incorporated into the HCVS design as described in NEI 13-02 Section 4.2.2.1.2.1 (Ref.1K [of the OIP]). The controls and indications at the HCVS Local Panel 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 have vent temperature, pressure, mass flow, radiation, pneumatic pressure, and battery capacity monitoring. The temperature monitoring will be downstream of the second vent valve (A0-5025). Both AOVs have open and

closed limit switch indication. These HCVS indications will be at the same location as the valve control switches, which is on the MCR Panel C7. The temperature, pressure, mass flow, and radiation indicators and valve position switch lights will be provided on MCR Panel C7 and at the HCVS Local Panel in the Reactor Building (Att. 3, Sketch 2B [of the OIP]). The position switches, temperature sensor, pressure, and mass flow sensor will be used to determine with certainty whether or not containment pressure/energy is being vented through the HCVS at the conditions required to meet the venting strategy.

Local pressure gages at the HCVS Local Panel will monitor the high pressure nitrogen cylinder supplies and gages downstream of the pressure regulators will show the reduced pressure provided to the AOV actuators (Att. 3, Sketch 2B [of the OIP]).

Since the instrumentation dedicated for Containment pressure monitoring is AC powered, the Containment Pressure will be monitored using the RCIC or HPCI [high-pressure coolant injection] suction pressure instrumentation which are powered by the 125/250 VDC System. An alternate method for monitoring the Torus Pressure is using the pressure monitoring between the upstream (A0-5042B) and the downstream vent valve (A0-5025), so that Torus Pressure can be verified by opening the first isolation valve before the Torus Vent flow path is opened. The Containment Monitoring instrumentation will be available upon the installation of the FLEX DGs supplying power to the 125/250 VDC Station Battery Chargers, which are repowering the supply panels (Ref. 3A [of the OIP]).

Torus Water Level monitoring instrumentation (AC powered) is not available until installation of the FLEX DGs supplying power to the 125/250 VDC Station Battery Chargers, which are repowering the supply panels (Ref. 3A [of the OIP]). This is acceptable because the Torus Water Level is not required until after the 8 hours.

The new HCVS instrumentation will normally be supplied by the Station 125 VDC Power System, via 125 VDC to 24 VDC converters in MCR Panel C7. The new HCVS instrumentation and existing controls will also include a 24 VDC Dedicated Battery Panel included at the HCVS Local Panel and MCR, with spare terminals to connect additional 24 VDC external batteries at either the HCVS Local Panel or in MCR Panel C7. The available battery capacity will be displayed in the MCR Panel C7 (Att. 3, Sketch 1A [of the OIP]).

This monitoring instrumentation provides the indication in the MCR as per Requirement 1.2.4. The HCVS and related controls and instrumentation will be specified and evaluated or tested, as required, with the expectation that the components remain functional under thermal, environmental, and radiation conditions that are consistent with station specific conditions and the actual recorded events at the Fukushima Dai-ichi Nuclear Power Plants in March 2011.

The PNPS OIP provides a description of HCVS monitoring and control 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 as an acceptable means for implementing applicable requirements of

Order EA-13-109. Specific details not available at this time include: descriptions 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 NRC staff has not completed its review.

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 20 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, has been designed/analyzed to conform to the requirements consistent with the applicable design codes (e.g., Non-safety, Cat 1, 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 and total integrated dose radiation for the Effluent Vent Pipe and HCVS Local Panel location.
>
> Conduit design will be seismically rugged. 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. These qualifications will be bounding conditions for PNPS.

For the instruments required after a potential seismic event, the appropriate method 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 equivalent of 2x Safe Shutdown Earthquake (SSE) loads based on the plant bounding response spectra;

- 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 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations, (Ref.2A[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 bounding the existing design basis loading at the installation location.

The PNPS OIP provides descriptions for component reliable and rugged performance that, pending resolution of open items, appear to be in accordance 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. The seismic and tornado missile final design criteria for the HCVS stack are not available at this time; therefore the NRC 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.

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 21 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 BDBEE hazards identified in part 1 of this OIP. Immediate operator actions can be completed by Operators from the HCVS control station(s) and include remote-manual initiation. Remote-manual is defined in this report as a manually initiated power operation of a component and does not require the operator to be at or in close proximity to the component. The operator actions required to open a vent path are as described in Table 2-1 [of the OIP].
>
> The HCVS will be designed to allow initiation, control, and monitoring of venting from the MCR or the HCVS Local Panel. Both locations minimize plant operators' exposure to adverse temperature and radiological conditions and are protected from hazards assumed in Part 1 of this report [the OIP].
>
> Permanently installed power and motive air/gas capability will be available to support operation and monitoring of the HCVS for 24 hours. Permanently installed equipment will supply air and power to the HCVS for 24 hours.
>
> A condensate drain trap, manual isolation valve, and flex hose quick-connect fitting will be installed downstream of torus drain valve 44-H0-114 as part of the FLEX modifications. Prior to venting, a flexible hose must be connected to this fitting and routed to the Torus Room to drain condensate from the vent pipeline (Att. 3, Sketch 3C [of the OIP]).
>
> Isolating the outlet of the Standby Gas Treatment System will be completed by manually closing the valves that interface with the vent path, AO-N-108 and AO-N-112. This will be accomplished using manual actuator overrides local to the valves in the Reactor Building, Elevation 51' (Att. 3, Sketch 30 [of the OIP]). Ladders or platforms will not be required to access the manual actuator control(s) for isolation of the SGTS discharge piping (see this OIP Part 2, "Unintended Cross Flow of Vented Fluids" for more information).

System control:

i. Active: The HCVS vent valves are operated in accordance with EOPs to control containment pressure. The HCVS is designed for 5 open/close cycles over the first 24 hours following an ELAP. Controlled venting will be permitted in the revised EPGs [emergency procedure guidelines]. There is no intention to cycle the HCVS vent valve A0-5025 once it is opened for purposes of heat removal. The strategy will be to minimize Containment pressure from that point until Wetwell venting is no longer required.

   As noted in Table 2-1, a keylock switch will need to be closed to defeat the containment isolation circuit on the PCIV A0-5042B needed to vent containment. Inadvertent actuation protection is provided by the use of a key lock switch located on MCR Panel C7 for the downstream vent valve A0-5025. In addition, locked open solenoid vent valves prevent inadvertent pressurization of the vent valve actuators A0-5042B and A0-5025 from the HCVS Local Panel.

ii. Passive: No passive component (e.g. rupture disk) will be installed.

The PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. Specific details not available at this time include the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation and the final nitrogen pneumatic system design including sizing and location; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.

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

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 22 of the OIP states the following:

> After 24 hours, available personnel will be required to connect supplemental motive air/gas to the HCVS. Connections for supplementing electrical power and motive air/gas 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. The response to NRC EA-12-049 (Ref. 3A [of the OIP]) will demonstrate the capability for FLEX efforts to maintain the power source.
>
> After 24 hours, available personnel will be required to discharge the accumulated condensate in the basement of the Main Stack to the Frac Tank using a submersible for reuse as makeup water via the Water Treatment Skid from the RRC.
>
> These actions provide long term support for HCVS operation for the period beyond 24 hrs 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 PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. Specific details not available at this time include the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation and the final nitrogen pneumatic system design including sizing and location; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG 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 26 of the OIP stated the following:

> Specifics are the same as for BDBEE Venting Part 2 except the following locations and travel pathways are evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway:
>
> - HCVS Local Panel (Reactor Building, Elevation 23').
> - Installation of a condensate drain hose from Auxiliary Bay, Elevation 3' to the Torus Room.
> - Isolating the outlet of the Standby Gas Treatment System using valves AO-N-108 and AO-N-112 (Reactor Building, Elevation 51') or a newly installed downstream valve.
>
> An evaluation of travel pathways for dose and temperature concerns will be completed as part of detailed design for confirmation.
>
> System control:
>
> i. Active: Same as for BDBEE Venting Part 2.
>
> ii. Passive: Same as for BDBEE Venting Part 2.

The PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. Specific details not available at this time include: the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation, the final nitrogen pneumatic system design including sizing and location, and an evaluation of environmental and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.

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 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 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.

Order EA-13-109, Section 1.2.8 states that:

> 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.

Page 27 of the OIP states the following:

> Specifics are the same as for BDBEE Venting Part 2 except the following are evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway.
>
> - The location and refueling/replenishment actions for the FLEX DGs (Battery Charger and Switchgear Rooms) and the HCVS Local Panel (Reactor Building, Elevation 23').
>
> - The location and installation actions for draining the Main Stack
>
> These actions provide long term support for HCVS operation for the period beyond 24 hrs 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 PNPS OIP describes a greater than 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. Specific details not available at this time include: the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation; the final nitrogen pneumatic system design including sizing and location; and an evaluation of environmental and radiological conditions, including radiological hazards that result from the condensing of vented fluids in the HCVS system and plant stack, to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified). Therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.

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 an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.

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 28 of the OIP states the following:

> Containment integrity is initially maintained by permanently installed equipment. All containment vent operating functions will be performed from the MCR or HCVS Local Panel. Venting will require support from DC power and instrument air systems as detailed in the response to Order EA-12-049 (Ref. 3A [of the OIP]) but not until after 24 hours for HCVS instrumentation.
>
> Existing safety related station batteries will provide sufficient electrical power for operation of the HCVS vent valves from the MCR for at least 8 hours. HCVS Dedicated Batteries will supply sufficient electrical power for HCVS operation and monitoring for 24 hours. At 24 hours, power will be switched back to the station batteries, which at that point will be backed up by FLEX DGs.
>
> The HCVS Local Panel will be installed in the Reactor Building outside of the TIP Room (Elevation 23'), which contains vent valves A0-5042B and A0-5025 (Ref.'s 7B, 7C; Att. 3, Sketch 3A & 3B [of the OIP]). Additional nitrogen bottles will be stored in a readily accessible location.
>
> A condensate drain trap, manual isolation valve, and flex hose quick-connect fitting will be installed downstream of torus drain valve 44-H0-114 as part of the FLEX modifications. Prior to venting, a flexible hose must be connected to this fitting and routed to the Torus Room to drain condensate from the vent pipeline (Att. 3, Sketch 3C [of the OIP]).

The PNPS OIP describes BDBEE supporting equipment functions that, pending resolution of open items, appear to be in accordance 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. Specific details not available at this time include the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation and the final nitrogen pneumatic system design including sizing and location; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG 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 28 of the OIP states the following:

> The same support functions that are used in the BDBEE scenario would be used for severe accident venting.

The PNPS OIP describes support equipment functions for severe accident venting that, pending resolution of open items, appear to be in accordance 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. Specific details not available at this time include: the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation, the final nitrogen pneumatic system design including sizing and location, and an evaluation of environmental and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment (licensee identified); therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.

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 an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.

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 30 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 PNPS OIP describes supporting equipment deployment functions that, pending resolution of open items, appear to be in accordance 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. Specific details not available at this time include: the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation, the final nitrogen pneumatic system design including sizing and location, and an evaluation of environmental and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment; therefore, the NRC staff has not completed its review.

Open Item: Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.

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 an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.

Summary, Section 3.2:

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 DRY WELL VENT

Summary, Section 3.3:

Dry Well Vent will be evaluated during Phase 2 of Order EA-13-109. The NRC Staff will provide the ISG for Phase 2 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 33 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 the 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 HCVS dedicated 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

Licensees will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in Operations department administrative controls:

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

- If for up to 90 consecutive days, the primary or alternate means of HCVS operation are non-functional, 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 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 PNPS OIP describes programmatic controls that appear 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. The NRC staff determined that procedure development appears to be in accordance with existing industry protocols. 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.

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 34 of the OIP states the following:

> Personnel expected to perform direct execution of the HCVS 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. 1J [of the OIP]) all personnel on-site will be available to supplement trained personnel.

The PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109. The systematic approach to training process has been accepted by the NRC staff 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 34 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 Pilgrim 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 as an acceptable means for implementing applicable requirements of Order EA-13-109.

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 35 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.
>
> PNPS will implement the following operation, testing and inspection requirements for the HCVS to ensure reliable operation of the system (Ref. 1K [of the OIP]). The minimum frequency for testing and inspection of the HCVS has been listed in Table 4-1[of the OIP].

Table 4-1: 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) 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 PNPS 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 as an acceptable means for implementing applicable requirements of Order EA-13-109.

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. The 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 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

2.	Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.	Section 3.2.2.3 Section 3.2.11
3.	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 3.2.4.1 Section 3.2.4.2 Section 3.2.5.2 Section 3.2.6
4.	Provide a description confirming that the HCVS discharges to a point above main plant structures.	Section 3.2.2.3
5.	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
6.	Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.	Section 3.2.2.4 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
7.	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	Section 3.2.2.4 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
8.	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
9.	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
10.	Make available for NRC staff audit descriptions of design details that minimize unintended cross flow of vented fluids within a unit including: the final method to isolate HCVS from SBGT, all interfacing discharges to the plant stack, and control of all penetrations to the HCVS envelope.	Section 3.2.2.7

11.	Make available for NRC staff audit documentation of an evaluation verifying the existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during BDBEE and severe accident wetwell venting.	Section 3.2.2.9
12.	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 has provided an OIP for designing and installing Phase 1 of a severe accident capable 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 atmosphere (including steam, hydrogen, carbon monoxide, non-condensable gases, aerosols, and fission products), and control containment pressure within acceptable limits. The OIP describes a HCVS wetwell vent 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 ELAP.

The NRC staff finds that the licensee's OIP for Phase 1 of Order EA-13-109 describes: plan elements and assumptions; boundary conditions; provisions for programmatic controls, training, drills and maintenance; and an implementation schedule that appear consistent with the guidance found in NEI 13-02, as endorsed, in part, by JLD-ISG-2013-02 as an acceptable means for implementing Phase 1 requirements of Order EA-13-109, subject to acceptable closure of the above open items.

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 Entergy to NRC, "Pilgrim – 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 30, 2014 (ADAMS Accession No. ML14188B731).

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. Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," September 1, 1989 (ADAMS Accession No. ML13017A234).

16. 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).

17. Pilgrim Nuclear Power Station Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (ADAMS Accession No. ML13225A587).

18. Letter from Entergy to NRC, Pilgrim Nuclear Power Station 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. ML13063A063).

19. 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 24, 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 No. 50-293

Enclosure:
Interim Staff Evaluation

cc w/encl: Distribution via Listserv

DISTRIBUTION
PUBLIC
JOMB R/F
RidsNrrDorlLpl1-1Resource
RidsNrrPMPilgrimResource
RidsNrrLASLentResource
RidsAcrsAcnw_MailCTR Resource
RidsOGCMailCenter
RidsRgn1MailCenter Resource
SMonarque, NRR
CNorton, NRR
WReckley, NRR/JLD

ADAMS Accession No.: ML15043A754 ***via email**

OFFICE	NRR/JLD/JOMB/PM	NRR/JLD/LA	OGC	NRR/DORL/LPL1-1/PM
NAME	CNorton	SLent	BHarris	NMorgan
DATE	02/12/15	02/19/15	03/04/15	03/16/15
OFFICE	NRR/JLD/JOMB/PM	NRR/JLD/JCBB/BC	NRR/JLD/JERB/BC	NRR/JLD/JOMB/BC (A)
NAME	SMonarque	SBailey	BPham	MHalter
DATE	03/10/15	02/20/15	02/12/15	03/24/15

OFFICIAL RECORD COPY